# *DOCKET ITEM #4*
# *Master Plan Amendment #2021-00008*
# *Sanitary Sewer Master Plan Update*

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| Issue:<br>(A) Initiation of a Master Plan Amendment; and (B) Public hearing and consideration of an amendment to update the Sanitary Sewer Master Plan Chapter of the City's Master Plan which includes updates to sanitary sewer programs, strategies and recommendations. | Planning Commission Hearing: | November 4, 2021 |
| | City Council Hearing: | November 13, 2021 |
| Staff: *Transportation and Environmental Services*: Yon Lambert, Director; William Skrabak, Deputy Director, Infrastructure and Environmental Quality; Erin Bevis-Carver, Acting Division Chief, Sanitary Infrastructure Division | | |

# I. OVERVIEW

The City developed its first Sanitary Sewer Master Plan as a chapter to the City's Master Plan, which was adopted in 2013 (2013 Plan). The proposed 2021 Sanitary Sewer Master Plan serves as an update to the 2013 Plan. The 2013 Plan envisioned that updates would be provided on a periodic basis, generally around every 5-10 years. The purpose of the 2021 Sanitary Sewer Master Plan Update (2021 Plan Update) is to provide the City and its decision-makers a plan to address future projected wastewater flows and identify when and where infrastructure will be needed to accommodate future growth. The 2021 Plan Update also presents strategies for address sanitary sewer backups that occur as a result of extreme wet weather events. Finally, this 2021 Plan Update includes a review of sanitary sewer fees, including sewer user fees (on monthly sewer bills) and connections fees as part of redevelopment, and provides fee change recommendations.

