

**Joint Board Matter Supervisor Pat Herrity and Supervisor Penny Gross
Sewer Capacity Information Request October 5, 2021**



County of Fairfax, Virginia

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Background: Earlier this year, Buckley Development, LLC filed an application (PCA/CDPA/FDPA 2000-SU-012) to modify the zoning approvals for the Buckley's Reserve community located at the intersection of the Fairfax County Parkway and Route 29/Lee Highway in Fairfax. Buckley's Reserve is zoned PDH-4 and was developed in the mid-1990s with 247 single family detached and attached dwelling units. The pending application proposes to remove two single family homes and replace them with six new single-family homes, a net increase of four houses.

During its review of the zoning application, Staff recently determined that the theoretical capacity of the sanitary sewer lines serving Buckley's Reserve had been exceeded as a result of development elsewhere in the service area that occurred after the community was built. Among the developments constructed after Buckley's Reserve and served by this sanitary sewer line are the McConnell Public Safety and Transportation Operations Center and 283 homes. As I understand it, Staff has informed the applicant that no additional development can occur until the sanitary lines for the entire service area are upgraded to add capacity.

Setting aside the details of this particular application, I find it concerning that the sanitary sewer system serving 530 homes and a 225,000 square foot public safety facility is stretched so thin that it cannot even handle the addition of four new houses. If this situation exists at this location, where most of the development occurred in the last 25 years, I wonder whether the same or similar issues exist in other parts of the County, particularly those areas built 50 or 60 years ago. As we have seen in Pimmit Hills, Springfield, Alexandria, McLean and Falls Church, three-bedroom, two-bathroom homes built in the 1950s or '60s routinely are being torn down and replaced with 5-6 bedroom homes having four or more bathrooms. Infill developments and redevelopments occur throughout the County and rely, in many cases, on sewer lines built decades before. Although the County expends capital funds each year to upgrade existing sewer lines, I would hope that we do so before demand exceeds capacity on any given line. As this applicant has discovered, however, that may not be the case.

I understand that proposed developments in Tysons and the Dulles Corridor have exceeded the theoretical capacity of sewer lines there, and staff has adopted a strategy to have developers fund the expansion of sewer lines. These are typically large projects that can spread the cost of the sewer expansion across multiple buildings or developments. What I am less clear about is what policies and plans are in place in other parts of the County where development and redevelopment is more incremental and at a scale that makes it hard for any single project to fund needed upgrades.

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Motion: Accordingly, Mr. Chairman, I move that the Board of Supervisors direct staff to prepare a report to the Board summarizing (i) how the County monitors the sanitary sewer network to determine when individual service areas or line segments have reached or will reach their theoretical or actual capacity limits, (ii) how many such service areas or line segments already are at or above their theoretical or actual capacity limits and their locations in the County, (iii) how the County prioritizes upgrades to existing sewer lines that have reached or exceeded their capacity limits, (iv) the status of upgrades the County is making or intends to make using capital funds, and (v) the policy it is currently using for developer expanded sewer lines.

Responses to Specific Questions in the Board Matter

- (i) **How does the County monitor the sanitary sewer network to determine when individual service areas or line segments have reached or will reach their theoretical or actual capacity limits?**

Response:

As part of the development review process, the DPWES uses hydraulic models of the sewer system to ensure adequate capacity exists in the sanitary sewer network to accommodate the proposed new development. DPWES uses measured flow in the sewer system to calibrate the hydraulic models.

The County uses 53 permanent metering stations and rotates temporary meters throughout the County's sewer system to continuously measure and monitor the flows from large portions of the sewer service area. Should these meters indicate flows are reaching the system limit, after further investigation and confirmation of the data, the County addresses the matter via a project in its CIP. DPWES does not monitor flow in all 3,100 miles of individual line segments, which would be costly and result in larger-than-needed sewer service rates. DPWES's metering practices are reviewed by outside consultants. DPWES also continues to work with the Metropolitan Washington Council of Governments and the Blue Plains Advanced Wastewater Treatment Plant on uniformity of flow meter usage and results.

DPWES follows industry standards and flow meter manufacturer's specifications for calibrating flows. The meter data is reviewed twice weekly with quarterly measurement verification and more frequently if there are data anomalies such as a discrepancy in flow. Meters are calibrated any time equipment is switched out. DPWES contractors' take manual depth measurements and velocity readings to calibrate actual flow through the meters. In the case of County equipment, the Triton+ industry standard specifies a +/- 10% error factor.

- (ii) **How many such service areas or line segments already are at or above their theoretical or actual capacity limits and their locations in the County?**

Response:

DPWES performed a planning-level hydraulic modeling of the sewer system in response to this Board matter (see Attachment 4). Separately, DPWES had already initiated a full hydraulic model of the system in November 2019, which should be completed in Fall 2022. In this planning-level modeling effort, DPWES assessed pipe capacity under new sewer design standards. DPWES modeled projected peak flows generated during diurnal peak water use and a storm event simultaneously. Storm events contribute to infiltration and inflow of ground and surface waters into the sewer system. The projected peak flows are intentionally conservative and produce higher than actual flows to appropriately manage risk and minimize the potential for sanitary sewer overflows.

As wastewater flows from smaller pipes to the larger pipes to reach a treatment plant, the actual peak flow is attenuated because of the travel time in the sewer pipe network. The planning level hydraulic modeling that was done for this effort does not account for the attenuation of the flow. Therefore, the conservativeness of the assumed peak flow is amplified in the hydraulic model, especially in the larger pipe sizes. In addition, some of the existing pump stations such as Difficult Run, Braddock and Backlick are designed to divert flows among larger sewer pipes to allow for the efficient use of the available capacity in larger pipes. In this modeling effort, no flow transfers were performed. The full hydraulic model of the sewer system, estimated to be completed in Fall 2022, will account for the effects of the attenuation and flow transfer.

