



DOCKET ITEM #
Master Plan Amendment #

Issue: Public hearing and consideration of an amendment to the City's Master Plan to include the Sanitary Sewer Master Plan as a city-wide chapter	Planning Commission Hearing:	TBD
	City Council Hearing:	
Staff: Emily Baker, P.E., City Engineer, Department of Transportation and Environmental Services, emily.baker@alexandriava.gov		

DRAFT

I. DISCUSSION

A. Purpose

The proposed amendment to the City's Master Plan is to adopt the Sanitary Sewer Master Plan developed by Transportation and Environmental Services (T&ES) staff. The purpose of the Sanitary Sewer Master Plan is to provide the City and its decision-makers with a plan to address future 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. Specifically, the plan addresses:

- Sanitary system components and an understanding of how these systems work
- Growth forecasts and the impact of growth on the sanitary sewer system
- Existing wet weather impacts on the sanitary sewer system
- Regulatory drivers that impact the sanitary and combined sewer systems
- Identification and evaluation of infrastructure improvements and associated costs
- Developing a plan which will meet the City's needs through 2040 and beyond
- Funding strategies to meet the infrastructure needs

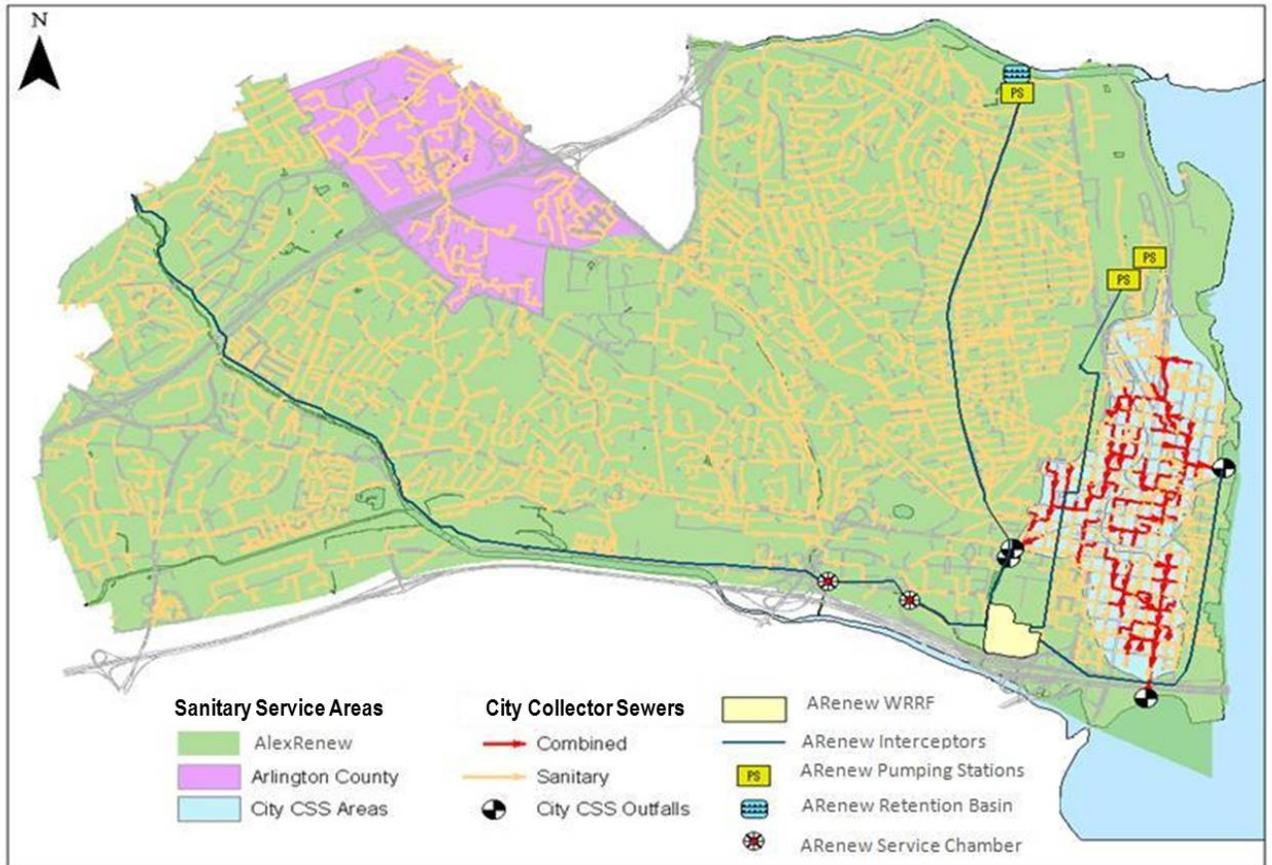
B. Sanitary Sewer System Components

Alexandria's wastewater collection system dates back to the 1800s when the City constructed a system of combined sewers in the Old Town area to convey stormwater and wastewater to the Potomac River. In 1952, the Alexandria City Council created the City of Alexandria Virginia Sanitation Authority, now known as Alexandria Renew Enterprises (AlexRenew) for the purpose of constructing, operating and maintaining a sewage disposal system to serve Alexandria. Since then the City's sewer collection system has expanded to serve the population and upgrades in wastewater treatment have taken place. Today, the City's wastewater collection system includes the following components:

- City-owned collection system including both separate sanitary sewers and combined sewers
- AlexRenew interceptor sewers and associated sewer assets
- Wastewater treatment facilities
 - AlexRenew Water Resource Recovery Facility
 - Arlington County Water Pollution Control Plant

The City's wastewater collection system is shown on Figure 1.

Figure 1 – Alexandria Wastewater Collection System



