



Loudoun Water

Water and Sewer Rate Study Report

October 4, 2018





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Mr. Brian Carnes
Director of Finance
Loudoun Water
44865 Loudoun Water Way
Ashburn, VA 20147

Re: Water and Sewer Rate
Study Report

Dear Mr. Carnes,

Stantec is pleased to present this Report on the Water and Sewer Rate Study (Study) that was conducted for Loudoun Water. We appreciate the professional assistance provided by you and all of the members of Loudoun Water who participated in the study.

If you or others at Loudoun Water have any questions, please do not hesitate to call us at (202) 585-6391 or email me at David.Hyder@stantec.com. We appreciate the opportunity to be of service to Loudoun Water, and we look forward to the possibility of doing so again in the near future.

Sincerely,

A handwritten signature in black ink, appearing to read "David Hyder".

David A. Hyder
Principal

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Enclosure

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EXECUTIVE SUMMARY

E.1 INTRODUCTION

This Executive Summary presents an overview of the results of the Water and Sewer Rate Study (Study) that was conducted for Loudoun Water by Stantec Consulting Services (Stantec). While the Executive Summary presents the primary conclusions and recommendations developed during the study, the full report outlines all of the key assumptions and detailed analysis completed to arrive at the results of the Study and should be consulted to gain a full understanding of the analysis.

E.2 SCOPE OF WORK

The principal components of the Comprehensive Water and Sewer Rate Study are as follows:

Revenue Sufficiency Analysis and Financial Plan – Develop a three-year financial plan for Loudoun Water’s water and sewer systems that will determine the level of annual revenue required to satisfy projected annual operating, debt service, and capital cost requirements as well as the maintenance of adequate reserves. The financial plan is designed to support the short and long-term needs of Loudoun Water in an effort to provide fiscal sustainability while minimizing customer impacts.

Reclaimed Water Rate Analysis – Evaluate the cost of providing reclaimed water service to determine if adjustments to the reclaimed water rates are warranted in light of the cost of service and forecasted changes in reclaimed water system demands within the Loudoun Water service area.

Availability Charge Analysis – Evaluate the methodology used by Loudoun Water to determine water and sewer availability charges and recommend modifications if appropriate. Develop a forecast of availability charges based on the cost of providing water and sewer system capacity to new customers joining the Loudoun Water systems.

Developer Fee Analysis – Review the current plan review and inspection fees charged by Loudoun Water to determine if the fees are set at a level that recovers the cost of providing these services and recommend modifications to the fees if the fees are set below the cost of service.

Benchmarking and Customer Impacts – Benchmark Loudoun Water’s rates, fees and charges with comparable and local utilities. Demonstrate the impacts of any recommended changes to rates, fees and charges on customers of the systems in the form of customer bill impact comparisons.

Based on the completion of the scope of work, Stantec has developed several conclusions and recommendations for Loudoun Water’s consideration. The key conclusions and recommendations are outlined herein.

E.3 REVENUE SUFFICIENCY ANALYSIS AND FINANCIAL PLAN

A revenue sufficiency analysis was completed for a ten-year period covering 2019 to 2028. The revenue sufficiency analysis was used to determine if Loudoun Water's current rates, fees and charges will be adequate to meet the system revenue requirements (operating expenditures, debt service and capital investments) over the planning period. The revenue requirements were developed based on Loudoun Water's budget documents, capital improvement program and assumed cost escalation factors. The following conclusions and recommendations are provided based on the revenue sufficiency analysis.

- The revenue sufficiency analysis developed for the planning period, reveals that Loudoun Water's revenues generated from current rates and fees will not be sufficient to meet the annual revenue requirements of the water and sewer system. If additional revenues are not generated over the planning period, Loudoun Water will not be able to provide adequate funds to meet the revenue requirements and will draw the cash balance below the minimum balance requirement established by Loudoun Water.
- The primary drivers for the increases in revenue requirements over the planning period include the following key items:
 - Loudoun Water will commence full operations of the Trap Rock Water Treatment Plant in 2019. Operation of the plant will reduce the amount of water purchased from Fairfax Water. The reduction in Purchased Water will be more than offset by the cost to produce water at Trap Rock.
 - In 2018, DC Water began charging Loudoun Water an additional \$1.5 million per year for wastewater treatment services. These costs will continue over the planning period and will likely increase annually at an inflationary level.
 - Loudoun Water continues to invest significant funds to expand the water and sewer services to meet the requirements of new demand placed on the water and sewer systems, while at the same time funding the ongoing repair and replacement of the systems.
- To address the funding requirements of the system, we recommend that Loudoun Water adopt a three-year financial plan that will adjust water and sewer rates by 3.5% in 2019, 2020 and 2021, respectively. The financial management plan will allow Loudoun Water to provide adequate and sustainable funds for the operation, maintenance and replacement of the water and sewer systems, while minimizing the impacts on its water and sewer customers. The recommended rates under the financial plan are shown in the following tables.

Table E-1 Recommended Water Rates

	Current	Jan 1, 2019	Jan 1, 2020	Jan 1, 2021
Residential Rates				
Basic Charge	\$33.46	\$34.63	\$35.84	\$37.09
Tier 1: 0 - 25,000 Gallons	\$2.44	\$2.53	\$2.62	\$2.71
Tier 2: 25,001 - 50,000 Gallons	\$6.80	\$7.04	\$7.29	\$7.55
Tier 3: Over 50,000 Gallons	\$9.11	\$9.43	\$9.76	\$10.10
Commercial Rates				
Basic Charge				
5/8"	\$33.46	\$34.63	\$35.84	\$37.09
3/4"	\$47.12	\$48.77	\$50.48	\$52.24
1"	\$99.08	\$102.55	\$106.14	\$109.85
1 1/2"	\$156.51	\$161.99	\$167.66	\$173.53
2"	\$252.21	\$261.04	\$270.18	\$279.63
3"	\$416.27	\$430.84	\$445.92	\$461.53
4"	\$689.71	\$713.85	\$738.83	\$764.69
6"	\$1,373.30	\$1,421.37	\$1,471.12	\$1,522.60
Tier 1: Up to Purchased Capacity	\$3.21	\$3.32	\$3.44	\$3.56
Tier 2: Over Purchased Capacity	\$5.53	\$5.72	\$5.92	\$6.13
All Other Uses*	\$6.80	\$7.04	\$7.29	\$7.55

* Includes, but not limited to, fire hydrant special use, construction water and irrigation/submeters for which an availability charge has not been paid.

Table E-2 Recommended Sewer Rates

	Current	Jan 1, 2019	Jan 1, 2020	Jan 1, 2021
Residential Rates				
Basic Charge	\$33.43	\$34.60	\$35.81	\$37.06
Usage Rate per 1,000 gallons*	\$4.80	\$4.97	\$5.14	\$5.32
Commercial Rates				
Basic Charge				
5/8"	\$33.43	\$34.60	\$35.81	\$37.06
3/4"	\$47.82	\$49.49	\$51.23	\$53.02
1"	\$102.61	\$106.20	\$109.92	\$113.77
1 1/2"	\$163.13	\$168.84	\$174.75	\$180.87
2"	\$264.02	\$273.26	\$282.82	\$292.72
3"	\$436.97	\$452.26	\$468.09	\$484.48
4"	\$725.21	\$750.59	\$776.86	\$804.05
6"	\$1,445.81	\$1,496.41	\$1,548.79	\$1,603.00
Usage Rate per 1,000 gallons	\$4.80	\$4.97	\$5.14	\$5.32

*Usage capped at winter quarter average consumption plus 3,000 gallons, residential only

- The recommended adjustments to water and sewer rates will result in the continued health and stability of the water and sewer systems, and will accomplish the following:
 - Ensure that the debt service coverage requirements are met during the projection period.

- Allow Loudoun Water to fund at or near 50% of annual depreciation on the water and sewer system assets in the form of funding of annual replacement projects or contributions to the repair and replacement reserve.
- Maintain unrestricted net asset balances within the target range over the projection period.

E.4 RECLAIMED WATER RATE ANALYSIS

A cost of service analysis was completed for Loudoun Water's reclaimed water operations to determine the appropriate pricing for reclaimed water service over the projection period. Based on our analysis of the reclaimed water system we have developed the following conclusions and recommendations.