Because the effects of attenuation and flow transfer are not included, the planning level hydraulic model overstates the theoretical capacity problem in pipes larger than 24 inches, as noted below. However, actual flow monitoring data and actual sanitary sewer overflow rates show that there are not currently capacity exceedances in these larger pipes.

- a. Collector Pipes (8-10 inch diameter) represent approximately 92% of the system. 99.6% of these pipes have adequate capacity for the existing customers when new sewer design standards are applied.
- b. Mainlines (12-24 inch diameter) represent approximately 6% of the system. 92.8% of these pipes have adequate capacity for the existing customers when new sewer design standards are applied.
- c. Interceptors (>24 inch) represent approximately 2% of system. 72.9% of these pipes have adequate capacity for the existing customers when new sewer design standards are applied.

(iii) How does the County prioritize upgrades to existing sewer lines that have reached or exceeded their capacity limits?

Response:

Based on the County's growth-pays-for-growth policy, DPWES requires developers to upgrade local lines as developments are proposed and if there is insufficient capacity to accommodate the proposed increase in density. DPWES plans the County CIP to upgrade major facilities including trunk lines, pumping stations, and treatment plants. DPWES prioritizes these improvements based on minimizing business risk exposure using asset management criteria, including capacity, regulatory requirements, condition assessments of aging infrastructure, criticality of the infrastructure, consequences of failure, and flow projections. Following industry standard practices, DPWES uses weighted numerical rankings to prioritize the major facilities that need to be addressed. This approach is aligned with the internationally recognized ISO 55000 and Effective Utility Management standards.

(iv) What is the status of upgrades the County is making or intends to make using capital funds?

Response:

The County's CIP documents the following projects related to capacity enhancements. These projects are at various stages of planning and design. For a complete list of all CIP projects that are planned and supported by the Sewer Fund, please refer to Table 10 of the [Wastewater Rate Study for Fiscal Year 2021 Through Fiscal Year 2026 \(fairfaxcounty.gov\)](https://www.fairfaxcounty.gov/water/wwr/wwr-study)

Capacity-Related Projects in Design:

1. Wastewater Utility Management Plan for a County-wide evaluation of the entire sewer system capacity needs. This evaluation will include a more detailed assessment of the planning-level hydraulic model described in Attachment 4.
2. Tysons West Pump Station, Force Main, and gravity sewer to address future growth in western part of Tysons and Reston.
3. Enlarging Accotink Interceptor from a 30-inch gravity sewer to a 42-inch gravity sewer to handle future growth.
4. Lakevale sewer project to address capacity constraints in the Lakevale area.
5. Enlarging a 12-inch gravity sewer to an 18-inch gravity sewer to address future flows in Merrifield.
6. Enlarging and relocating gravity sewers along the Route 1 BRT/Embark project to address future flows and avoid conflicts with BRT.

Capacity-Related Projects in Planning:

1. Evaluation of the Potomac Interceptor to address projected wet weather capacity issues.
2. New Sugarland Pump Station and Force Main to address projected growth in the vicinity of the Town of Herndon Metro Station.
3. New Tysons East Pump Station and Force Main to address growth in the eastern part of Tysons.
4. Difficult Run Pump Station capacity increase to address growth in the vicinity of Herndon and Reston.

(v) What is the policy the County is currently using for developer expanded sewer lines?

Response:

The County allocates available capacity in the system on a first-come-first-served basis. If adequate capacity does not exist, Sections B-5 and C-2.2 of the County's current Sewer Service Policy (Attachment #3) states:

“B-5 Developers will be required to provide enlarged sewers within the area developed when required by the DPWES to service adjacent and/or upstream areas in accordance with general plans promulgated from time to time. An agreement to provide for reimbursing a portion of the increased cost to the developer, as set forth in Section E-2, may be executed prior to construction.”

“C-2 Developed communities may receive public sewerage facilities from the County by one of the following methods:

... C-2.2 Fund Advancement by the community and/or individuals upon execution of agreement and deposit of sufficient funds to construct the facilities. Such funds shall be subject to partial reimbursement as provided in Section E-2.”

Projects Specific to This Board Matter

This Board Matter notes two projects located in Springfield and Mason Districts. Following is a summary of sewer capacity challenges with these projects.

Springfield District

Buckley's Reserve - 12627 & 12631 Buckleys Gate Drive, Fairfax VA 22030

- PCA/CDPA/FDPA 2000-SU-012 – The PCA amendment proposes to increase the number of lots within the Buckley's Reserve subdivision from 247 to 251.
- The four additional single family homes are estimated to produce 9,100 gallons per day of additional peak flow per Fairfax County Public Facilities Manual ([PFM](#))
- To ensure that the existing 8-inch diameter local sanitary sewers built in 1996 are adequate for the proposed use, the applicant conducted sanitary sewer capacity analysis from Manhole 055-4-092 to Manhole 055-3-019.
- The analysis determined that two existing 8-inch sanitary sewers of approximately 476 feet need to be enlarged to 12 inches in diameter.
- The developer has worked with DPWES and another developer in the area that faced the same capacity restriction. The two developers will partner to install the approximately 476 feet of pipe at the required larger diameter.
- The 12 inch-diameter enlargement accounts for the full Comprehensive Plan flow as well as the developer flow. In other words, the additional flow for full Comprehensive Plan buildout did not cause additional upsizing.