The sanitary sewer collection system gravity mains (sanitary and combined) are operated and maintained by T&ES and consist of approximately 240 miles of gravity pipeline ranging in size from 6-inches in diameter to 7-feet by 6-feet. The majority of the City’s collection system is comprised of separate sanitary sewers, with approximately 540 acres served by a combined sewer system located in the Old Town area. During periods of rainfall, the capacity of the combined sewers (mixture of sanitary sewage and stormwater) may be exceeded and excess flow discharged into receiving waterways from one of the City’s four combined sewer outfalls. These wet weather discharges are permitted by the Virginia Department of Environmental Quality (VDEQ). The existing 5-year permit had an ending date of January 15, 2012 and the permit has been administratively continued by VDEQ. The City is currently in discussions with VDEQ regarding the details and requirements of the next permit.

Flows in the City’s collection system are conveyed to either the AlexRenew or Arlington County wastewater treatment facility. In the AlexRenew sewer service area, flows in the City’s collection system reach the treatment facility via one of four interceptor sewers that are owned and operated by AlexRenew. AlexRenew also

owns and operates three pumping stations, two service chambers and two retention basins. The basins are located at the Four Mile Run Pumping Station and store sanitary sewage during periods of significant wet weather.

The City’s annual average wastewater treatment allocation at AlexRenew and Arlington County are 21.6 million gallons per day (mgd) and 3.0 mgd, respectively. The City’s allocation at AlexRenew represents 40 percent of the treatment facility’s design capacity of 54 mgd. The remaining 60 percent is allocated to Fairfax County. Currently, the City’s annual average flow at AlexRenew is 16.3 mgd (75% of its allocation) and at Arlington County is 1.4 mgd (47% of its allocation). Wastewater flow at these facilities will increase as a result of growth.

C. Growth Forecasts and System Impacts

Demand for wastewater collection, treatment and disposal is generated by the population and economic activity in a community. 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 future flows on the sanitary sewer system. Forecasts were provided through year 2040 and for build-out conditions (post 2040). On average, the growth forecasts indicate an annual rate of growth of one-percent. Future development projects were broken out into existing development projects, infill sites, current approved plans, and long-term potential. Figure 2 shows the City’s historic and projected population estimates and Figure 3 shows potential future development by use and category.