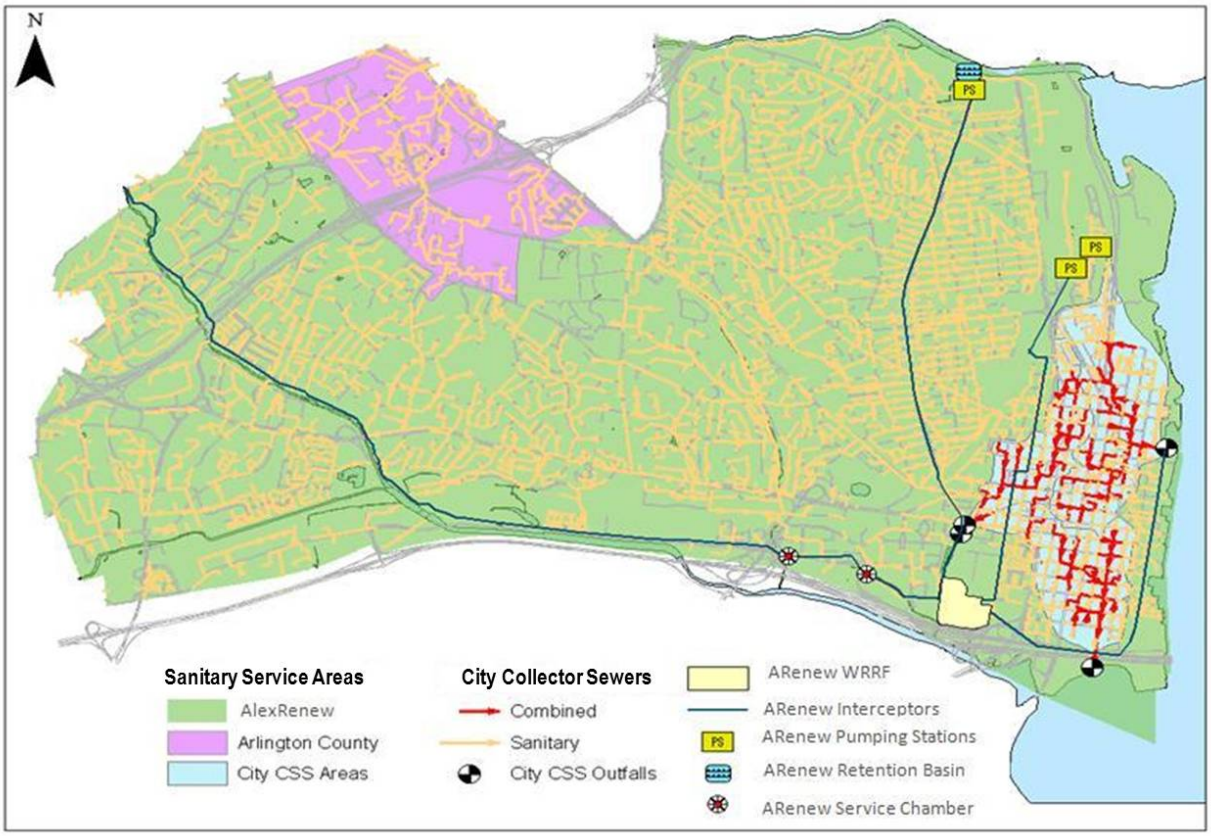
# II. DISCUSSION

**Background**

The City's sanitary sewer system dates back to the 1800s when the City began constructing a series of combined sewers in Old Town to convey stormwater and wastewater to the Potomac River. Today, the City owns, operates and maintains over 240 miles of sanitary and combined sewers throughout the City as shown on Figure 1 below. Flows from these sewers are primarily conveyed one of four interceptor sewers owned by Alexandria Renew Enterprises (AlexRenew) and to their wastewater treatment facility. AlexRenew also owns three pumping stations, two services chambers and two retention basins (at the Four Mile Run Pumping Station). Additionally, the City transferred its four combined sewer outfalls to AlexRenew in 2018 in response to legislation passed in 2017 (2017 CSO Law). To meet this law, AlexRenew is building the RiverRenew project, including a tunnel system and wet weather pumping station which will significantly reduce combined sewer discharges into the Potomac River.

A smaller portion of the City's flow is conveyed to the Arlington County wastewater treatment facility. The City currently holds service agreements with both AlexRenew and Arlington County, which provide for 21.6 million gallons per day (mgd) of wastewater treatment capacity (based on an annual average) at AlexRenew and 3.0 mgd at Arlington County. AlexRenew receives wastewater from both the City and a portion of Fairfax County. The City's wastewater treatment allocation represents 40 percent of the total wastewater treatment capacity at AlexRenew, with the remaining 60 percent allocated to Fairfax County.

Figure 1 – Sewer System Overview




**Sanitary Sewer Master Plan Objectives**

This 2021 Plan Update serves multiple objectives, including:

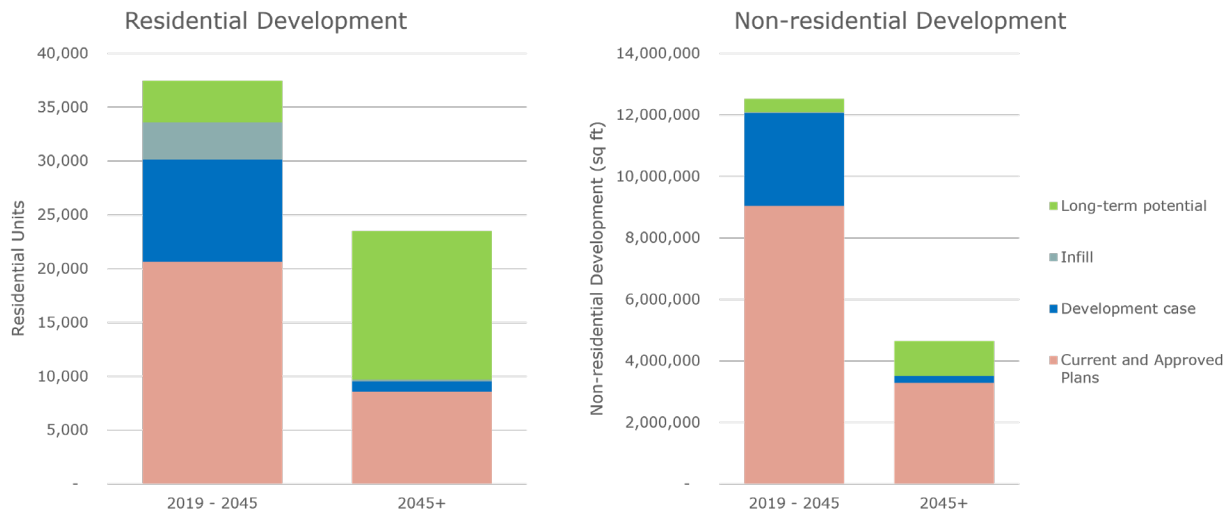
- Provide a detailed description of the existing sanitary sewer system including identification of sewersheds, how wastewater in the collection system is conveyed and how much wastewater flow is currently being sent to wastewater treatment plants
- Summarize the regulatory drivers that impact wastewater collection, conveyance and treatment;
- Summarize existing programs and milestones related to the operation and maintenance of the sanitary sewer system, along with providing roadmap for how City is addressing sanitary sewer impacts from climate change and flooding;
- Provide a summary of anticipated growth through 2045 and post-2045 (build-out) using demand generators provided by the City's Department of Planning and Zoning (P&Z);
- Perform capacity assessment of sanitary sewers in the City-owned sanitary sewer collection system and the AlexRenew interceptor sewers and identifying the need for and timing of capacity upgrades required to serve future growth;