- The cost of providing reclaimed water service is closely linked with the operations of Loudoun Water's Broad Run Water Reclamation Facility (WRF), and therefore costs are anticipated to trend with the cost of operating and maintaining the WRF.
- The current reclaimed water rates are not sufficient to meet the annual revenue requirements of the reclaimed system in the near term. Given the shortfall in revenues compared to expenses, and the linkage between the WRF and the cost of providing reclaimed water service, we recommend that Loudoun Water increase the reclaimed water rates at 3.5% per year for the next three years, consistent with the adjustments to sewer user rates over the same period. The recommended rates are presented in the following table.

Table E-3 Recommended Reclaimed Water Rates

	Current	Jan 1, 2019	Jan 1, 2020	Jan 1, 2021
Usage Rate per 1,000 gallons	\$1.50	\$1.55	\$1.61	\$1.66

E.5 AVAILABILITY CHARGE ANALYSIS

Loudoun Water currently collects water and sewer availability charges from new customers joining the water and sewer system to recover the cost of providing system capacity. The Availability Charge is calculated for a residential connection, or equivalent resident connection (ERC). As part of the rate study, the current methodology used to calculate the charges was evaluated along with the level of the current charges. Based on our analysis, the following conclusions and recommendations were developed during the course of the study.

- The overall methodology used to determine the availability charges is appropriate and reflects the cost of providing water and sewer system capacity, however some minor changes to the methodology are recommended to provide greater stability within the determination of the charges on a year over year basis. The recommended changes include:

- The cost of system investments should be scaled using the National Engineering News Record (ENR) Construction Cost Index instead of the index for the City of Baltimore due to the variability of the Baltimore index.
- The distribution system component of the water system charge should be based on the existing distribution system pipes plus those identified in the Loudoun Water Master Plan to reflect the average cost of providing distribution system assets.
- Along with the changes to the methodology, availability charges should be adopted for a three-year period to provide clarity within the community. The recommended availability charges are presented in the following table.

Table E-4 Recommended Availability Charges

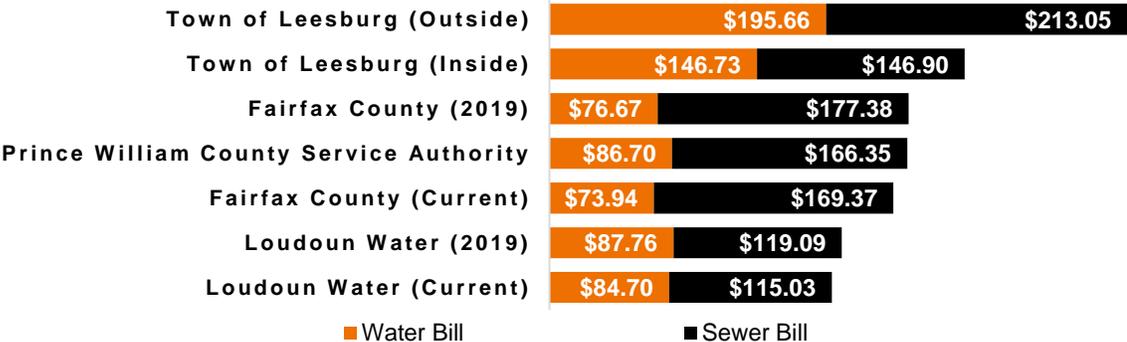
	Current	Jan 1, 2019	Jan 1, 2020	Jan 1, 2021
Water Availability Charge per ERC	\$6,766	\$6,901	\$7,039	\$7,180
Sewer Availability Charge per ERC	\$8,209	\$8,373	\$8,540	\$8,711

E.6 BENCHMARKING AND CUSTOMER IMPACTS

As part of the Study, benchmarking of comparable rates, fees and charges and resulting average customer water and sewer bill impacts were completed. The following findings and conclusions are provided based on the comparisons.

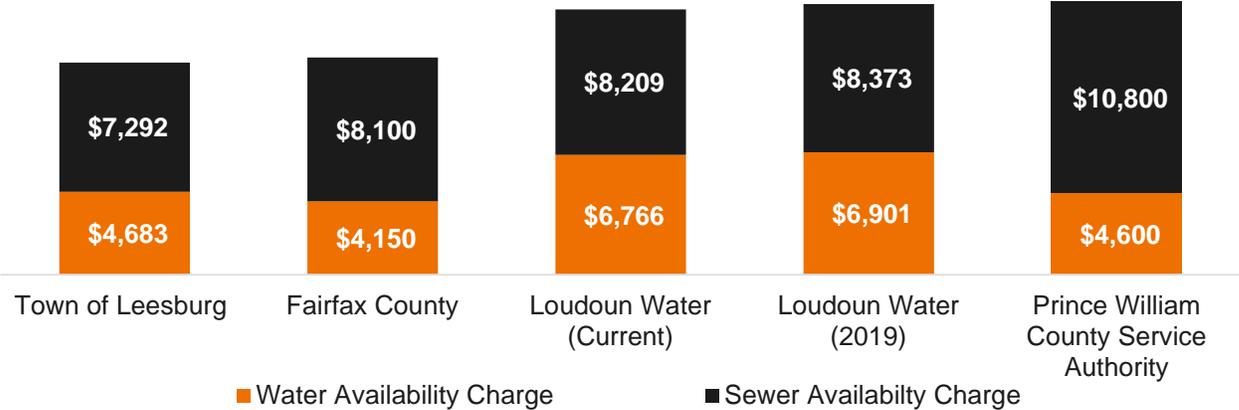
- Loudoun Water's average residential bill for 21,000 gallons per quarter was compared with neighboring and comparable jurisdictions. Based on the comparison, Loudoun Water's average bills remain among the lowest within the neighboring utilities. Given the modest adjustments recommended as part of this Study, Loudoun Water customers will continue to pay utility bills at the lower end of the scale. The figure on the following page demonstrates how Loudoun Water's current and proposed 2019 average water and sewer bill compares with those of surrounding jurisdictions. It is important to note that the bills for comparison utilities represent current bills and do not include likely future annual increases which are not yet publicly available. Additionally the sewer bill for Loudoun Water is capped at 17,000 gallons assuming a winter quarter average consumption of 14,000 gallons.

Figure E-1 Combined Water & Sewer Bill Comparison



- Availability charges were benchmarked against the same utilities. The following figure presents the comparison.

Figure E-2 Availability Charge Comparison



1. INTRODUCTION

Stantec has conducted a comprehensive Water and Sewer Rate Study (Study) for the water, sewer and reclaimed water systems operated and maintained by Loudoun Water. This report presents the objectives, approach, methodologies, source data, assumptions, as well as the findings, conclusions and recommendations of the Study.

1.1 BACKGROUND

Loudoun Water was created by action of the Board of Supervisors of Loudoun County, VA under the Virginia Water and Wastewater Authorities Act and was chartered with the State Corporation Commission (SCC) in 1959. In accordance with the Charter, Loudoun Water is to provide water and wastewater service to the residents who live outside incorporated areas of Loudoun County. Loudoun Water is responsible for constructing, improving, and otherwise maintaining the water and sewer systems within portions of Loudoun County. The cost of operating and maintaining the water and sewer systems is fully funded by the rates, fees and charges collected by Loudoun Water from users of the systems.

The eastern portion of the water and wastewater system is considered the “Central System” and serves approximately 78,700 water and sewer accounts. Loudoun Water also owns and operates a number of community water and wastewater systems in the rural portion of the County. In 2016, Loudoun Water adopted a uniform rate for all metered customers.

The Loudoun Water Board is authorized to fix and revise rates, fees and other charges for water and sewer service by Section 15.2-5136 of the Virginia Code. Prior to action on proposed rates, Loudoun Water conducts a public hearing as required by the Virginia Code. After approval by the Loudoun Water Board, the rates become effective on the dates specified in the Board’s action and require no further review or approval. In 2015, Loudoun Water engaged a rate consultant to complete a cost of service analysis and rate study. The study resulted in the adoption of rates and charges for 2016 - 2018. The Loudoun Water Board adopted the recommended rates developed during the study, and water and sewer rates have been adjusted annually per the plan over the last three years.