Figure 2 – City Historic and Projected Population 1790-2040

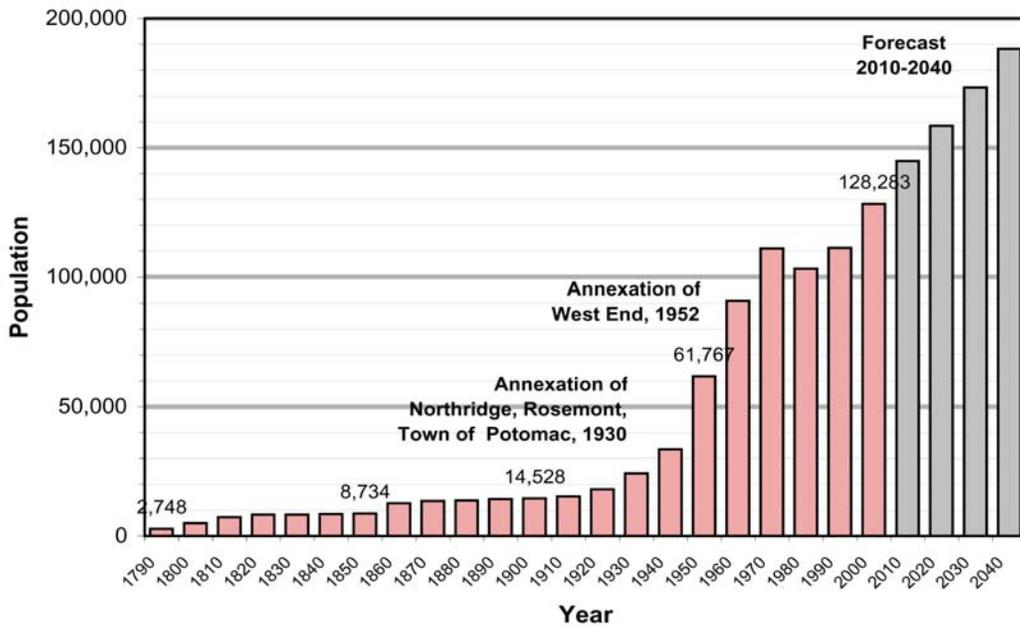
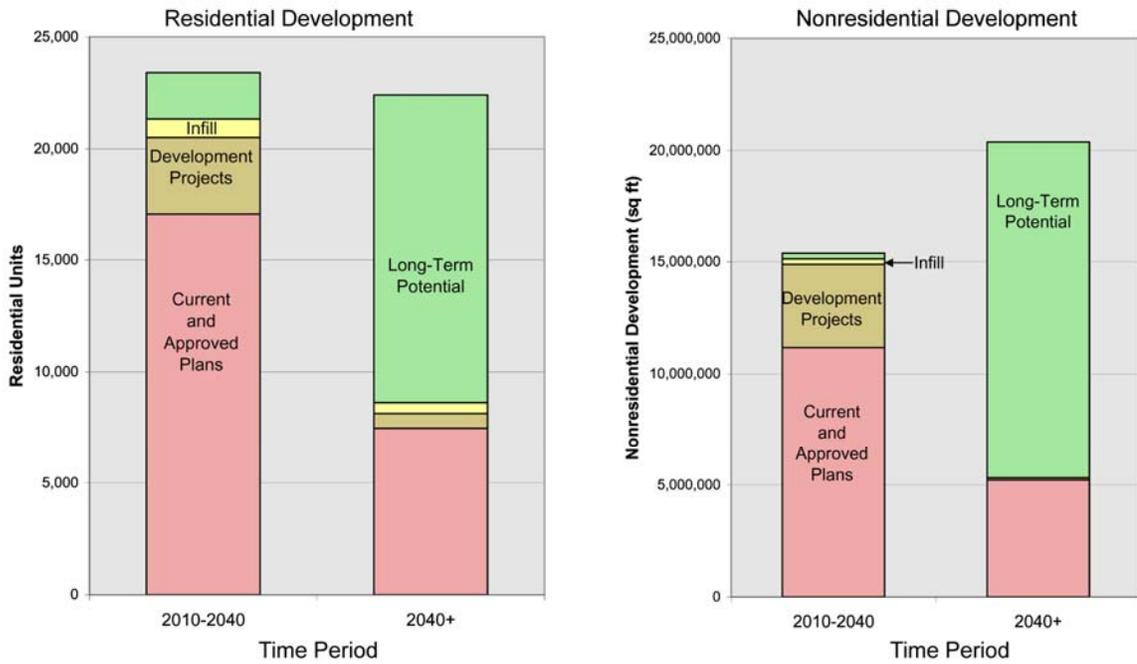


Figure 3 – Forecasted Future Development by Use and Category



Flows in the sanitary sewer system are comprised of wastewater from homes, businesses, and public facilities, as well as inflow and infiltration (I/I). Inflow comes directly from wet weather (rainfall or snowmelt). Infiltration is groundwater that is constantly entering the sewer system, but the rate of infiltration is significantly influenced by wet weather. I/I comes from defects (cracks, voids, etc.) in sewer pipes, manholes, and private laterals; stormwater connections to the sanitary sewer (downspouts, sump pumps, etc.); and from runoff into manhole covers such as through the pick holes. Sanitary sewers are typically designed to accommodate some level of I/I in the system.