- Perform an analysis of wastewater treatment capacity at both the AlexRenew WRRF and the Arlington WPCP and determine additional treatment needs and timing of needs in terms of both wastewater flows and loads;
- Provide a discussion of the City's combined sewer system and RiverRenew Program for mitigating combined sewer overflows, including anticipated schedule and costs; and
- Conduct a review and evaluation of the City's sanitary sewer revenue sources and develop a financial model and funding plan available to implement systemwide recommended improvements.

**Growth Forecasts**

Staff from the City's Department of Planning and Zoning (P&Z) provided growth forecasts, which were then used to compute wastewater flows and assess the impact of these additional wastewater flows on the sanitary sewer system. Forecasts were provided through 2045 and for build-out conditions (post-2045) and were divided into four categories including existing development projects, infill sites, current approved plans (small area plans, coordinated development districts, etc) and long-term potential. Figure 2 below shows the amount of forecasted growth by these categories for residential and non-residential development.

Figure 2 – Sanitary Sewer Master Plan Growth Forecasts




Growth forecasts are used to analyze capacity on the City owned collector sewers, AlexRenew interceptor sewers and wastewater treatment plant capacity at AlexRenew and Arlington County. More information about growth forecasts can be found in Chapter 5 of the 2021 Plan Update.

**Sanitary Sewer Capacity Needs**

*City-owned Collection System*

The City maintains a hydraulic model comprised of 31 separate sanitary sewer basins covering just over 60 percent of the City by land area. As part of the 2013 Plan, these basins were developed based on where the greatest amount of development was projected in the City, but were not yet calibrated based on actual

measured flows in the system. As part of this 2021 Plan Update, the 31 model basins were fully calibrated based on a flow monitoring program and the model results were updated based on this calibration. Modeling was performed for existing flows and flows from build-out conditions (post-2045). The modeling indicates a total of 12,000 feet of sewer have existing capacity deficiencies and another 4,000 feet of sanitary sewer will have capacity exceedances based on future growth. The City is currently working to identify projects to alleviate sewer capacity deficiencies, which will be incorporated into the City's Capital Improvement Program (CIP) as part of a future CIP. Capacity improvement projects required as a result of growth will be a requirement of future development in accordance with the City's current policies and requirements. The City is currently working to expand the model to other areas of the remaining areas of the City and these modeling results will be provided in a future update to the Sanitary Sewer Master Plan. More information about the City's collection system model can be found in Chapter 6 of the 2021 Plan Update.

*Interceptor Sewers (AlexRenew)*

AlexRenew has a hydraulic model of its four interceptor sewer (Commonwealth Interceptor, Holmes Run Trunk Sewer, Potomac Interceptor and Potomac Yard Trunk Sewer) and periodically performs joint modeling studies with the City and Fairfax County. Based on the most recently modeling, interceptor sewer capacity improvements are required both in the Holmes Run Trunk Sewer and Potomac Yard Trunk Sewer to serve future growth. The City continues to work with AlexRenew on the timing of future capacity improvements in these interceptor sewers. Because the Holmes Run Trunk Sewer is a joint use sewer which receives flow from both the City and Fairfax County, the cost of capacity improvements in this sewer will be shared. The current CIP identifies the capacity improvement needs of this sewer, but the amount of funding is not yet provided. Once a cost share agreement is reached, the CIP will be updated accordingly. The timing of capacity improvements in the Potomac Yard Trunk Sewer is not anticipated within the next 10 years; hence, it is not currently identified in the CIP. More information about the interceptor modeling can be found in Chapter 8 of the 2021 Plan Update.