Mason District

Alta Crossroads – 3531 Moncure Ave, Falls Church, VA 22041

- FDP 2014-MA-023-02 – Provides for three single-family attached dwelling units and 370 multifamily dwelling units
- The three additional single family homes and 370 multifamily units are estimated to produce 607,000 gallons per day of additional peak flow per Fairfax County [PFM](#)
- To ensure that the existing 8-inch and 10-inch diameter local sanitary sewers built in 1956 are adequate for the proposed use, the applicant conducted sanitary sewer capacity analysis from Manhole 061-2-227 to Manhole 062-1-002
- The analysis determined that three 8-inch sewer segments and two 10-inch sewer segments of approximately 1,080 feet need to be enlarged to meet the Comprehensive Plan level of density. Sewer lines needed to be upsized by two inches in diameter to meet the needs of the development, and an additional two to three inches (depending on the specific pipe) to accommodate the Comprehensive Plan density.
- The requirement to provide for adequate sewer capacity is included in the draft staff report associated with FDP 2014-MA-023-02.
- The applicant continues to work with DPWES on identifying the required improvements. As of February 1, 2022, DPWES expects that soon the applicant will submit analysis regarding the sizes of pipe needed to convey Comprehensive Plan buildout density.

Planning-Level Hydraulic Modeling Results

DPWES performed a planning-level hydraulic model of existing sewers, applying new sewer design standards. This model does not contain site-specific field survey information, nor does it represent a full hydraulic model of the County's sewers. In November 2020, DPWES contracted with a consultant to assist the County with a full hydraulic model of the system down to the 8-inch pipe size. DPWES's existing hydraulic model predicts flow patterns in pipes greater than 10 inches in diameter. DPWES estimates completion of this full hydraulic model in Fall 2022.

The planning-level capacity analysis of the County's over 3,100 miles of sewers showed that the sewer collection system has adequate capacity to serve existing customers in all sewers. However, the planning-level analysis shows that, theoretically, approximately 1% (~30 miles) of sewers surcharge when held to new sewer design factors. That is, DPWES estimates that approximately 1% of existing sewers do not meet new sewer design factors.

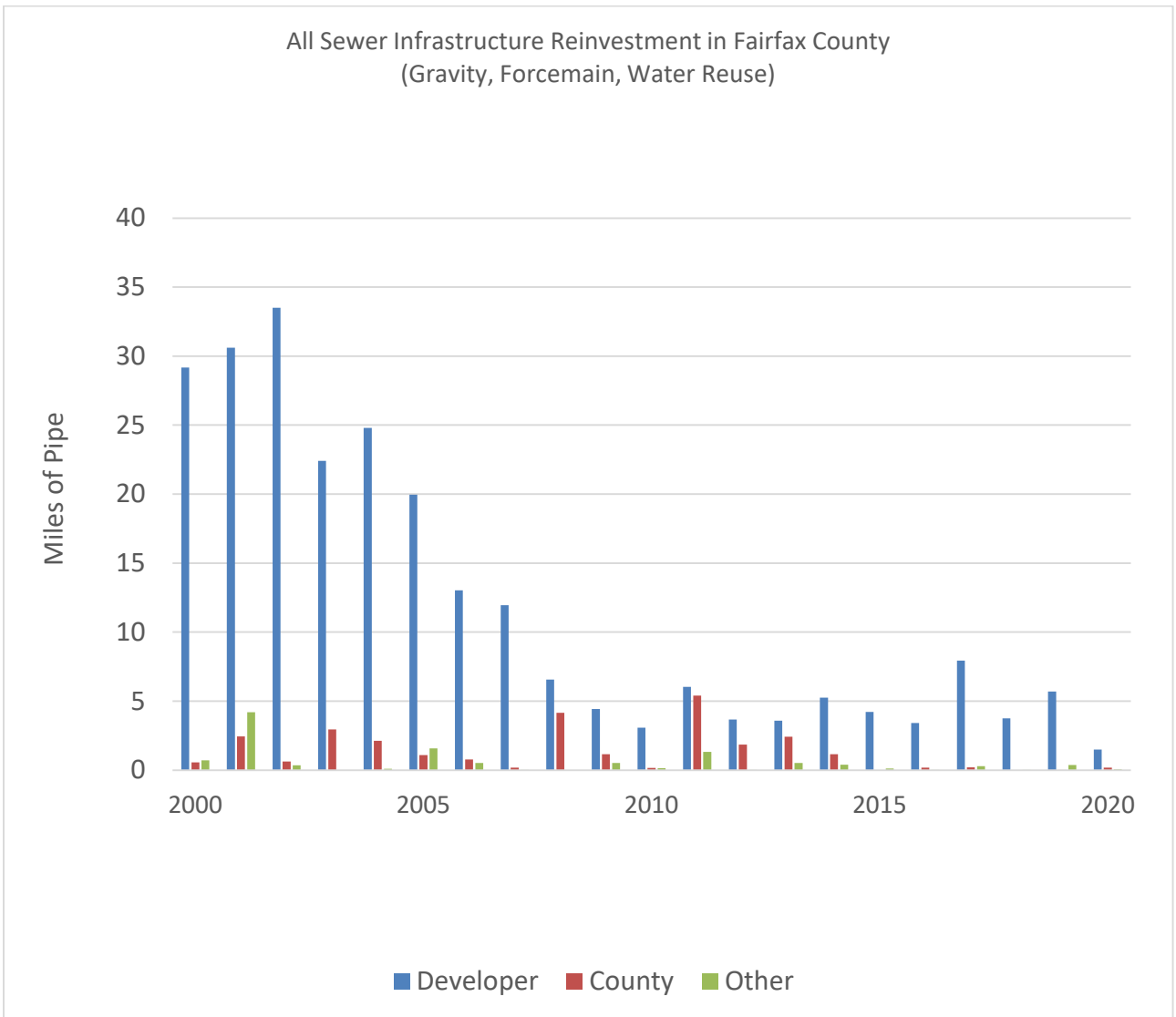
Based on the planning-level, theoretical hydraulic model, DPWES estimates that the following sewer lengths lack capacity under existing conditions when flows are at maximum peaking, such as during a storm coincident with peak customer usage. DPWES considers these segments already at maximum capacity and would require developers to upgrade the sewer capacity before allowing new connections.