1.1.1 Water System

Loudoun Water delivers water to its customers through a water distribution system consisting of 1,285 miles of water mains and 8 storage tanks with a storage capacity of over 18 million gallons. Loudoun Water currently purchases the majority of its source water from Fairfax Water which supplies approximately 19 million gallons per day (MGD). The remainder of the water, about 6.0 MGD, is supplied from Goose Creek and is treated at Loudoun Water’s Goose Creek Water Treatment Plant. Over the last several years, Loudoun Water has been developing the Potomac Water Supply Program (PWSP). The PWSP includes an intake on the Potomac River, transmission lines, quarry storage and the Trap Rock Water Treatment Plant. The new plant will have the ability to produce up to 20 MGD. Loudoun Water

anticipates that Trap Rock will be fully operational by January 2019. The plant will completely replace the operations of the Goose Creek plant and reduce the purchases of water from Fairfax Water. Loudoun Water anticipates that Trap Rock will produce 10 MGD, which will be augmented with purchases from Fairfax Water. As demands on the Loudoun Water system increase, it is currently assumed that the additional water will be purchased from Fairfax Water, as Loudoun Water anticipates continuing to operate Trap Rock at 10 MGD in the near future.

1.1.2 Wastewater System

Wastewater is treated at two different facilities. Loudoun Water owns, operates and maintains the WRF which currently treats approximately 6 MGD of wastewater. The WRF has treatment capacity of 11 MGD. The remainder is treated by DC Water at their Blue Plains Wastewater Treatment Plant. Loudoun Water currently sends about 13.3 MGD to Blue Plains. Based on the current agreement, Loudoun Water has a maximum treatment capacity in the Blue Plains plant of 13.8 MGD. In addition to the WRF, Loudoun Water maintains over 900 miles of gravity wastewater mains and 49 miles of wastewater force mains.

1.1.3 Reclaimed Water System

Loudoun Water provides reclaimed water to commercial customers located within the Central System. The reclaimed water is produced at the WRF. The reclaimed water is distributed through a distribution system consisting of 14 miles of reclaimed mains. The reclaimed water system in 2017 delivered approximately 1.3 MGD of reclaimed water to 30 commercial customers.

1.1.4 Study Overview

Loudoun Water maintains a practice of completing a comprehensive water and sewer rate study at least every three years. Historically the rate studies have been used to establish rates, fees and charges for a three-year period. This practice allows Loudoun Water to ensure that the charges for service are sufficient, equitable and predictable within the service area. In January of 2018, Loudoun Water engaged Stantec to complete a comprehensive water, sewer and reclaimed water rate study consistent with Loudoun Water's practices. The scope of work for the study, established between Stantec and Loudoun Water includes several related tasks. The specific tasks are summarized below.

- 1) **Revenue Sufficiency Analysis and Financial Plan** – Develop a three-year financial plan for Loudoun Water's water and sewer systems that will determine the level of annual revenue required to satisfy projected annual operating expenses, debt service, and capital cost requirements as well as the maintenance of adequate reserves. The financial plan is designed to support the short and long-term needs of Loudoun Water in an effort to provide fiscal sustainability while minimizing customer impacts.
- 2) **Reclaimed Water Rate Analysis** – Evaluate the cost of providing reclaimed water service to determine if adjustments to the reclaimed water rates are warranted in light of the cost of service

and forecasted changes in reclaimed water system demands within the Loudoun Water service area.

- 3) **Availability Charge Analysis** – Evaluate the methodology used by Loudoun Water to determine water and sewer availability charges and recommend modifications if appropriate. Develop a forecast of availability charges based on the cost of providing water and sewer system capacity to new customers joining the Loudoun Water systems.
- 4) **Developer Fee Analysis** – Review the current plan review and inspection fees charged by Loudoun Water to determine if the fees are set at a level that recovers the cost of providing these services and recommend modifications if the fees are set below the cost of service.
- 5) **Benchmarking and Customer Impacts** – Benchmark Loudoun Water’s rates, fees and charges with comparable and local utilities. Demonstrate the impacts of any recommended changes to rates, fees and charges on customers of the systems in the form of customer bill impact comparisons.

The remaining sections of this report outline the analysis, assumptions, findings, conclusions and recommendations related to the completion of the scope of work.

2. REVENUE SUFFICIENCY ANALYSIS AND FINANCIAL PLAN

This section of the report presents the financial management plan and corresponding plan of water and sewer rate adjustments developed in the revenue sufficiency analysis (RSA) that was conducted as part of the Study. The following sub-sections of the report present a description of the approach, source data, assumptions and results of the RSA.

2.1 APPROACH

The water and sewer rate study was completed as a collaborative effort with Loudoun Water staff. During the Study, Stantec reviewed alternative multi-year financial management plans and corresponding water and sewer rate revenue adjustment plans through several interactive work sessions with Loudoun Water staff. During these work sessions, Stantec examined the impact of various inputs or assumptions upon key financial indicators by use of tabular and graphical output and extensive review of inputs, assumptions, and relationships between key variables. In this way, Stantec developed the recommended financial management plan and corresponding plan of annual water and sewer rate revenue adjustments presented in this report, which will allow Loudoun Water to fund its cost requirements throughout the planning period and meet its financial performance goals and objectives.

Loudoun Water provided historical and budgeted financial information regarding the operation of its water and sewer systems, as well as historical customer counts and volume data by class of customer. Loudoun Water also provided a multi-year capital improvement program (CIP), and documented current debt service obligations and covenants, relative to net income coverage requirements, reserves, etc. Following review of the data, we discussed with Loudoun Water staff key assumptions and policies that would affect the financial performance of the Utility, such as trends in demands, planned developments/customer growth, debt coverage levels, levels of reserves, capital funding sources, earnings on invested funds, escalation rates for operating costs, and purchased resources.

All of this information was entered into the financial module of our Financial Analysis and Management System interactive modeling system. The model is used to produce a 10-year projection of the sufficiency of the revenue provided by the current rates of the system to meet current and projected financial requirements and determined the level of rate revenue increases necessary in each year of the projection period to satisfy the system's annual financial requirements. While the model is developed for a ten-year period, the period shown in the main body of this report includes the next five years from 2019 to 2023.

2.2 SOURCE DATA

The following presents the key source data relied upon in conducting the Study:

2.2.1 Cash Balances

While Loudoun Water maintains a single fund to account for the operations of the utility, Loudoun Water maintains several internal accounts to track how the funds are generated and their intended use. The accounts used for tracking the funds and available balances include the following:

- Operating Account - The Operating Account serves as working capital reserve to provide for the potential lag between operating revenues and operating expenditures, fluctuations on budgets and unexpected minor expenses. The Operating Account is set to equal at least 3 months of operating expenses of the systems.
- Repair and Replacement Account - The Repair and Replacement Account serves to provide future funds for the repair and replacement of aging system assets. Rather than set a specific minimum target for the account, Loudoun Water has a goal maintained a practice of contributing to the account on an annual basis a minimum equivalent to 50-percent of annual depreciation expense on the system assets.
- Availability Charge Account - The Availability Charge Account serves as a funding mechanism for expansion related capital projects (cash funding and retirement of expansion related debt service).

Loudoun Water staff provided the cash balances within each of the accounts as of January 1, 2018. The account balances are shown in Table 2-1.

Table 2-1 Cash Balances at January 2018

Account	Beginning Balance
Operating	\$15,681,184
Repair and Replacement	\$101,518,816
Availability Charge	\$143,900,000
Total	\$261,100,000

2.2.2 Revenues

The revenues utilized in the analysis reflect an evaluation of multiple years of historical results, 2017 actuals, and the 2018 Proposed Budget. Revenues consist of fixed and commodity charges, availability charges, wholesale water service, hydrant commodity charges, late payment penalty fees and miscellaneous service charges. Rate revenue is based upon 2017 actual results, adjusted annually to reflect assumed customer growth and changes in demands. Projections of all other revenues reflect the amounts within the 2018 Budget, excluding interest income, which was calculated annually based upon

projected average account balances and assumed interest rates. Revenue from availability charges is calculated based on the assumed growth in new accounts and current rates.

2.2.3 Operating Expenditures

Loudoun Water's operating expenditures include all operating and maintenance (O&M) expenses and minor capital outlay. The rate study analysis based O&M expenditure projections on individual expense categories and expense amounts within Loudoun Water's 2018 budget, adjusted annually thereafter based upon assumed cost escalation factors. These were reviewed with Loudoun Water staff and outlined in the next section. The O&M expenses for 2019 include full operation of the Trap Rock Water Treatment plant which replaces the majority of operational costs at the Goose Creek Water Treatment plant. It is important to note that in 2018, Loudoun Water received notice from DC Water that an additional \$1.5 million in annual costs would be required for wastewater conveyance services. The \$1.5 million is anticipated to continue during the entire projection period and increase annually at an inflationary level.