In order to estimate wastewater flows from the growth forecasts, staff has developed sanitary sewer flow factors for both residential and non-residential uses based on water consumption data for the City. Flows are calculated per residential unit and per 1000 square feet of non-residential building area. Estimates of I/I into the system have been developed as well based on flow monitoring conducted throughout the City. Hydraulic models have been developed for the City's sanitary sewer collection system and the AlexRenew interceptor sewers in order to determine where capacity is currently exceeded (due to wet weather and/or existing sanitary flows) or is anticipated to be exceeded due to growth. Modeling results are described in more detail below.

City's Separate Sanitary Collection System

Thirty-one individual drainage areas, comprising over 60% of the City by land area, have been modeled to date. The 31 modeled basins represent the areas where the greatest amount of growth is forecasted. The hydraulic model was run for both existing and build-out (post 2040) conditions and indicates that approximately 9% of the sewers modeled do not have sufficient capacity to accommodate forecasted growth. Improvements to these local sewers will be required as a condition of the specific future development projects that are demonstrated to exceed the capacity in a given sewer.

AlexRenew Interceptor Sewers

AlexRenew has developed a hydraulic model of its interceptors which takes into account both existing and future flows from the City and Fairfax County. A discussion of long-term model results for each interceptor is presented below. The interceptor locations are identified in Figure 1.

- Commonwealth Interceptor. There is sufficient capacity in this sewer to accommodate both existing and forecasted wastewater flows during dry weather conditions. Currently, this sewer does experience surcharging under significant wet weather events. Future growth will increase the amount of surcharging in the sewer until this surcharging is mitigated.
- Potomac Interceptor. This sewer serves both the sanitary and combined sewers. There is sufficient capacity in this sewer for both existing and build-out conditions during dry weather. During wet weather, excess flows are discharged through combined sewer outfalls.
- Potomac Yard Trunk Sewer. Analysis has indicated that there are two pipe segments at the downstream end of this sewer that need to be adjusted to create capacity to accommodate forecasted growth. Developments that will contribute future flows to this sewer will contribute proportionally to the needed capacity improvements.
- Holmes Run Trunk Sewer. This sewer serves both the City and Fairfax County. There is existing wet weather surcharging in certain sections of this sewer and there may not be sufficient capacity in the upstream reaches to accommodate growth from both the City and Fairfax County. The City, Fairfax County, and AlexRenew are participating in a joint study to evaluate capacity in this sewer. This study will provide recommendations for mitigating capacity issues and associated planning-level costs. The results of this study will be included in an update to the Sanitary Sewer Master Plan.

Wastewater Treatment Capacity

The City's wastewater flow allocation at AlexRenew and Arlington County is 21.6 mgd and 3.0 mgd, respectively. Based on the City growth forecasts, it is anticipated that the City will exceed its allocation at AlexRenew by approximately 4 mgd and need to obtain additional capacity sometime after year 2040. No additional treatment capacity is currently anticipated from Arlington County. As the growth forecasts are

updated over time, staff will update the wastewater flow projections and continue to evaluate the need for additional wastewater treatment capacity.

Two alternatives have been identified for obtaining an additional 4 mgd of capacity at AlexRenew:

- AlexRenew expansion. AlexRenew has indicated that it can expand its facility by 4 mgd to accommodate the City's additional flow needs. AlexRenew has proposed doing so as part of the planned upgrade to individual treatment processes when those processes are in need of replacement. They have provided a cost of \$29M (2011 dollars) for the hydraulic expansion and a timeframe of year 2020-2025 for the majority of the upgrades. It should be noted this 4 mgd of flow does not include an allocation for nutrient loads associated with the discharge of the treated effluent. T&ES staff has evaluated several alternatives for accommodating these additional loads, discussed in the Sanitary Sewer Master Plan, which are not anticipated to be needed until after 2040. One alternative may be accessing Virginia's authorized nutrient trading program.
- Purchase capacity from Fairfax County. The County has indicated that it may not need all of its allocated capacity at AlexRenew and has discussed selling 4 mgd of its allocation to the City. This is contingent on Fairfax County obtaining additional capacity at the Blue Plains treatment facility in Washington D.C. The preliminary price is \$56M (2011 dollars) and is based on Fairfax County's investment in the facility over time.