- Collector Pipes (8-12 inch):
 - 0.4% of pipes or 75,000 linear feet
- Mainlines (12-24 inch):
 - 7.2% of pipes or 102,000 linear feet
- Interceptors (>24 inch):
 - 27.1% of pipes or 113,000 linear feet

DPWES estimated an order-of-magnitude cost to upgrade these pipes as part of the CIP instead of following a "growth-pays-for-growth" policy. The order-of-magnitude estimate ranges from approximately \$300M to \$600M to increase the capacity of these pipes in their entirety. By comparison, the County budget for Fiscal Year 2022 included \$86 million in Fund 69300, Sewer Construction Improvements, which includes \$36 million for treatment plant projects. To further advise the cost and pace of development, DPWES composed the table and graph below to show the conveyance infrastructure investment performed over the past ten and twenty years, respectively.

Sewer Infrastructure Installed by Developers

Calendar Year	Total Developer Installed Pipe (miles)	Estimated Developer Cost (million dollars)
2010	3.1	\$16.3
2011	6.0	\$33.5
2012	3.7	\$21.2
2013	3.6	\$19.0
2014	5.3	\$29.3
2015	4.2	\$22.6
2016	3.4	\$19.0
2017	7.9	\$42.5
2018	3.8	\$20.8
2019	5.6	\$31.6
2020	1.5	\$7.8



The following tables show the planning-level hydraulic modeling results by magisterial district. The figure at the end of this Attachment shows the approximate geographic distribution of modeling results.

Analysis by Supervisor Districts

District	Existing Collector Pipes (8-10 inch) Not Meeting New Sewer Design Standards ^a	
	%	Linear Feet
Braddock	0.4%	8,200
Dranesville	0.3%	5,700
Hunter Mill	0.2%	4,500
Lee	0.7%	11,500
Mason	0.6%	8,700
Mount Vernon	0.4%	6,300
Providence	1.1%	19,500
Springfield	0.4%	8,000
Sully	0.1%	2,300

Notes:

^a For modeling, DPWES applied a peaking factor of 4.0 for 8- to 10-inch pipes.

District	Existing Main Pipes (12-24inch) Not Meeting New Sewer Design Standards ^b	
	%	Linear Feet
Braddock	2.1%	2,300
Dranesville	15.7%	25,500
Hunter Mill	8.1%	17,200
Lee	3.8%	4,800
Mason	4.4%	3,000
Mount Vernon	3.8%	3,900
Providence	9.3%	16,600
Springfield	7.7%	10,700
Sully	7.5%	17,800

Notes:

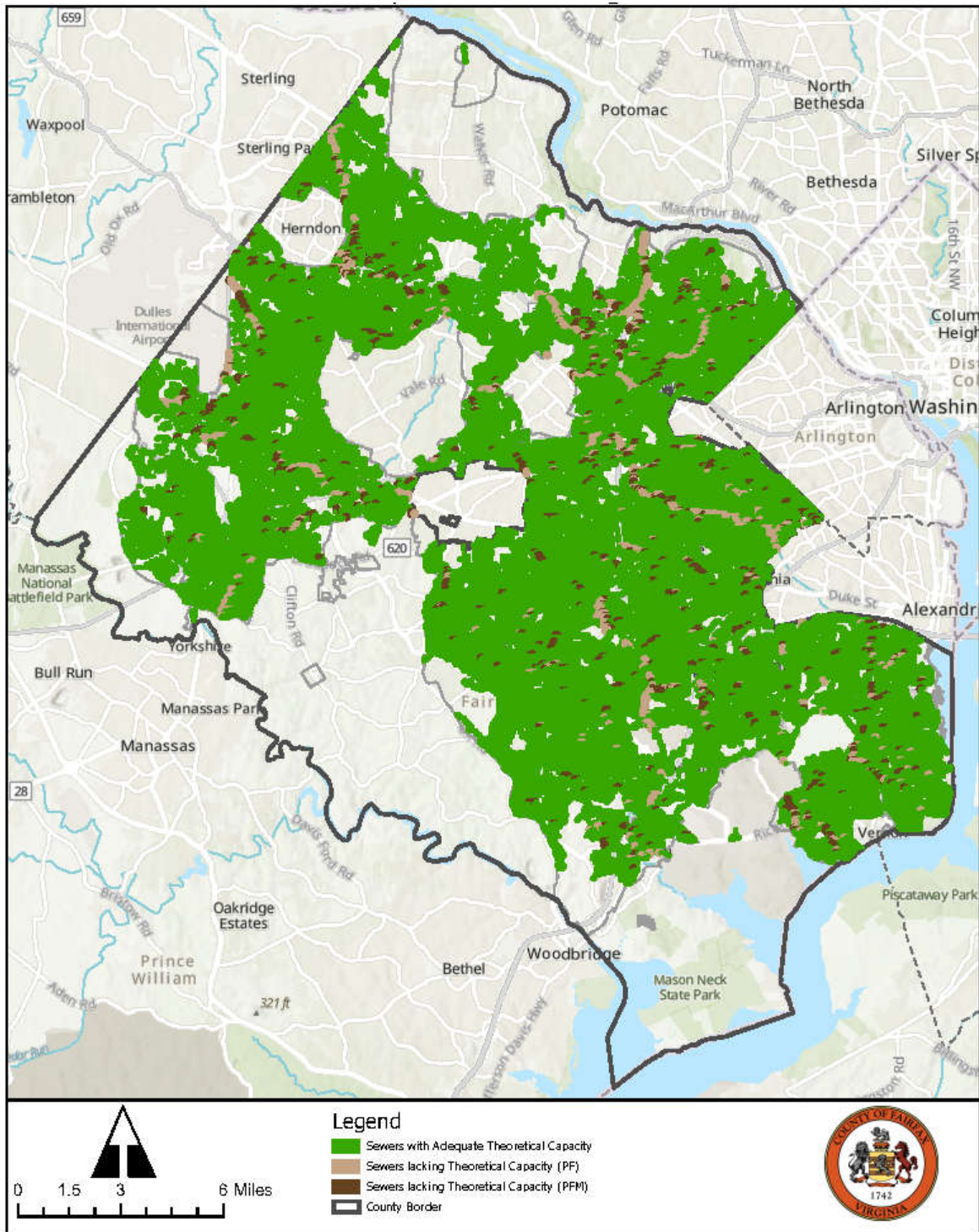
^b For modeling, DPWES applied a peaking factor of 3.5 for 12- to 24-inch pipes.