*Wastewater Treatment*

Based on the growth forecasts, the City does not require additional wastewater treatment at the Arlington County wastewater treatment facility. The City will exceed its annual average allocation of 21.6 mgd at the AlexRenew wastewater treatment facility between 2040 and 2045. Based on growth projections through build-out conditions, an additional 4 mgd will be needed to meet the wastewater demand, for a total of 25.6 mgd of wastewater treatment capacity. Alternatives to meet this need include expansion of the AlexRenew facility to meet this 4 mgd need, purchase of available capacity from Fairfax County, or a combination of these two alternatives, along with other smaller-scale measures to reduce wastewater flows. Following the completion of the RiverRenew project and once the infrastructure is operational, AlexRenew will conduct a feasibility study of expanding their facility by an additional 4 mgd. Results of this study will be provided in a future Sanitary Sewer Master Plan Update. More information about wastewater treatment needs can be found in Chapter 7 of the 2021 Plan Update.

**Wet Weather Mitigation Strategies**

We weather-related sanitary sewer backups can occur when too much infiltration and inflow (I/I) enters the sanitary sewer system. These backups typically occur in basements where sanitary sewage backs up through floor drains, toilets or shower drains. These backups may also occur in the combined sewer area where both the sanitary sewage and stormwater are contained in the same pipe and the amount of stormwater overloads the capacity of the sewers. Wet weather-related sewer backups have occurred due to severe storm events over the past few years. Most of these backups occur in the oldest areas of the City,

including Old Town, Del Ray, Rosemont and Lynhaven neighborhoods. The City is currently implementing various mitigation strategies, along with considering others for future implementation, to address sewer backups that occur due to severe wet weather including the following:

- Backflow Preventer (BFP) Assistance Program. The City's BFP assistance program reimburses residents 50 percent of the cost of installing a BFP device, up to a maximum of $2,000 reimbursement.
- $36 million has been programmed in the FY2022-2031 CIP for sanitary sewer system assessment and rehabilitation program, which will help reduce the amount of I/I in the separate sanitary sewer system.
- Replacement of several hundred manhole inserts (to prevent stormwater runoff from entering the sanitary sewer) in Four Mile Run and Commonwealth Sewersheds (areas more prone to sewer back-ups) that were installed in the mid-2000s and are in need of replacement.
- Identify areas of where existing sewers can be upsized in order to provide for additional conveyance capacity and storage and identify areas in the combined sewer system where sanitary sewers can be separated from the combined sewer. Programming for these initiatives will be proposed as part of the FY2023 CIP.
- Development of a framework of a private property I/I reduction program of private stormwater sources (downspouts, sump pumps, basement area drains, etc) from separate sanitary sewers.
- Continued implementation of a fats, oils and grease (FOG) program to minimize the amount of FOG entering sanitary sewers, which can take up valuable capacity.
- Addition of two additional engineering positions in the FY2022 budget to assist with the implementation of the above-mentioned programs.

More information about existing City sanitary sewer programs and wet weather strategies can be found in Chapter 4 of the 2021 Plan Update.

**Sanitary Sewer Fees**

Chapter 10 of the 2021 Plan Update provides a review of the existing CIP including which programs are currently funded and identifies where future funding may be required. Sanitary sewer operating and capital budgets are funded as part of a Sanitary Sewer Enterprise Fund, where revenue sources come from sewer user fees and connection fees. A review of both of these revenue sources is provided, along with recommendations for fee changes.

*Sewer User Fee*

The Sanitary Sewer Captial Investment and Maintenance Fee (sewer user fee) is charged to residential and commercial customers as part of their monthly sewer bill, which also includes wastewater fees from AlexRenew. The City currently assesses this fee based on monthly water consumption, whereas AlexRenew calculates their wastewater fees using the winter average basis. The basis used by AlexRenew accounts for any water that does not enter into the sanitary sewer system, such as that used for irrigation. The 2021 Plan Update recommends changing the sewer user fee billing basis from monthly water consumption to the winter average basis to more accurately reflect water that reaches the sewer system and to be consistent with AlexRenew. It is estimated that the City would receive approximately 4-5 percent less revenue by using the winter average bases and residential customers would pay $1-2 less per month on their sewer bill. Staff has done a fee study and has determined that the existing sewer user fee of $2.28/1000 gallons would not need to be increased.