2.2.4 Debt Service

The annual debt service schedules for existing outstanding debt were provided by Loudoun Water. Loudoun Water currently has nine outstanding debt issues totaling approximately \$280 million in outstanding principal at the beginning of 2018. Loudoun Water currently recovers 20% of annual principal payments on existing debt from user rates (existing customers) and the remaining 80% is recovered from availability charges (new customers). This allocation is based on the types of projects funded with bond proceeds. The interest on existing debt service is recovered from user rates. The existing debt payments (principal and interest) are shown in Table 2-2.

Table 2-2 Existing Debt Payments

System	2019	2020	2021	2022	2023
Water	\$9,018,615	\$9,022,119	\$9,059,193	\$9,058,430	\$9,067,326
Sewer	12,918,428	12,916,598	13,016,550	\$13,006,112	\$13,027,279
Total	\$21,937,043	\$21,938,717	\$22,075,743	\$22,064,542	\$22,094,605

2.2.5 Capital Improvement Program

Loudoun Water provided the multi-year capital improvement program (CIP) at the detailed project level for the period 2018 through 2027. A summary of the five-year capital improvement program by project category for the water system is presented in Table 2-3 followed by a summary for the sewer system in Table 2-4.

Table 2-3 Water Capital Improvement Program

Project Category	2019	2020	2021	2022	2023
Administrative	\$2,800,600	\$1,344,200	\$730,400	\$2,261,600	\$1,122,000
Community Systems	2,125,000	1,295,000	45,000	25,000	25,000
Finance	6,260,000	5,100,000	5,090,000	6,490,000	5,350,000
Potomac Water Supply	2,650,000	26,340,000	27,100,000	24,160,000	9,220,000
Repair & Replacement	1,855,000	885,000	895,000	595,000	65,000
Other Water	13,460,000	8,190,000	12,350,000	3,810,000	19,790,000
Total	\$29,150,600	\$43,154,200	\$46,210,400	\$37,341,600	\$35,572,000

Table 2-4 Sewer Capital Improvement Program

Project Category	2019	2020	2021	2022	2023
Administrative	\$3,564,400	\$1,710,800	\$929,600	\$2,878,400	\$1,428,000
Broad Run WRF	9,280,000	8,840,000	38,870,000	43,690,000	3,900,000
Community Systems	5,365,000	25,000	25,000	25,000	25,000
Finance	6,830,000	5,490,000	5,170,000	5,250,000	5,250,000
Repair & Replacement	8,845,000	4,960,000	1,735,000	3,370,000	3,225,000
Reclaimed System	450,000	2,900,000	2,500,000	0	1,500,000
Other Sewer	17,990,000	3,320,000	2,250,000	4,080,000	6,340,000
Total	\$52,324,400	\$27,245,800	\$51,479,600	\$59,293,400	\$21,668,000

As part of the Study, we worked with Loudoun Water staff to examine the specific funding for each of the capital projects included in the CIP. Loudoun Water staff identified which projects or portions of projects should be funded by existing users, and which projects were growth related and should be funded from availability charges. Table 2-5 presents Loudoun Water's anticipated capital spending by funding source over the next five years.

Table 2-5 Capital Improvement Summary by Funding Source

Funding Source	2019	2020	2021	2022	2023
Availability Charges	\$33,232,500	\$37,251,000	\$68,897,500	\$77,516,500	\$31,672,000
User Rates	48,242,500	33,149,000	28,792,500	19,118,500	25,568,000
Total	\$81,475,000	\$70,400,000	\$97,690,000	\$96,635,000	\$57,240,000

As demonstrated in the table, approximately 40-percent of the five-year capital plan will be funded from user rates with the balance funded from availability charges. The specific funding for the capital

improvements plan, including the issuance of debt to fund a portion of the CIP and the assumed execution rate for the projects are discussed in the next section of the report.

2.3 ASSUMPTIONS

The following presents the key assumptions utilized in the completion of the study.

2.3.1 Cost Escalation

Annual cost escalation factors for the various types of operating and maintenance expenses were developed based upon a review of historical trends, our industry experience, and detailed discussions with Loudoun Water staff. Table 2-6 presents a summary of the water and sewer system annual cost escalation factors used in the Study to forecast operating expenses for the period 2019 to 2027.

Table 2-6 O&M Cost Escalation Assumptions

Budget Category	Annual Inflation
Salaries and Wages	5.0%
Fringe Benefits	5.0%
Electric	7.0%
Contractual Services	3.0%
Repairs and Maintenance	3.0%
Operating Supplies	3.0%
Other Operating Expenses	3.0%
Wholesale Sewer*	3.5%
Purchased Water**	3.6%

*Assumed escalation in DC Water treatment expenses

**Assumed escalation in purchased water costs from Fairfax Water

Based on discussions with Loudoun Water staff and review of historical budget to actual operating and maintenance spending, an assumed execution rate of 97-percent of budget was used in the forecast of annual operating and maintenance expenses.

2.3.2 Interest Earnings

Interest Income throughout the projection period is calculated annually based upon projected average fund balances and assumed interest rates. The assumed interest rates are presented in Table 2-7.

Table 2-7 Interest Rates

Funding Source	2019	2020	2021	2022	2023
Interest Rate on Balances	1.50%	1.75%	2.00%	2.25%	2.50%

2.3.3 Customer Growth & Volume Forecast

The growth in new connections to the Loudoun Water systems was based on Loudoun County population projections. Historically, Loudoun Water has seen an average increase of approximately 3.5-percent in connections per year. The County projections provide growth forecasts that are consistent with this historical level of growth, but with slowed growth over time. The changes in water system demands are based on a combination of the increase in the number of ERCs and an assumed decrease in the per ERC usage of approximately 1% per year. The decrease in per account usage is based on historical trends demonstrated within Loudoun Water’s customer usage patterns and is consistent with national trends. Table 2-8 presents the anticipated customer growth and incremental increases in system demand over the planning period.

Table 2-8 Water Connection Growth and Volume Forecast

Year	Increase in ERCs	% Change in ERCs	Increase in Demands ¹	% Change in Demands
2019	3,000	3.90%	212,397	2.48%
2020	2,900	3.52%	197,458	2.25%
2021	2,900	3.28%	192,632	2.15%
2022	2,800	3.18%	178,244	1.95%
2023	2,750	2.97%	168,991	1.81%
Total	14,350		949,722	

¹Thousand gallons, assumes declining per connection usage (-1.0% per year)

Loudoun Water currently maintains a water rate structure with two customer classes (Residential and Commercial) with increasing water rates proportional to water usage. To accurately forecast future water rate revenues under the existing structure, it was necessary to determine the amount of consumption that falls within the current Residential and Commercial tiers. Loudoun Water currently defines the Residential tiers for quarterly usage as:

- Tier 1: 0 to 25,000 gallons
- Tier 2: Over 25,001 to 50,000 gallons
- Tier 3: Over 50,000 gallons

The current Commercial Tiers for quarterly usage are:

- Tier 1: Consumption up to reserved capacity purchased with availability charge
- Tier 2: Consumption in excess of the reserved capacity purchased

Table 2-9 shows the percentage breakdown of customers and consumption within the current rate structure. It should be noted that the percentages in Table 2-9 are based on annual numbers and therefore are influenced by seasonal variations.

Table 2-9 Consumption Usage Patterns in Current Water Rate Structure

	2015	2016	2017
Residential			
Tier 1: 0 – 25,000 gallons	84.9%	83.1%	86.4%
Tier 2: 25,001 – 50,000 gallons	10.9%	11.7%	10.3%
Tier 3: Over 50,000 gallons	4.2%	5.2%	3.4%
Commercial			
Tier 1: Up to purchased capacity	92.0%	92.8%	95.1%
Tier 2: Over purchased capacity	8.0%	7.2%	4.9%

Table 2-9 shows that there has been some fluctuation over the last three years in the usage by tier. The changes are most likely due to the amount of rainfall experienced each year. 2017 was an abnormally wet year and the amount of water sold in the higher tiers likely reflects this fact. This concept is further discussed in Section 3 of the report.

2.3.4 Cash Balance Guidelines

Loudoun Water maintains a policy that the total cash balance should be maintained within the range of two to three times the three-year rolling average of operating and maintenance expenses, and debt service.