District	Interceptor Pipes (>24inch) Not Meeting New Sewer Design Standards ^c	
	%	Linear Feet
Braddock	17.1%	7,000
Dranesville	26.4%	17,100
Hunter Mill	5.2%	2,300
Lee	2.4%	3,700
Mason	45.8%	32,200
Mount Vernon	21.2%	12,900
Providence	2.2%	2,400
Springfield	10.0%	6,800
Sully	0.0%	-

Notes:

^c For modeling, DPWES applied a peaking factor of 2.5 for pipes with diameters greater than or equal to 24 inches.

Approximation of Existing Pipes Not Meeting New Sewer Design Standards



County Sanitary Sewer Program Overview

- 1.0 Sewer Capacity Overview
- 2.0 Development Process
- 3.0 Wastewater Capital Improvement Program
- 4.0 How Neighboring Entities Fund the Capacity Increase of Local Lines

1.0 Sewer Capacity Overview

The state requires the County to regulate development to ensure adequate sewer capacity and to project sewer system needs for the estimated 50-year population growth. By state regulation, sewage collection systems must be designed for the estimated ultimate tributary population, and state regulations empower the County to adopt regulations establishing how wastewater infrastructure is installed as a condition of development approval.

DPWES plans for population growth in its capital improvement program (CIP) and by regulating proposed development to ensure adequate sewer capacity. State regulations require that new sewer designs must incorporate a peaking factor that considers per capita daily flow as well as inflow and infiltration (I/I) from stormwater and groundwater. When developers propose to connect to existing sewers, DPWES allows them to use the following simplified peaking factors that comply with state requirements: 4 for local connector lines, 3 for mainlines, and 2.5 for interceptors.ⁱ Should sewers need to be upsized, for construction of new sewers, DPWES requires compliance with the established design standards that incorporate per capita daily flow and I/I in the Fairfax County Public Facilities Manual (PFM).

The County has updated the PFM over time to apply state-of-the-industry standards. For example, DPWES lowered the estimated daily flow per capita based on published studies showing decreased sewage discharge volumes due to increased use of water-saving devices. Conversely, as the sewer system ages, the County experiences higher flow peaking due to greater I/I of stormwater and groundwater. The flow increase due to I/I is addressed as part of DPWES' ongoing repair and replacement of the sewer lines.

DPWES hired consultants to study the County's design peaking factors to ensure they properly account for water use and I/I as required by the state. In 2018, the consultants concluded that the DPWES peaking factors incorporated into the PFM standards are appropriate based on industry standards, including the Ten-State Standard.ⁱⁱ Throughout the remainder of this memorandum, the term "new sewer design" indicates that the design incorporates peaking factors described above.

Peaking factors predict the maximum capacity needs of a sewer. Wastewater flows from residences peak diurnally, with highest peak flow when residents wake-up and a lower peak in the evening. Although the County has separate systems for stormwater and wastewater, the wastewater lines are not water-tight and are subjected to I/I from ground and surface waters. The I/I peaks when it rains and surges with bigger storms. The peaking factor represents the "worst case scenario" where all users discharge their peak flow at the same time that I/I peak.

When sewers are undersized relative to their peak flows, the excess flow surcharges as a sanitary sewer overflow (SSO) or a basement backup, and sewage enters the community. SSOs and basement backups cause health risks, negatively impact property, and damage the environment. DPWES selected peaking factors based on industry recommendations to minimize the risk of SSOs and basement backups. The new sewer design requirements in the PFM incorporate the peaking factors selected to reasonably minimize risk to public health, community damage, and the environment. As described above, the use of a peaking factors of 4, 3, and 2.5 in hydraulic modeling reasonably minimizes this risk, as well.