*Sewer Connection Fees*

Section 5-6-25.1 of the City Code establishes sewer connection fees for a variety of new connections into the sanitary sewer system, including single-family homes, multi-family homes, hotels and non-residential development. These fees are updated at the beginning of each fiscal year in accordance with the City Code using the Consumer Price Index for Urban Areas (CPI-U). The Code also provides a provision for credits to the connection fees related to properties that are torn down or are converted in usage (for instance, conversion of an office building to multi-family). As part of this 2021 Plan Update, a study was performed that included a review of the City's existing fees in comparison with neighboring jurisdictions, along with a water consumption study for various types of uses. The following connection fee changes are recommended:

- Increase the connection fee teardown credit from 50 percent to 100 percent in order to be consistent with neighboring jurisdictions.
- Establish senior living facilities as their own use and set the connection fee per unit equal to 75 percent of the single-family fee based on a review of water consumption of these types of facilities, both in the City and in neighboring jurisdictions.
- Update the non-residential connection fees based on the results of the water consumption study of non-residential properties, using the equivalent residential unit (ERU) methodology to update these fees. The ERU methodology establishes a ratio between non-residential properties and single-family properties based on water usage. Fees for non-residential properties are currently based on water meter size and this methodology computes fees by multiplying this ratio by the current connection fee for a single-family home.

No sewer connection fee changes are proposed for single-family, multi-family homes or hotels.

## III. OUTREACH

A draft of the 2021 Plan Update was released in August 2021. Once released, the City followed up with outreach to share details of the plan and to solicit feedback. Notice of the plan or detailed presentations regarding the plan were provided to the following stakeholders:

- Ad Hoc Stormwater Utility and Flooding Advisory Group
- Alexandria Renew Enterprises Board of Directors
- Environmental Policy Commission
- Federation of Civic Associations
- National Association of Industrial and Office Parks
- Northern Virginia Business Industry Association

In addition, a public meeting was held on September 30, 2021 that provided and overview of the plan, along with answering questions from residents about the plan. A copy of the presntation and recording of the public meeting is posted on the City's website at alexandriava.gov/sewers. Based on plan feedback received, no major changes to the plan have been identified. Updates to the draft were primary to provide additional clarification.

## IV. IMPLEMENTATION

Many initiatives in 2021 Plan Update will not require additional staffing resources as additional staff was added as part of the FY2022 budget. However, the needs and strategies in the plan will help guide decision-making around CIP development. It is anticipated that Staff will initiate an update to this plan in the next 5-7 years to account for changes in growth forecasts, progress in addressing wet weather, and to report on results of future engineering studies.

## V. FISCAL IMPACT

This Plan contains both initiatives that can be advanced with existing staff resources and programs and projects to be funded out of the Sanitary Sewer CIP. The FY2022 10-year Sanitary Sewer CIP provides $53.9 million in funding for capital projects. Sanitary sewer user fees are set on a year by year basis. Currently, the 10-year plan does not require any increase in the sewer user fee. It also does not include any increases to the sewer connection fees outside the annual increase to the fees based on the City Code as described above.

## VI. STAFF RECOMMENDATION

Staff recommends approval of a Master Plan amendment to replace the existing Sanitary Sewer Master Plan Chapter of the City's Master Plan.

### Attachments:

1. Resolution MPA #2021-00008
2. 2021 Sanitary Sewer Master Plan Update Executive Summary

### Reference:

2021 Sanitary Sewer Master Plan Update

RESOLUTION NO. **MPA 2021-00008**

WHEREAS, under the Provisions of Section 9.05 of the City Charter, the Planning Commission may adopt amendments to the Master Plan of the City of Alexandria and submit to the City Council such revisions in said plans as changing conditions may make necessary; and

WHEREAS, the proposed amendment will amend the **Sanitary Sewer Master Plan** chapter of the 1992 Master Plan;

WHEREAS, the Department of Planning and Zoning has analyzed the proposed revision and presented its recommendations to the Planning Commission; and

WHEREAS, a duly advertised public hearing on the proposed amendment was held on **November 4, 2021** with all public testimony and written comment considered; and

WHEREAS, the Planning Commission finds that:

1. The proposed amendment is necessary and desirable to guide and accomplish the coordinated, adjusted and harmonious development of the **Sanitary Sewer Master Plan** sections of the City; and

2. The proposed amendment is generally consistent with the overall goals and objectives of the 1992 Master Plan and with the specific goals and objectives set forth in the **Sanitary Sewer Master Plan** chapter of the 1992 Master Plan; and

3. The proposed amendment shows the Planning Commission's long-range recommendations for the general development of the **Sanitary Sewer Master Plan**; and