Table 2-10 presents the calculated target range for each year over the next five years. The target range balance was used in the study to evaluate the sufficiency of current revenues to meet the minimum balance and to develop the financial plan discussed later in this section of the report.

Table 2-10 Unrestricted Balance Targets

	2019	2020	2021	2022	2023
Maximum (3 x O&M and Debt)	\$263,175,258	\$276,829,403	\$290,017,191	\$299,369,138	\$309,075,278
Minimum (2 x O&M and Debt)	\$175,450,172	\$184,552,935	\$193,344,794	\$199,579,425	\$206,050,185

2.3.5 Funding of the Capital Improvements Program

Based on discussions with Loudoun Water staff and utilizing the capital optimization function of the financial model, the capital improvements program (CIP) over the planning period will be funded from a combination of existing cash balances (from user rates and availability charges), annual revenues “pay-go” funding (from user rates and availability charges) and with long-term borrowing. Our financial analysis assumes that Loudoun Water will borrow approximately \$74 million in 2021 to fund capital project needs, and that the remainder of the CIP will be funded from current revenues and available balances within the availability charge account and the repair and replacement account. The exact size and timing of the borrowing will depend on the specific funding requirements in future years.

Given the magnitude of the CIP, one of the key assumptions for the financial planning analysis is the anticipated execution rate of the capital projects. Historically the CIP has not fully executed on a year to year basis. Based on discussions with Loudoun Water staff and review of historical capital spending, the financial planning analysis assumes that Loudoun Water will execute the CIP as shown in Table 2-11.

Table 2-11 Capital Improvement Summary at Execution

	2019	2020	2021	2022	2023
Total Planned CIP	\$81,475,000	\$70,400,000	\$97,690,000	\$96,635,000	\$57,240,000
Assumed Execution Rate	90%	90%	90%	90%	110%
Total CIP Funded	\$73,327,500	\$63,360,000	\$87,921,000	\$86,971,500	\$62,964,000

2.3.6 Funding of Repair and Replacement Account

Loudoun Water currently maintains a goal that approximately 50-percent of the annual depreciation expense on water and sewer system assets will be contributed to the Repair and Replacement Account on an annual basis. These contributions ensure that adequate funds are generated from user rates to fund at least a portion of the depreciation. While we recommend that Loudoun Water continue to follow this practice, it is important to recognize that as the system ages there will be years when the amount of required funding for repair and replacement will be significant. During these years, it may be unrealistic to fund contributions to the reserve account and fund current replacement projects at the same time. The most important factor is that user rates are set at a level that fund at least 50% of depreciation each and every year. In some years, the revenues may be used immediately to fund projects, and in other years they can be contributed to the Repair and Replacement Account. Table 2-12 presents the annual funding of depreciation and shows that Loudoun Water will be funding at or above 50-percent of depreciation from user rates over the five-year planning period.

Table 2-12 Annual Funding of Depreciation

	2019	2020	2021	2022	2023
Annual System Depreciation	\$49,044,293	\$51,760,127	\$54,106,793	\$57,363,127	\$60,584,293
Annual Funding of Depreciation	\$22,685,600	\$27,950,469	\$31,381,940	\$34,417,876	\$39,379,790
% of Depreciation Funded from Rates	46%	54%	58%	60%	65%

2.3.7 Debt Service and Coverage

One of the most important covenants Loudoun Water makes relative to the issuance of debt is that its annual net revenues (revenues less operating expenses) will be at least 1.2 times greater than its senior lien debt service requirements. It is important to note that these revenue covenants (often referred to as debt service coverage requirements) represent minimum requirements established in Loudoun Water's bond covenants. Should Loudoun Water be unable to meet these requirements, it could be found in technical default. This would result in Loudoun Water facing a potential downgrade in its credit rating, which would affect the interest rate and terms of any future financing initiatives. As a policy decision, utilities often measure revenue sufficiency and set rates based upon a higher debt service coverage level, to ensure compliance with these type of covenants in the event future projections of revenue and expenses do not occur as predicted (due to extended drought conditions, unanticipated capital requirements or operating cost increases, natural disasters, etc.). In accordance with Loudoun Water policy, we have assumed that Loudoun Water will maintain debt service coverage of at least 1.5. This level of debt coverage is typical within the utility industry and will help to ensure water and sewer revenues are kept at a level that satisfies Loudoun Water's bond covenants.

2.4 REVENUE SUFFICIENCY AND FINANCIAL PLANNING RESULTS

To evaluate the sufficiency of existing rates, fees and charges to fund Loudoun Water's system revenue requirements over the planning period, a projection of system revenue requirements and revenues at current rates was developed. It is important to note that Loudoun Water's availability charges are determined based on the cost of providing system capacity as compared to annual cash requirements. As a result, the revenue sufficiency is focused on the revenues generated from user rates. The evaluation of availability charges is discussed in Section 4 of this Report. However, any changes in availability charges and reclaimed water rates are factored into the overall revenues of the utility.

2.4.1 Revenue Requirement Projection

Based on the data and assumptions outlined in the prior sections of this report, a forecast of the water and sewer system revenue requirements was developed. The forecasts for the water system and the sewer system are presented on the following page in Tables 2-13 and 2-14, respectively.

Table 2-13 Forecast of Annual Water Revenue Requirements

Expenditure Type	2019	2020	2021	2022	2023
Personnel	\$13,348,070	\$14,015,473	\$14,716,247	\$15,452,060	\$16,224,663
Purchased Water	5,515,716	5,686,536	5,857,356	6,028,176	6,198,996
Trap Rock Operations	4,459,250	4,593,028	4,730,818	4,872,743	5,018,925
Other Operating	10,092,256	10,449,265	10,820,780	11,207,503	11,610,175
Total Operating	33,415,292	34,744,302	36,125,201	37,560,482	39,052,759
Existing Debt Service	9,018,615	9,022,118	9,059,193	9,058,430	9,067,326
Projected Debt Service ¹	-	-	2,026,022	3,030,260	3,030,260
Cash Funded Capital	26,097,571	39,083,850	21,770,910	22,297,050	19,093,800
Total Capital	35,116,186	48,105,968	32,856,125	34,385,740	31,191,386
Total Water Expenses	\$68,531,478	\$82,850,270	\$68,981,326	\$71,946,222	\$70,244,145

¹ Assumes interest only payments in first year of new issue

Table 2-14 Forecast of Annual Sewer Revenue Requirements

Expenditure Type	2019	2020	2021	2022	2023
Personnel	\$18,605,429	\$19,485,159	\$20,407,359	\$21,374,108	\$22,387,586
Broad Run WRF	5,053,212	5,255,341	5,465,554	5,684,177	5,911,544
Sewage Disposal	8,264,557	8,617,583	8,919,198	9,231,370	9,554,468
Other Operating	4,188,472	4,325,616	4,471,442	4,624,540	4,785,388
Total Operating	36,111,670	37,683,699	39,263,553	40,914,195	42,638,986
Existing Debt Service	12,918,428	12,916,599	13,016,550	13,006,113	13,027,279
Projected Debt Service ¹	-	-	700,178	1,047,235	1,047,236
Cash Funded Capital	47,229,930	24,276,150	40,236,840	47,467,800	15,745,400
Total Capital	60,148,358	37,192,749	53,953,568	61,521,148	29,819,915
Total Sewer Expenses	\$96,260,028	\$74,876,448	\$93,217,121	\$102,435,343	\$72,458,901

¹ Assumes interest only payments in first year new issue

As demonstrated in the tables above, there is a significant amount of fluctuation in the annual revenue requirements for the water and sewer systems over the projection period due primarily to the annual capital needs and how the specific capital projects are funded.

2.4.2 Revenue Projections at Current Rates and Cash Flow Projection

Based on the data and assumptions outlined above, a revenue forecast over the planning period was developed using the current rates, fees and charges. The revenue forecasts for the water and sewer system are presented in Tables 2-15 and 2-16, respectively.