There have been very few sewer capacity related issues in the daily operation of the system. The County's SSO rate is 0.58 per 100 miles of sewer lines, substantially lower than the national median of 2.0 reported by the Water Environment Federation. The County's SSOs are primarily related to vandalism, line breaks, and clogs due to customer use such as the buildup of fats, oils, greases, and rags over time, and not capacity limitation. The County's sewer system is highlighted by the U.S. Environmental Protection Agency as a model system for others to follow (https://www3.epa.gov/npdes/pubs/sso_casestudy_fairfax.pdf). In addition, the County has received Peak Performance Awards from the National Association of Clean Water Agencies for 100% compliance for 30 years with the County's Virginia Pollutant Discharge Elimination System permit issued by the Virginia Department of Environmental Quality.

DPWES performed a planning-level capacity analysis of the County's over 3,100 miles of sewers, which showed that the collection system has adequate capacity to serve existing customers in all sewers. However, the planning-level analysis shows that theoretically approximately 1% (~30 miles) of sewers surcharge when held to new sewer design factors. That is, DPWES estimates that approximately 1% of existing sewers do not meet new sewer design factors.

This high-level model should not be misconstrued as a pipe-by-pipe analysis. In some cases, the high-level model will miss pipes that would fail a peak factor analysis. In other cases, the high-level model will identify "problem" pipes that a detailed analysis would show as adequate. This high-level model should solely be used for planning purposes to advise the County of the approximate scale of the capacity upsizing needed county-wide. Any attempt to use this high-level model for specific cases is mistaken.

State regulations mandate that the County apply peaking factors to new sewer designs. When developers add flow to an existing sewer, this triggers the peaking factor design requirement for new sewers. As a result, DPWES requires developers to determine if the existing sewer system can handle the additional flow using a hydraulic model and applying the new sewer design requirements. DPWES estimates that, with new sewer design peaking factors applied, hydraulic models will show SSOs in 1% of the County's sewers. In these 1% of sewers, if developers add flow of any quantity, the receiving sanitary sewer must be upsized to the new sewer design requirements. Also, there may be other sewers that have adequate capacity for existing flows, but will show having an SSO when flows from a proposed development are added to the sewer line. Those lines will have to be upsized as well.

DPWES anticipates that a higher percentage of the sewer system will require capacity enhancements as higher-density redevelopments are considered in the County. The existing sewer system was designed for lower-density, subdivision-style horizontal growth. As the County has become more built out, growth patterns are shifting to higher density, mid-rise, and high-rise style vertical growth. Existing sewers may not have sufficient capacity for this increased density. In some cases, infill development constructs ten houses on lots that previously held four. Even this small increase can exceed existing sewer capacity under new sewer design standards.

The impact of redevelopment on the sewer capacity will vary based on the available capacity in the existing system at the location of the redevelopment and the proposed development density. Should capacity enhancements be needed due to redevelopment, then County regulations require developers to upsize the capacity of the sewer system at their cost based on the County's growth-pays-for-growth policy. Higher-density developments have led to more frequent developer-driven sewer upgrades and caused concerns with the Sewer Service Policy (SSP).

2.0 Development Process

When a developer files an application for redevelopment or rezoning with the County with increased development density, DPWES requires developers to determine if the existing sewer system can handle the higher anticipated flows from the proposed redevelopment. The developer must apply new sewer design standards when determining capacity in the existing line. On a first-come-first-served basis, if there is capacity available for the proposed redevelopment, then the developer will not be required to do anything further regarding sewer capacity. If there is not capacity to handle the additional flows, then the developer must increase the sewer capacity to serve the level of development indicated in the Comprehensive Plan in accordance with the County's SSP and the state requirements to plan for 50 years of growth.

The Comprehensive Plan capacity increase normally exceeds the need of the developer. Per Section E of the existing [Statement of Policy Regarding Sewage Disposal](#) (or SSP) (see Attachment 3), the developer can enter into an agreement with the County to be reimbursed for the increased capacity beyond the development's need. In this scenario, the County reimburses the developer by collecting a pro rata surcharge from future developers who will use this increased capacity. The reimbursement agreement sunsets in 20 years, or when the developer is paid in full, whichever comes first. This is in accordance with the County's growth-pays-for-growth policy and the County's Statement of Policy Regarding Sewage Disposal, Section E (Attachment 3).

3.0 Capital Improvement Program:

DPWES plans its capital improvement program (CIP) to reinvest in existing infrastructure according to asset management best practices and to increase capacity in the major portion of the sewer system (see attached Basics of Fairfax County Sewer Program and Fees). Regarding the

County's responsibility for ensuring that adequate capacity in the sewer system is available for the County's future growth, it is important to note that there are two parts to the system capacity:

1. Treatment plant capacity – Wastewater is conveyed through the collection system to treatment plants where it is processed. For treating wastewater, the County relies on the County's own Noman M. Cole, Jr. Pollution Control Plant along with six regional plants including Blue Plains in Washington, DC; Arlington County; Alexandria Renew; Upper Occoquan Service Authority in Centreville; Loudoun Water; Prince William County Service Authority; and a privately owned plant serving the Harbor View Subdivision.

The County plans its CIP and works with regional partners to ensure there is adequate capacity at treatment plants to serve the future needs of the County. Currently, the total treatment capacity available to the County is 157 million gallons per day (MGD), and the County generates an annual average flow of 100 MGD. The remaining available treatment capacity of 57 MGD is projected to serve the County's needs through the year 2045 and potentially beyond. Planning, designing, permitting, and constructing treatment plant expansions could require 15 to 20 years and are expensive. It is critical to have the projected treatment plant capacity needs in place well in advance of the projected flow, and thus maintaining a fully-funded and well-organized CIP is critical for continued development within the County.