D. Wet Weather Impacts

Infiltration and inflow (I/I) can lead to excess wet weather flow taking up space in the sanitary collection system. If the capacity of the pipes is exceeded, this can cause basement back-ups and sanitary sewer overflows (SSOs) out of manholes and/or into receiving waterways. The City's existing I/I program has been ongoing since the late 1990's and has led to rehabilitation of city-owned sanitary sewers and manholes in three of the City's sanitary sewersheds to minimize the amount of water entering the pipes. To date approximately \$18M has been invested in the City's I/I program which has resulted in the rehabilitation of 39 miles of sanitary sewer and repair of over 2100 manholes. The Holmes Run I/I project is part of the current Capital Improvement Program (CIP). The Holmes Run sewershed represents the largest sanitary sewershed and the one where the most future growth is anticipated.

A number of options for reducing the impact of wet weather are presented in the Sanitary Sewer Master Plan. AlexRenew, Fairfax County and the City participated in a study aimed at reducing the risk of SSOs at the treatment facility. The study recommended the construction of a Wet Weather Management Facility. Components of the proposed facility include wet weather storage, increased flow through primary treatment at AlexRenew, and a pumping facility to reduce surcharging in the AlexRenew interceptors and to help protect against basement back-ups. This

reduction in surcharging will also provide for more hydraulic capacity in the sewers. The total capital cost of the facility is estimated at \$51M, with the costs to be shared between the City and Fairfax County.

E. Regulatory Considerations

The City of Alexandria's wastewater collection and treatment system is regulated by a number of Federal and state regulations. The City and AlexRenew are impacted by these regulations including the Clean Water Act, the Chesapeake Bay Total Maximum Daily Load (TMDL) and the Hunting Creek Bacteria TMDL.

The primary Federal regulation governing wastewater collection and treatment is the Clean Water Act, under which the National Pollutant Discharge Elimination System (NPDES) program was established. Point source discharges, such as wastewater treatment facilities, are regulated under the NPDES through the issuance of permits by the Virginia Department of Environmental Quality (VDEQ). AlexRenew has a permit for its treatment facility and the City has a permit for its combined sewer system (CSS).

On December 29, 2010, EPA established the Chesapeake Bay TMDL for nitrogen, phosphorous and sediment. A TMDL represents the maximum amount of a pollutant that a body of water may receive and still meet its water quality standards. The Chesapeake Bay TMDL establishes wasteload allocations for nitrogen, phosphorous and sediment for point source discharges, including the AlexRenew facility and the City's combined sewers. AlexRenew is currently meeting the wasteload allocations and is upgrading its treatment facility so that it will be able to continuing meeting its allocation as the City grows. The City received a wasteload allocation consistent with what is currently being discharged from its CSS, so no reductions in combined sewer discharges are required as part of this TMDL.

The Hunting Creek Bacteria TMDL establishes wasteload allocations for *E. coli* that call for a reduction in the existing combined sewer overflow (CSO) volume discharged from three of the City's four CSO outfalls. To date, no deadline is established for when these reductions must be achieved. The City is currently engaged in discussions with VDEQ regarding requirements of the next CSS permit cycle. It is anticipated that additional CSO controls will likely be required in the next permit, but it is not yet known what the extent and timing of this will be. CSO controls will likely include very costly alternatives (nine-figure price range) such as full-scale sewer separation and/or storage of CSO flows. These costs are not reflected in this Sanitary Sewer Master Plan, as the regulatory requirements are not yet known.

F. Summary of Needs and FY2013 CIP

The Sanitary Sewer Master Plan outlines the capital needs and costs to accommodate future growth and development and continue to effectively serve the wastewater needs of the City's residents and businesses. Significant new funding has been incorporated into the FY 2013 to FY 2022 CIP based on the findings of this plan and includes the following in its 10-year plan:

- AlexRenew Facility Capacity Expansion - \$35.2M
- Wet Weather Management Facility - \$31.5M
- Holmes Run I/I - \$7.7M of additional funding

The Sanitary Sewer Master Plan describes these financial needs in detail. Unknown needs, such as those related to the combined sewer system and capacity in the Holmes Run Trunk Sewer are still under evaluation and will be included in future CIPs.