Table 2-15 Projection Water Revenues at Current Rates, Fees and Charges

Revenue Type	2019	2020	2021	2022	2023
Water User Rates	\$41,443,722	\$42,510,059	\$43,560,715	\$44,549,973	\$45,501,846
Other Operating	2,666,550	2,711,821	2,757,998	2,805,098	2,853,140
Availability Charges	20,298,000	19,621,400	19,621,400	18,944,800	18,606,500
Investment Income	1,481,592	1,610,455	1,734,175	1,766,298	1,878,550
Total Water Revenues	\$65,889,864	\$66,453,735	\$67,674,288	\$68,066,169	\$68,840,036

Table 2-16 Projection Sewer Revenues at Current Rates, Fees and Charges

Revenue Type	2019	2020	2021	2022	2023
Sewer User Rates	\$48,816,211	\$50,077,478	\$51,320,031	\$52,489,771	\$53,615,123
Reclaimed Water Rates	700,000	700,000	700,000	700,000	700,000
Other Operating	3,272,584	3,328,145	3,384,816	3,442,621	3,501,581
Availability Charges	24,627,000	23,806,100	23,806,100	22,985,200	22,574,750
Investment Income	1,818,317	1,976,466	2,128,306	2,167,728	2,305,493
Total Sewer Revenues	\$79,234,112	\$79,888,189	\$81,339,253	\$81,785,320	\$82,696,947

A comparison of the projected total revenue requirements (Tables 2-13 and 2-14) and revenues at current rates within the water and sewer systems reveal that the current rates, fees and charges are not sufficient to meet the future annual revenue requirements. Tables 2-17 and 2-18 present a comparison of the annual revenue requirements for each system and the forecasted revenues at current rates.

Table 2-17 Projection of Water Revenue Requirements and Current Revenues

	2019	2020	2021	2022	2023
Water Expenses	\$68,531,478	\$82,850,270	\$68,981,326	\$71,946,222	\$70,244,145
Water Revenues	65,889,864	66,453,735	67,674,288	68,066,169	68,840,036
(Shortfall) / Surplus	(\$2,641,614)	(\$16,396,535)	(\$1,307,038)	(\$3,880,053)	(\$1,404,109)

Based on the forecast, the water system will experience a cumulative shortfall of approximately \$25 million over the five-year forecast period should the water revenues at current rates, fees and charges remain in place.

Table 2-18 Projection of Sewer Revenue Requirements and Current Revenues

	2019	2020	2021	2022	2023
Sewer Expenses	\$96,260,028	\$74,876,448	\$93,217,121	\$102,435,343	\$72,458,901
Sewer Revenues	79,234,112	79,888,189	81,339,253	81,785,320	82,696,947
(Shortfall) / Surplus	(\$17,025,916)	\$5,011,741	(\$11,877,868)	(\$20,650,023)	\$10,238,046

Based on the forecast, the sewer system will experience a cumulative shortfall of approximately \$30 million over the five-year forecast period based on sewer revenues at current rates, fees and charges. The annual shortfalls in the water and sewer system would not allow Loudoun Water to maintain its minimum unrestricted net asset balance target as shown in Table 2-19.

Table 2-19 Forecast of Year End Cash Balance

	2019	2020	2021	2022	2023
Beginning Balance	\$234,223,060	\$214,555,530	\$203,170,736	\$189,985,830	\$165,455,754
(Shortfall) / Surplus	(19,667,530)	(11,384,794)	(13,184,906)	(24,530,076)	8,833,937
Ending Balance	214,555,530	203,170,736	189,985,830	165,455,754	174,289,691
Target Minimum	\$175,450,172	\$184,552,935	\$193,344,794	\$199,579,425	\$206,050,185

The table demonstrates that by 2021, the cash balance would fall below the minimum target and continue the downward trend over the subsequent years.

2.4.3 Recommended Financial Plan

Based on the annual revenue requirements, the necessity to maintain the minimum unrestricted net asset balance and maintain the financial viability of the utility, a recommended plan of user rate increases was developed. The adjustments in user rates were developed in concert with the calculated availability charges and reclaimed water rates discussed later in this report and recognize the additional revenues that will be generated should Loudoun Water adjust these charges and rates. The recommended increases in water and sewer rates are proposed for 2019, 2020 and 2021. Based on our financial analysis we forecast that additional increases will be required in subsequent years. Table 2-20 presents the recommended rate adjustments and an estimate of future adjustments.

Table 2-20 Recommended Water and Sewer User Rate Adjustments

	2019	2020	2021	2022	2023
Water Rate Adjustment	3.5%	3.5%	3.5%	3.0%	3.0%
Sewer Rate Adjustment	3.5%	3.5%	3.5%	3.0%	3.0%

The recommended rate adjustments should be applied to all components of the water and sewer user rates and for both residential and commercial customers. The recommended water and sewer rates are presented in the following tables.

Table 2-21 Recommended Water Rates

	Current	Jan 1, 2019	Jan 1, 2020	Jan 1, 2021
Residential Rates				
Basic Charge	\$33.46	\$34.63	\$35.84	\$37.09
Tier 1: 0 - 25,000 Gallons	\$2.44	\$2.53	\$2.62	\$2.71
Tier 2: 25,001 - 50,000 Gallons	\$6.80	\$7.04	\$7.29	\$7.55
Tier 3: Over 50,000 Gallons	\$9.11	\$9.43	\$9.76	\$10.10
Commercial Rates				
Basic Charge				
5/8"	\$33.46	\$34.63	\$35.84	\$37.09
3/4"	\$47.12	\$48.77	\$50.48	\$52.24
1"	\$99.08	\$102.55	\$106.14	\$109.85
1 1/2"	\$156.51	\$161.99	\$167.66	\$173.53
2"	\$252.21	\$261.04	\$270.18	\$279.63
3"	\$416.27	\$430.84	\$445.92	\$461.53
4"	\$689.71	\$713.85	\$738.83	\$764.69
6"	\$1,373.30	\$1,421.37	\$1,471.12	\$1,522.60
Tier 1: Up to Purchased Capacity	\$3.21	\$3.32	\$3.44	\$3.56
Tier 2: Over Purchased Capacity	\$5.53	\$5.72	\$5.92	\$6.13
All Other Uses*	\$6.80	\$7.04	\$7.29	\$7.55

*Includes, but not limited to, fire hydrant special use, construction water and irrigation/submeters for which an availability charge has not been paid.

Table 2-22 Recommended Sewer Rates

	Current	Jan 1, 2019	Jan 1, 2020	Jan 1, 2021
Residential Rates				
Basic Charge	\$33.43	\$34.60	\$35.81	\$37.06
Usage Rate per 1,000 gallons*	\$4.80	\$4.97	\$5.14	\$5.32
Commercial Rates				
Basic Charge				
5/8"	\$33.43	\$34.60	\$35.81	\$37.06
3/4"	\$47.82	\$49.49	\$51.23	\$53.02
1"	\$102.61	\$106.20	\$109.92	\$113.77
1 1/2"	\$163.13	\$168.84	\$174.75	\$180.87
2"	\$264.02	\$273.26	\$282.82	\$292.72
3"	\$436.97	\$452.26	\$468.09	\$484.48
4"	\$725.21	\$750.59	\$776.86	\$804.05
6"	\$1,445.81	\$1,496.41	\$1,548.79	\$1,603.00
Usage Rate per 1,000 gallons	\$4.80	\$4.97	\$5.14	\$5.32

**Usage capped at winter quarter average consumption plus 3,000 gallons, residential only*

Sample customer bill impacts resulting from the recommended water and sewer rates are presented in Section 7 of the report.

The adjustments to water and sewer rates along with proposed adjustments to reclaimed water rates and availability charges (both discussed later in this report) will allow Loudoun Water to maintain an unrestricted net asset balance that remains above the minimum balance, meet debt service coverage requirements and fund the operations and maintenance of the water and sewer systems. The detailed pro-forma cash flow results with the recommended changes is presented in Section 6 of the report.

3. EVALUATION OF WATER AND SEWER USER RATES

This section of the report examines the pricing of water and sewer service within Loudoun Water's system. While our scope of work for the study does not include the development of alternative water and sewer user rate structures, we were tasked with evaluating how well the current rate structures comport with intended cost of service recovery for each component of the rate structure. The design and structure of the current rates are discussed below.

3.1 EVALUATION OF WATER AND SEWER USER RATE STRUCTURE

As demonstrated in the prior section of the report, Loudoun Water's current water and sewer rates include fixed basic charges and volumetric or commodity rates that are charged based on the metered water used each quarter. The basic charges for commercial customers are based on the size of the meter serving each connection account. Volumetric rates are differentiated by the customer class between residential and commercial customers. Loudoun Water maintains specific cost of service recovery objectives for each component of the water and sewer user rates.