2. Conveyance system capacity – Wastewater in the County is conveyed to treatment plants via a network of gravity sewer lines ranging in size from 8 inches to 72 inches, and 63 pumping stations with associated force mains.

The County ensures that the major conveyance facilities have adequate capacity for the County's future needs by systematically including them in the County's CIP for capacity enhancements. Increasing the capacity of the conveyance system does not require as much time as the treatment plant capacity increase does. Thus, conveyance system capacity increases are planned to take place when and where the need arises for a more efficient use of the County's Sewer Fund.

The DPWES CIP includes capacity enhancement projects at various stages of planning, design, and construction. DPWES has planned new and expanded pump stations, force mains, and major trunk lines to serve anticipated growth in Tysons and Reston, the Accotink Trunk Line, the sewer lines along Route 1 in concurrence with the Route 1 Bus Rapid Transit/Embark project, and the Sugarland Pump Station and Force Main associated with the Herndon Metro Station. DPWES is evaluating alternatives to address wet weather flows in the DC Water's Potomac Interceptor as part of our CIP. Also, when a sewer line needs to be replaced because of deterioration, then DPWES replaces it with a larger diameter pipe to provide capacity for the level of density in the Comprehensive Plan.

The County generally finances the cost of treatment and major conveyance facilities upgrades by issuing Sewer Revenue Bonds with a 30-year payback period. This allows for the debt service

payments on these bonds to be covered by the Availability Charge (or tap fees) paid by future customers who will be using the increased capacity of these facilities.

DPWES requires developers to increase the capacity of local sewer lines when their projects generate additional flows beyond the capacity of the existing sewer lines. Local lines are those lines downstream of the proposed developments (see attached Basics of Fairfax County Sewer Program and Fees). Occasionally, the development community is challenged by the cost of this capacity enhancement if the size of their project cannot absorb this expense or if a long length of sewer must be upsized.

4.0 Potential Alternatives for Funding the Capacity Increase of Local Sewer Lines:

The existing reimbursement policy (see Section 2.0 of this Attachment, the Development Process section) was frequently used by the developers in the past but has not been actively used by the development community in recent years. The gradual reimbursement over a 20-year period and the lack of guarantee that the developers will be fully reimbursed do not seem to be attractive to the development community.

DPWES surveyed the policies of neighboring water and sewer utilities regarding reimbursing developers for capacity enhancement. The following is a summary of other jurisdictions' policies, which the Board may consider for the County. All jurisdictions require capacity enhancements to be for the ultimate built-out/Comprehensive Plan level density.

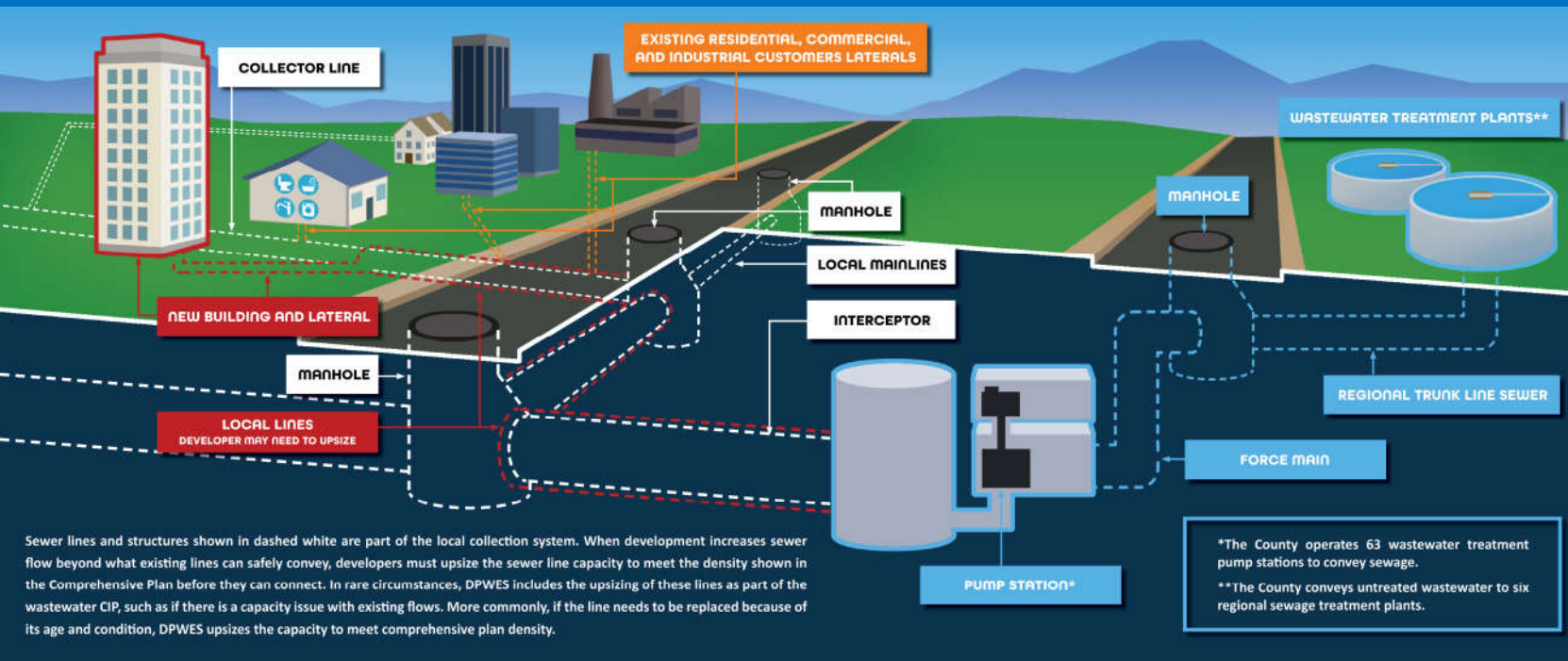
1. When the capacity enhancement is in the jurisdiction's CIP, usually because of existing issues, then the developers pay their pro rata share of the cost of capacity increase. The challenge for the jurisdiction is to stay ahead of the development activity to ensure adequate capacity is available when needed.
2. When the capacity enhancement is done by the developer, then the jurisdiction applies a credit to the required Availability Charge to reimburse the developer. If the credits do not cover the cost, then a check is issued to the developer for the balance. The challenge of this approach is that it limits the revenue generated from the Availability Charge which is used to reinvest in the system.
3. The jurisdiction negotiates a reimbursement agreement with the developer for major infrastructure capacity enhancement. This arrangement deals with site specific needs on a case-by-case basis, which can become an administrative burden and potentially difficult to keep consistent.
4. When the developer constructs a capacity enhancement, the jurisdiction returns collected Availability Charges quarterly for up to 20 years for the entire cost of the project, not just the incremental cost of capacity enhancement beyond the developers' needs. This can create complicated financial frameworks for reimbursement.
5. When the developer constructs a capacity enhancement, the jurisdiction pays the developer at the time of construction for the pro rata cost of the increased capacity beyond the developer's need. The developer is required to pay for the capacity needs of its development, which is in line with the growth-pays-for-growth policy. However, the burden of the cost will be lessened by pro rating the total cost of the project. Normally the development process requires more than one fiscal year from the start of a rezoning