G. Financing Strategies

The City's sanitary sewer program, including both capital and operating expenses, is established as an Enterprise Fund. AlexRenew is also funded in this manner. The City's sanitary program is funded entirely by sewer user fees and connections fees. The Enterprise Fund is used to fund capital sewer (sanitary and combined) sewer projects and operating expenses (personnel and non-personnel). It is not used to fund improvements related to development projects or AlexRenew projects (such as its ongoing treatment facility upgrade). The City also leverages sanitary sewer funds through the issuance of General Obligation Bonds, with the debt service covered by sanitary sewer revenues.

A number of financing alternatives were considered for funding the needs and projects identified in the Sanitary Sewer Master Plan including:

- Increasing the user fees
- Increasing the connection fees
- Developer-funded collection system improvements
- Applying a fee to development in order to reserve future treatment capacity (treatment capacity reservation)
- Funding and requirements related to separation in the combined sewer service area.

Sanitary Sewer Revenue Discussion

The sanitary sewer user fee is charged to existing customers on the quarterly bill from AlexRenew. One option to increase sanitary sewer funding is to increase the sanitary user fees that the City charges to all households and businesses. Existing customers also pay a sewer treatment fee on their sewer bill, which is charged by AlexRenew. Most other surrounding jurisdictions own and operate both the wastewater treatment facility and the collection system. Therefore, in order to compare the usage fees to neighboring areas, both the existing City and AlexRenew usage fees have been combined below. Table 1 shows a summary of these fees.

Table 1 – Sewer Usage Fee Summary

Jurisdiction	Usage Fee per 1000 Gallons Metered Water
City of Alexandria and AlexRenew	\$1.25 (City), \$6.36 (AlexRenew), \$7.61 (Total)
Arlington County	\$8.63
District of Columbia (DC Water)	\$5.64
Fairfax County	\$6.85
Prince William County	\$6.55 (residential); \$7.15 (commercial)
Washington Suburban Sanitation Commission (WSSC)	\$3.64-\$9.24 (based on usage)

Sanitary sewer connection fees are charged to new projects that connect to a City sewer. Table 2 shows a comparison of the single-family connection fees for the City and surrounding jurisdictions.

Table 2 – Single-Family Connection Fees

Jurisdiction	Single-Family Connection Fee
City of Alexandria	\$8,404
Arlington County	\$3,080 (typical, based on # of drainage fixture units)
Fairfax County	\$7,750
Prince William County	\$10,800
Washington Suburban Sanitation Commission (WSSC)	\$3,500 (unimproved area); \$10,750 (improved area)

An examination of the connection fees revealed that the City's multi-family connection fee is generally lower than most of the other jurisdictions. The City's multi-family connection fee is 50% of the single-family connection fee, whereas most other neighboring jurisdictions' multi-family connection fees are 80-100% of the single-family connection. Additionally, water usage for multi-family homes in the City is approximately 87% of the usage that is generated from single-family homes. Staff is recommending that the connection fee for multi-family development projects be increased from 50% to 90% of the single-family connection fee, phased in over a two year period.

Currently, when a development project consists of tearing down an existing structure and building a new structure, the developer does not receive a credit against the connection fee for wastewater flows generated from the existing structure. A survey of other jurisdictions regarding their policy towards credits for teardowns determined that a number of other jurisdictions do apply teardown credits (either full or partial) towards the connection fees. Staff is recommending that a credit be allowed for 50% of the structure to be removed. Because the costs associated with conveying and treating sanitary effluent has increased significantly over the years, staff is not recommending a 100% credit.

Combined Sewer Separation

The City currently requires all development and redevelopment in the combined sewer area to connect its sanitary sewer flows to a separate sanitary sewer (or to contribute funds towards separation based on the project site size if separation is not feasible) and is in the process of developing more specified criteria outlining the required contributions for CSS separation. The proposed guidelines state in the event that a separate sanitary sewer is not available within 900 feet, the project is required to contribute funding toward future separation projects in an amount equal to \$300,000 per acre of the development site. Staff encourages development projects to construct separation of the combined sewer, even if the project is greater than 900 feet from a separate sanitary sewer. In the case where a project constructs sewer improvements beyond those required, credits against the sewer connection fee can be given to offset the additional costs. These guidelines are in line with the City's current practice.