4. Based on the foregoing findings and all other facts and circumstances of which the Planning Commission may properly take notice in making and adopting a master plan for the City of Alexandria, adoption of the amendments to the **Sanitary Sewer Master Plan** chapter of the 1992 Master Plan will, in accordance with present and probable future needs and resources, best promote the health, safety, morals, order, convenience, prosperity and general welfare of the residents of the City;

NOW, THEREFORE, BE IT RESOLVED by the Planning Commission of the City of Alexandria that:

1. The attached document titled **2021 Sanitary Sewer Master Plan** and any appendices to such document are hereby adopted replacing the 2012 Sanitary Sewer Master Plan as amended of the 1992 Master Plan of the City of Alexandria, Virginia in accordance with Section 9.05 of the Charter of the City of Alexandria, Virginia:

2. This resolution shall be signed by the Chairman of the Planning Commission and attested by its secretary, and a true copy of this resolution forwarded and certified to the City Council.

ADOPTED the **4th day of November, 2021.**

_____
Nathan Macek, Chair
Alexandria Planning Commission

ATTEST: _____
Karl Moritz, Secretary

ATTACHMENT #2

City of
# Alexandria

## Sanitary Sewer Master Plan

Executive Summary

October 2021

CDM Smith

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# Executive Summary

The purpose of this Sanitary Sewer Master Plan is to provide the City of Alexandria (City) and its decision-makers with a plan to address future projected wastewater flows, identify when and where infrastructure upgrades or improvements will be needed to accommodate growth, and continue to serve the wastewater needs of residents and businesses by effectively operating and maintaining the sewer system. This Sanitary Sewer Master Plan also addresses regulatory drivers related to sanitary sewers, such as the 2017 combined sewer overflow (CSO) legislation (2017 CSO Law). Finally, this Sanitary Sewer Master Plan includes a review of sanitary sewer fees, including sewer user fees (on monthly sewer bills) and connection fees as part of redevelopment, and provides fee change recommendations.

## Sanitary Sewer Capacity Needs

This Sanitary Sewer Master Plan uses the growth forecasts through 2045 and post-2045 (build-out conditions) to analyze the following:

- Hydraulic capacity of the City's collector (local) sanitary sewers
- Hydraulic capacity of the Alexandria Renew Enterprises (AlexRenew) interceptor sewers
- Treatment plant capacity at both the AlexRenew Water Resource Recovery Facility (WRRF) and the Arlington County Water Pollution Control Plant (Arlington WPCP)

The results of these analyses indicate additional needs related to sanitary sewer collection system capacity, treatment plant capacity, and wet weather capacity:

- A total of 12,000 feet of sanitary sewer have been identified with capacity deficiencies in the City's collection system based on current system flows and another 4,000 feet of sanitary sewer will have capacity exceedances based on future growth. The City is identifying projects to alleviate sewer capacity deficiencies, which will be incorporated into the City's Capital Improvement Program (CIP) as part of a future CIP. Capacity projects required for growth needs will be a requirement of future development in accordance with the City's current policies and requirements. See Chapter 6 of this Sanitary Sewer Master Plan for more information.
- Capacity improvements are required in both the AlexRenew Holmes Run Trunk Sewer and Potomac Yard Trunk Sewer to serve future growth. The City continues to work with AlexRenew to determine timing of future capacity improvements in these sewers. Because the Holmes Run Trunk Sewer is a joint-use sewer between the City and Fairfax County, the cost of capacity improvements will be shared. Cost-sharing discussions are currently underway between the City, Fairfax County, and AlexRenew. The current CIP identifies the need to upgrade the Holmes Run Trunk Sewer, but the amount of funding to be programmed is not yet provided since cost share discussions are ongoing. The timing for capacity improvements for the Potomac Yard Trunk Sewer is not anticipated in the next 10 years; hence, it is not currently in the CIP. See Chapter 8 of this Sanitary Sewer Master Plan for more information.
- The City will have sufficient capacity at the Arlington WPCP based on current growth forecasts and its existing allocation of 3.0 million gallons per day

(mgd). See Chapter 7 of this Sanitary Sewer Master Plan for more information.