3.1.1 Basic Charges

Basic charges represent the fixed charges billed to customers regardless of actual water use. Fixed basic charges are important because they provide a minimum amount of fixed revenue regardless of changes in customers' water usage patterns. There has been an overall trend within the utility industry to increase the amount of fixed revenue generated from user rates due to the ongoing declines in customer usage patterns.

The amount of revenue generated from the basic charge can be modified simply by increasing or decreasing the magnitude of the basic charge per account based on what percentage of revenues should be collected by the basic charge. Loudoun Water maintains a rate goal that the basic charge should recover between 25% and 30% of total rate revenues. To evaluate whether the current rate structure is meeting, and will continue to meet this revenue target, the current revenues and future revenues from the basic charge under the financial plan were estimated over the projection period. Table 3-1 shows the percentage of basic charge revenue that will be generated in 2019 through 2023 under the financial plan.

Table 3-1 Basic Charge Analysis

	2019	2020	2021	2022	2023
Basic Charge Revenue	\$28,907,513	\$30,901,366	\$33,005,288	\$35,009,241	\$37,085,079
Total Revenue	\$94,438,909	\$100,496,801	\$106,713,048	\$112,613,943	\$118,572,336
% of Total Revenue	30.6%	30.7%	30.9%	31.1%	31.3%

Table 3-1 demonstrates that under Loudoun Water’s current rate structure basic charges will generate at least 25% of revenues each year during the projection period, therefore meeting the revenue target.

3.1.2 Volumetric Charges

Variable charges represent the portion of the water and sewer bill that is based on metered water use. The key issues related to the variable charges are related to the intended cost of service recovery for each component of the structure. Loudoun Water currently charges residential and commercial customers different rates for different levels of metered water consumption. These structures are intended to recover the costs incurred by Loudoun Water at the varying levels of customer usage. The specific components of the revenue requirements recovered in the current water rate structure tiers include the following:

- Residential Tiers 1 and 2 combined with Commercial Tier 1 plus a portion of basic charges and a portion of other miscellaneous revenues should fund all operating and maintenance expenses and the annual debt service payments allocated to user rates.
- Residential Tier 3 and Commercial Tier 2 revenue, irrigation revenues, a portion of basic charges and a portion of miscellaneous revenues should fund a majority of the capital replacement reserve contribution.

The design of the water variable charges reinforces the idea that overuse of the system will result in higher replacement costs for the system as a whole and therefore the users who overuse the system will be paying for this increased replacement cost. Essentially these customers are “renting” additional capacity above and beyond the capacity that was reserved when availability charges were paid. Table 3-2 presents the results of the current variable rate structure performance under the proposed financial plan. It should be noted that the revenues from Residential Tiers 1 and 2 and Commercial Tier 1 include the 90-percent of the basic charge revenue. The Residential Tier 3 and Commercial Tier 2 revenues include the remaining 10-percent of the basic charge revenue.

Table 3-2 Water Tiered Rate Structure Analysis

	2019	2020	2021	2022	2023
Water O&M and Debt	\$36,982,980	\$38,453,826	\$40,051,042	\$41,646,640	\$43,307,508
Residential Tiers 1 & 2 and Commercial Tier 1	\$37,200,735	\$39,493,267	\$41,899,292	\$44,150,425	\$46,504,285
Target Met?	Yes	Yes	Yes	Yes	Yes
Annual R&R Reserve Contribution	\$12,076,593	\$12,800,368	\$13,570,546	\$14,194,778	\$14,813,116
Residential Tier 3 and Commercial Tier 2	\$9,856,192	\$10,431,601	\$11,070,707	\$11,667,290	\$12,408,423
% of Funding from Residential Tier 3 and Commercial Tier 2	82%	81%	82%	82%	84%

Table 3-2 demonstrates that the current Residential Tier 1 and 2 and Commercial Tier 1 rates will meet the desired cost recovery from these tiers during the five-year forecast period. Table 3-2 demonstrates that the revenues from Residential Tier 3 and Commercial Tier 2 will fund the majority of the contribution to the R&R account. It should be noted that in the past the level of revenue from Residential Tier 3 and Commercial Tier 2 has been able to fully fund the R&R reserve contributions. However as shown in Table 3-2, based on current usage patterns, these tiers are not anticipated to fully fund the contributions. This is primarily due to reductions in water sold at the highest tiers.

Over the last several years, Loudoun Water has seen a reduction in the amount of water sold at Residential Tier 3 and Commercial Tier 2 rates likely as a result of conservation, water fixture change outs and recent weather patterns. This result demonstrates that these customers are currently not “overusing” as much water as they have in the past. However it is important to note that the current usage patterns used in the study are from a period of time in which precipitation has been higher than recent history within the Loudoun Water service area. Table 3-3 shows the monthly rainfall amounts during the typical irrigation months over the past five years measured at the Dulles International Airport. The table demonstrates that 2017 and particularly 2018 have been unusually wet summers.

Table 3-3 Monthly Rainfall Amounts - Dulles International Airport

Inches of Rainfall ⁽¹⁾	2014	2015	2016	2017	2018
May	6.34	2.5	6.08	8.49	8.92
June	4.62	7.44	6.35	1.28	4.15
July	2.09	4.89	3.02	8.80	11.21
August	4.98	1.09	0.96	3.77	7.23
Total	18.03	15.92	16.41	22.34	31.51

⁽¹⁾ National Oceanic and Atmospheric Administration

We recommend that Loudoun Water continue to monitor customer usage patterns over the next three years to determine average demands in a year with normal precipitation levels. If precipitation patterns return to more recent historic levels but water sales at the higher tiers do not return to historic levels, the recent trends may represent a more fundamental shift in customer usage. If over the next few years, Loudoun Water learns that this is in fact the case, it would be worthwhile to investigate whether the current water tiers are set at the appropriate levels.

4. RECLAIMED WATER RATES

This section of the report outlines our evaluation of the current and projected cost of providing reclaimed water service within the Loudoun Water service area. The analysis includes an evaluation of whether adjustments to existing reclaimed water rates are warranted in light of the financial forecast and the anticipated demands for reclaimed water within the service area.

4.1 BACKGROUND

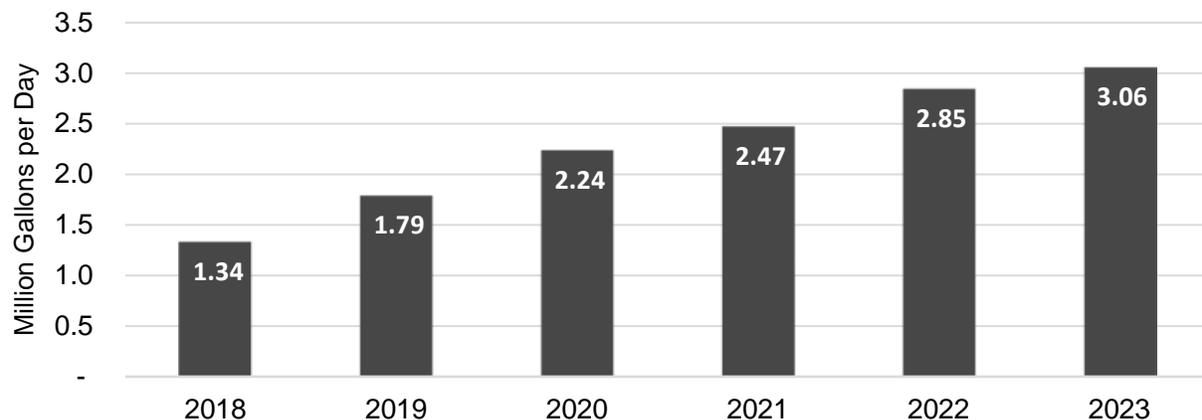
While the majority of the effluent from Loudoun Water's Broad Run Water Reclamation Facility (BRWRF) is discharged into Broad Run, a tributary of the Potomac River, a portion of effluent is delivered in the form of reclaimed water to commercial customers for various non-potable uses, such as irrigation and cooling water.

Loudoun Water has not increased reclaimed water rates since 2014. Since this time, the reclaimed water system has expanded in size, scope and the number of customers served by the system. The following sections of the report examine the growth in the system, the cost of providing service and specific recommendations for modifications to the existing reclaimed water rates.