Sanitary Sewer Financial Model

The FY 2013 to FY 2022 CIP proposed increasing the sewer maintenance (user) fees and issuing additional General Obligation Bonds to finance the above-referenced CIP projects. Increases in the user fees are proposed to begin in FY 2015 and increase to \$2.29 (per 1000 gallons of water consumption) by the end of the 10-year CIP. No change in the connection fee was presented in the FY 2013 to FY 2022 CIP, other than inflationary increases based the Consumer Price Index for Urban Consumers (CPI-U), which is currently outlined in the City Code.

A Sanitary Sewer Financial Model has been developed that addresses identified needs using current planning level cost estimates. This includes obtaining additional capacity at the AlexRenew wastewater treatment facility (through hydraulic expansion), the proposed Wet Weather Management Facility and additional funds for I/I remediation. Replacement of local collector sewers due to future growth is not included since these will be developer-funded. This model also does not include CSO mitigation funding beyond what is budgeted in the current FY 2013 to FY 2022 CIP or capacity improvements that may be required in the Holmes Run Trunk Sewer. These costs will be modeled and included in future CIP documents as the needs are identified. The Sanitary Sewer Financial Model developed assumes the following:

- Existing system needs to be funded via the sanitary sewer user fee (I/I remediation and the Wet Weather Management Facility).
- Needs due to growth (AlexRenew expansion) to be funded by the sewer connection fees.

This differs from the FY 2013 to FY 2022 CIP in that the CIP assumes the costs of the recommended projects be funded through the sanitary sewer user fees only. Additional model assumptions include:

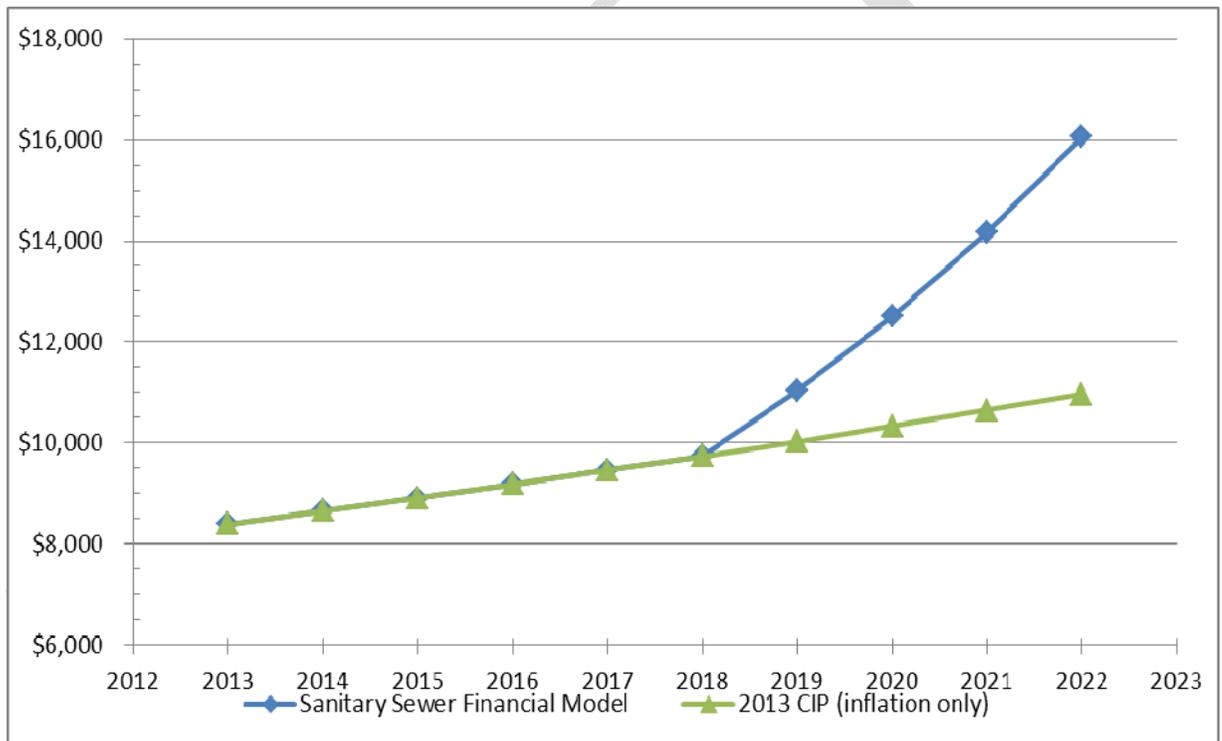
- Sanitary user fee revenue increased by 0.75% per year (lower than the 1% forecasted rate of growth due to installation of low-flow fixtures for new development).
- Multi-family connection fee is increased from 50% to 90% of the single-family fee over a 2-year period starting in FY 2014.