- The City will exceed its annual average allocation of 21.6 mgd at the AlexRenew WRRF between 2040 and 2045. Based on growth projections, an additional 4 mgd will be needed to meet the wastewater demand for build-out conditions. Alternatives to meet this need include modifications and upgrades at the AlexRenew WRRF, purchase of capacity from Fairfax County, or a combination of the two alternatives, along with various other smaller-scale measures to reduce wastewater flows (e.g., infiltration and inflow reduction). Following the completion of the RiverRenew Program and once the RiverRenew infrastructure is operational, AlexRenew will conduct a feasibility study of expanding their WRRF by 4 mgd. The feasibility study will be programmed as part of the upcoming fiscal year (FY) 2023 CIP. See Chapter 7 of this Sanitary Sewer Master Plan for more information.

## Sanitary Sewer Asset Management and Maintenance

In addition to the impacts of growth on the sewer system, effectively operating and maintaining existing sewer assets is crucial. Additionally, effective operations and maintenance can help to minimize addressing sanitary sewer backups that occur because of extreme wet weather events is an important priority, especially in the face of climate change. Several projects and initiatives have been funded in the CIP, and are discussed in more detail in Chapter 4 of this Sanitary Sewer Master Plan, to reduce the potential for sanitary sewer backups:

- The City's backflow preventer (BFP) assistance program reimburses residents 50 percent of the cost of installing a BFP device, up to a maximum of $2,000.
- $36 million has been programmed in the FY 2022 to 2031 CIP for sanitary sewer system assessment and rehabilitation, which will help reduce the amount of infiltration and inflow (I/I) in the separate sanitary sewer system.
- Several hundred manhole inserts that were installed in the mid-2000s will be replaced to prevent stormwater runoff from entering the sanitary sewer in the Four Mile Run and Commonwealth sewersheds (areas more prone to sewer backups).
- The City has begun identifying sanitary sewers that can be upsized to reduce the number of and severity of sanitary sewer backups. Initial sewer upsizing projects will move to detailed design in 2022 and funding for construction will be proposed in the FY 2023 CIP.
- Sewer backups will be identified in the combined sewer area that could be mitigated by separating small sections of sanitary sewer (where backups occurred) from the combined system and connecting to a separate sanitary sewer. Sewer separation projects will be funded as part of a future CIP.
- The framework for a private I/I reduction program for disconnecting private stormwater sources (e.g., downspouts, sump pumps, basement area drains) into the sanitary sewer will be developed.
- A fats, oils and grease (FOG) program will continue to be implemented to minimize the amount of FOG entering sanitary sewers, which can take up valuable capacity.

- Two engineering positions were added in the FY 2022 budget to assist with the implementation of the above-mentioned programs.

## Sanitary Sewer Fees

Chapter 10 of the Sanitary Sewer Master Plan update provides a review of the existing CIP, presents a summary of which programs are funded, and identifies areas where additional funding may be required in future years. It also presents an overview of the existing sewer user fees and connection fees and provides specific recommendations for updating these fees. The following fee changes are recommended:

- Change the sewer user fee billing basis from monthly water usage to the winter quarter consumption to more accurately reflect water that reaches the sewer system and to be on the same basis as the AlexRenew wastewater treatment billing.
- Increase the connection fee teardown credit for redevelopment from 50 to 100 percent.
- Establish senior living facilities as their own use and set the connection fee to 75 percent of the single-family fee.
- Use the equivalent residential unit (ERU) methodology to establish the nonresidential sewer connection fees.

Changes to the above fees can only be done through an update to the City's ordinance. Following approval of the Sanitary Sewer Master Plan, City staff will bring the required ordinance changes to City Council for approval.

## Outreach

After the draft of this Sanitary Sewer Master Plan update is released, the City will begin an outreach period to solicit input and feedback before finalizing and submitting the plan to the Planning Commission and City Council. The following types of outreach are planned:

- Public meetings that are open to all City residents
- Presentations to neighborhood civic and citizen associations
- Presentation to the development community
- Presentation to the City's Environmental Policy Commission
- Presentation to the City's Ad Hoc Stormwater Utility and Flood Mitigation Advisory Group

The draft of the plan will be announced through the City's eNews and shared on social media. Feedback on the draft plan can also be made in writing and the draft plan will be posted on the City's website.

## Schedule

This Sanitary Sewer Master Plan is an update to the first City Sanitary Sewer Master Plan, which was approved in 2013. This plan will be updated periodically as growth forecasts change and to reflect changes in both state and federal regulations related to sewage collection and treatment and water quality. Updates to this Sanitary Sewer Master Plan are anticipated approximately every 5 to 10 years.

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CDM Smith