application to final construction, and the jurisdiction can budget for its share of the cost and adjust the Availability Charge to cover costs. Also, this allows for effective and efficient use of the jurisdiction's funds for investment in the portion of the system where there is a need at the time when it is needed. Some proposed developments are delayed for many years or may never happen, and jurisdictions risk unnecessary investment in upsizing the system ahead of the development that may never happen. Investing in the system when the need arises provides for efficient use of the jurisdictions' funds.

ⁱ Sewage peaking factors (PFs) are highest in the smaller lines. As wastewater flows from smaller pipes to the larger pipes to reach a treatment plant, the actual peak flow attenuates because of the travel time in the sewer pipe network. The attenuation increases with larger pipe sizes. As a result, DPWES allows developers to use a PF of 4 for local connector lines and 3 for larger pipes, depending on the site-specific circumstances. In some cases, peak flows may be high due to a pipe's location, condition, and I/I. If

ⁱⁱ Health Research, Inc., Health Education Services Division. 2014. *Recommended Standards for Wastewater Facilities Policies for the Design, Review, and Approval of Plans and Specifications for Wastewater Collection and Treatment Facilities, 2014 Edition*. P.O. Box 7126 Albany, N.Y. 12224

Basics of Fairfax County Sewer Program and Fees



Sewer lines and structures shown in dashed white are part of the local collection system. When development increases sewer flow beyond what existing lines can safely convey, developers must upsize the sewer line capacity to meet the density shown in the Comprehensive Plan before they can connect. In rare circumstances, DPWES includes the upsizing of these lines as part of the wastewater CIP, such as if there is a capacity issue with existing flows. More commonly, if the line needs to be replaced because of its age and condition, DPWES upsizes the capacity to meet comprehensive plan density.

White dashed lines indicate local collector lines. DPWES requires developers to provide enlarged sewers when existing sewers cannot safely convey the additional flow from development. Under existing policy, developers may sign agreements to be reimbursed for a portion of the new sewer cost. Red dashed lines indicate new local collector lines needed to accommodate increased sewage due to development.

Orange lines indicate sewer lateral. Laterals are privately owned. Entire lateral and connection including the portion within the VDOT right-of-way is owned/maintained by private party.

Light blue lines indicate major infrastructure that DPWES plans as part of the wastewater CIP.

FEES ALLOCATION IN CURRENT POLICY

Program Element	Who Performs Work	Funding Source
CIP Costs: Reinvestment for existing infrastructure and regulatory requirement upgrades	Fairfax County and Regional Partners Plan and Construct	Service fees for existing customers. When replacing an existing line or treatment plan element, DPWES upsizes the capacity to meet comprehensive plan density. The availability fee pays for the unused portion of the available capacity.
Major wastewater system expansion to accommodate population growth and development: major trunk lines, force mains, and treatment plant projects	Fairfax County and Regional Partners Plan and Construct	Availability fees
Local collector pipes to accommodate additional flow from new development	Developer who requests connection designs and constructs	Developer with option for partial reimbursement from availability fees

Availability Fees

Common. One-time charge collected from all users prior to connection to the system to cover the applicant's proportional share of the cost of facilities required beyond the collector system, including the items shown in light blue: sub-trunk sewers, trunk sewers, pumping stations and treatment facilities. Developers or owners typically pay these fees.

Connection Fees

Less common. One-time charge collected from all users prior to connection to the system in those cases where service can be obtained from facilities provided by and at the expense of the County, or persons, firms, or corporations other than the applicant. It is levied as a partial repayment of the costs of collector sewers.

Service Fees

Common and paid by all users. Continuing charges to existing customers that cover the cost of operating and maintaining the sewer system, both the collections and treatment portions. Service fees include both a base fee (the minimum fee to remain connected to the system) and a fee based on water consumption at a cost per 1,000 gallons.