Table 3 presents a comparison of the sanitary sewer user fees between the FY 2013 to FY 2022 CIP and the Sanitary Sewer Financial Model which reflects the recommendations of this Sanitary Sewer Master Plan. Figure 4 shows a similar comparison of the connection fees. The Sanitary Sewer Model results in an increase to the connection fees at a rate of 10-percent annually between FY 2019 through FY 2022 to fund the AlexRenew expansion expenditures occurring during those years. The lower user fees in the Sanitary Sewer Financial Model will create some of the additional rate capacity needed to finance a portion of what may be needed to address the substantial future potential cost impacts related to new CSO-related permit requirements.

Table 3 – Sanitary Sewer User Fee Comparison

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
FY 2013 – FY 2022 CIP	\$1.25	\$1.25	\$1.38	\$1.38	\$1.47	\$1.77	\$2.05	\$2.05	\$2.29	\$2.29
Sanitary Sewer Financial Model	\$1.25	\$1.25	\$1.25	\$1.25	\$1.36	\$1.64	\$1.88	\$1.90	\$1.99	\$2.15

Figure 4 – Single-family Connection Fee Comparison



Recommendations

Based on the results of the Sanitary Sewer Financial Model, information regarding water usage and other jurisdictions’ policies, the following recommendations are provided in the Sanitary Sewer Master Plan:

- Increase the multi-family connection fee from 50% to 90% of the single-family connection fee, via a two-year phased-in approach starting in FY 2014.

- Create a policy for applying partial credits for teardowns at 50% of the existing use.

The above recommendations will be presented to City Council as amendments to the City Code in conjunction with the FY 2014 to FY 2023 proposed CIP.

Additionally, the Sanitary Sewer Master Plan recommends requiring development in the combined sewer service area to separate sanitary flows or to contribute funding towards future separation projects. This recommendation will be formalized in design criteria promulgated by the Director of Transportation and Environmental Services.

II. COMMUNITY INPUT

Over the course of preparing this Sanitary Sewer Master Plan, staff has participated in briefings with interested parties and stakeholders. These stakeholders include the National Association of Industrial and Office Parks (NAIOP), Northern Virginia Business Industry Association (NVBIA), Environmental Policy Commission (EPC), and the AlexRenew Board. Additionally, two City Council worksessions have been held to update Council on the progress of the Sanitary Sewer Master Plan. Valuable input has been received and considered in the development of this plan.

III. STAFF RECOMMENDATION

Staff recommends approval of an amendment to the City's Master Plan to adopt the attached Sanitary Sewer Master Plan as a chapter to the Master Plan.

Staff: Mark Jinks, Deputy City Manager
Richard J. Baier, Director, Transportation and Environmental Services
Emily Baker, City Engineer, Transportation and Environmental Services
Karl Moritz, Deputy Director, Planning and Zoning
Maurice Daly, Division Chief, Transportation and Environmental Services
Erin Bevis-Carver, Civil Engineer III, Transportation and Environmental Services
Pat Mann, Urban Planner, Planning and Zoning
Chris Bever, Capital Program Coordinator, Office of Management and Budget

Attachments: 1. Master Plan Amendment Resolution
2. Sanitary Sewer Master Plan

RESOLUTION NO. MPA 2012-0005

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 Department of Transportation and Environmental Services has brought forward an amendment to the 1992 Master Plan for the adoption of the Sanitary Sewer Master Plan as a chapter; and

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 TBD 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 City; and
2. The proposed amendment is generally consistent with the overall goals and objectives of the 1992 Master Plan; and
3. The proposed amendment shows the Planning Commission's long-range recommendations for the general development of the City; 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 amendment to 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 following amendment is hereby adopted in its entirety as a chapter 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:

Addition of the Sanitary Sewer Master Plan

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 th day of _____, 2012.

John Komoroske, Chairman
Alexandria Planning Commission

ATTEST:

Faroll Hamer, Secretary

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