4.2 RECLAIMED CUSTOMERS AND DEMAND FORECAST

Loudoun Water's reclaimed customer base includes 30 customers plus BRWRF onsite use, which is not billed. The customer base includes commercial customers that use reclaimed water for irrigation and as cooling water for data processing operations. In 2017, Loudoun Water supplied approximately 1.3 MGD of reclaimed water. Based on discussions with Loudoun Water staff, the reclaimed water demands are expected to grow substantially over the next five to ten years. The forecast of demand for the system is shown in Figure 4-1.

Figure 4-1 Reclaimed Water Demand Forecast



4.3 REVENUE REQUIREMENTS

The cost of providing reclaimed water is closely related to the operational costs of Loudoun Water's WRF, given that the reclaimed water is generated at this facility. While it is challenging to quantify all costs associated with producing reclaimed water, there are expenditures that can be identified as specifically related to providing the service. These costs include:

- Customer service staff assigned to the reclaimed water system
- Chemicals required to produce the reclaimed water
- Pumping power costs associated with producing reclaimed water
- Funding of the repair and replacement of the reclaimed water system

As part of the study, the cost of each of these individual expense line items were quantified for 2018 and forecasted over the projection period. To develop the forecast of reclaimed water revenue requirements based on these cost components several escalation factors were utilized. The factors are included in Table 4-1.

Table 4-1 O&M Cost Escalation Assumptions

Expenditure Type	Annual Inflation
Salaries and Wages	5.0%
Fringe Benefits	5.0%
Electric	7.0%
Chemicals	3.0%

The annual contribution to the repair and replacement of the reclaimed water system was set at 50% of the annual depreciation on the existing reclaimed water system assets. Table 4-2 presents the specific costs associated with the reclaimed water system. It is important to note that the annual expenditures for chemicals and electricity increase based on the cost escalation factor and the increase in demands on the reclaimed water system.

Table 4-2 Reclaimed Water Revenue Requirements and Projected Revenues

Expenditure Type	2019	2020	2021	2022	2023
Personnel	\$176,853	\$185,696	\$194,981	\$204,730	\$214,966
Chemicals	81,105	108,478	128,259	157,823	181,536
Electric	10,220	13,140	14,600	17,520	19,345
R&R Contribution	927,701	927,701	927,701	927,701	927,701
Total Expenditures	\$1,195,879	\$1,235,015	\$1,265,541	\$1,307,774	\$1,343,548
Revenues at Current Rates	\$980,653	\$1,225,816	\$1,354,526	\$1,557,705	\$1,674,533

Table 4-2 shows that the current reclaimed water rates will not cover the anticipated expenditures on the reclaimed water system until 2021. Additionally, this catch up in revenues is highly dependent on growth in customer demands. If the demands do not materialize, the revenues will remain below the annual revenue requirements. Finally, it is important to note that the costs shown in Table 4-2 represent only those costs that can easily be identified directly to reclaimed water service. There are additional costs that Loudoun Water incurs that are associated with the BRWRF that are difficult to extract and quantify but are required to provide reclaimed water service.

4.4 FINANCIAL PLAN

Based on our review of the reclaimed water system revenue requirements and anticipated revenues from existing reclaimed water rates, we recommend that Loudoun Water adjust reclaimed water rates at the same rate as the sewer user rates. This approach will allow reclaimed water revenue to keep pace with the cost identified in Table 4-2 as well as the increasing costs incurred at the BRWRF. The recommended adjustments and resulting reclaimed water rates are presented in Table 4-3.

Table 4-3 Recommended Reclaimed Water Rates

	Current	Jan 1, 2019	Jan 1, 2020	Jan 1, 2021
Reclaimed Water Rate Adjustment		3.5%	3.5%	3.5%
Reclaimed Water Rate Per 1,000 gallons	\$1.50	\$1.55	\$1.61	\$1.66

The average customer bill impact resulting from the adjustments to the reclaimed water rates are presented in Section 7 of the report.

5. AVAILABILITY CHARGES

Loudoun Water collects availability charges from new customers joining the water and/or sewer system to recover the cost of providing water and sewer system infrastructure. The charges are also assessed to existing customers requiring increased system capacity. The availability charges are used to fund expansion projects or retire annual debt service related to system expansion. The proper establishment of availability charges is necessary to ensure that costs required to meet growth in the customer base are funded by these customers so that “growth pays for growth.”

This section of the report outlines our evaluation of the current availability charges collected by Loudoun Water and our recommended modifications to the current charges.

5.1 CURRENT AND PROPOSED METHODOLOGY

There are a number of methods that are typically utilized to calculate water and sewer availability charges. The basic premise behind the determination of the charges is that they should represent the cost of providing water and sewer infrastructure and be applied based on the specific capacity required for each connection. The methodology used to calculate Loudoun Water’s current availability charges was established as part of a study completed by an engineering firm in the late 1980s. Based on this methodology, Loudoun Water has evaluated the availability charges on an annual basis, making adjustments to the charges as appropriate to ensure that they continue to reflect the cost of providing water and sewer system capacity. The current methodology includes the calculation of the unit cost of capacity for each of the major components of water and sewer infrastructure. The components include:

- Water Distribution
- Water Treatment/Transmission/Storage
- Other Water System Improvements
- Sewer Collection
- Sewer Treatment/Conveyance/Disposal
- Other Sewer System Improvements

Over the last several years, during the annual updates to the availability charges, Loudoun Water staff have identified a couple of areas within the current methodology that have resulted in variability within the calculation of the charges. The key areas and our proposed changes in methodology to address each is discussed below.

- Loudoun Water has historically utilized the Engineering News Record (ENR) Construction Cost index (CCI) for the City of Baltimore to scale the cost of infrastructure. The index for Baltimore has been used as it is the only local index provided by ENR. However, since this index is representative of only one location, there has historically been a significant amount of variation in this index year over year. To address this issue, we recommend that Loudoun Water use the National CCI to scale the cost of infrastructure within the availability charge calculation. This approach will provide significantly less variability year over year in the charge calculations.

- The current methodology for the determination of the unit cost of water system distribution is based on the cost of the distribution system in a typical development plus backbone distribution system assets. To determine the unit cost of capacity, the cost of the distribution system for the development portion is divided by the typical number of ERCs within a development, and the backbone distribution system is divided by the estimated number of new connections over the next 10 years. The methodology used for this second component (the backbone distribution piping) results in a unit cost that increases as growth slows down within the service area. This result is not necessarily an accurate representation of the cost of providing the infrastructure as it's an artifact of slowing growth rather than the cost of providing backbone distribution piping. To address this issue, we recommend that Loudoun Water change the methodology for this component of the charge to include the entire existing distribution system backbone costs plus those assets included in the Loudoun Water Master Plan and divide by the total estimated number of ERCs at system buildout. This approach will result in an average cost of backbone distribution system per ERC, and reduce the variability associated with the gradual reduction of growth within the Loudoun Water service area.
- Loudoun Water has historically calculated availability charges on an annual basis and adopted new availability charges annually, if deemed necessary. This approach does not provide clarity in regard to where the charges may be set from one year to another. To address this issue, we recommend that Loudoun Water adopt availability charges over a three-year period. For purposes of developing multiple years of availability charges, we recommend that the availability charges be escalated based on the historical ENR construction cost index. On a periodic basis (every three to five years) Loudoun Water should perform a full detailed analysis to ensure that the charges reflect the true cost of providing water and sewer system capacity.

5.2 RECOMMENDED AVAILABILTY CHARGES

Based on the methodology changes outlined above, the availability charges were calculated for each of the next three years. The recommended availability charges are presented in Table 5-1.

Table 5-1 Recommended Availability Charges

	Current	Jan 1, 2019	Jan 1, 2020	Jan 1, 2021
Water Availability Charge per ERC	\$6,766	\$6,901	\$7,039	\$7,180
Sewer Availability Charge per ERC	\$8,209	\$8,373	\$8,540	\$8,711

6. CASH FLOW PROJECTIONS AND DEBT SERVICE COVERAGE

This section of the report presents the results of operation of the water and sewer systems under the recommended financial plan including the appropriate maintenance of cash balances and debt service coverage compliance.

6.1 FIVE YEAR PRO-FORMA CASH FLOW FORECAST

Based on the recommended financial plan including adjustments to water and sewer user rates, reclaimed water rates and availability charges, a five-year pro-forma cash flow forecast demonstrating the financial performance of the combined utility was developed and is presented in Table 6-1.

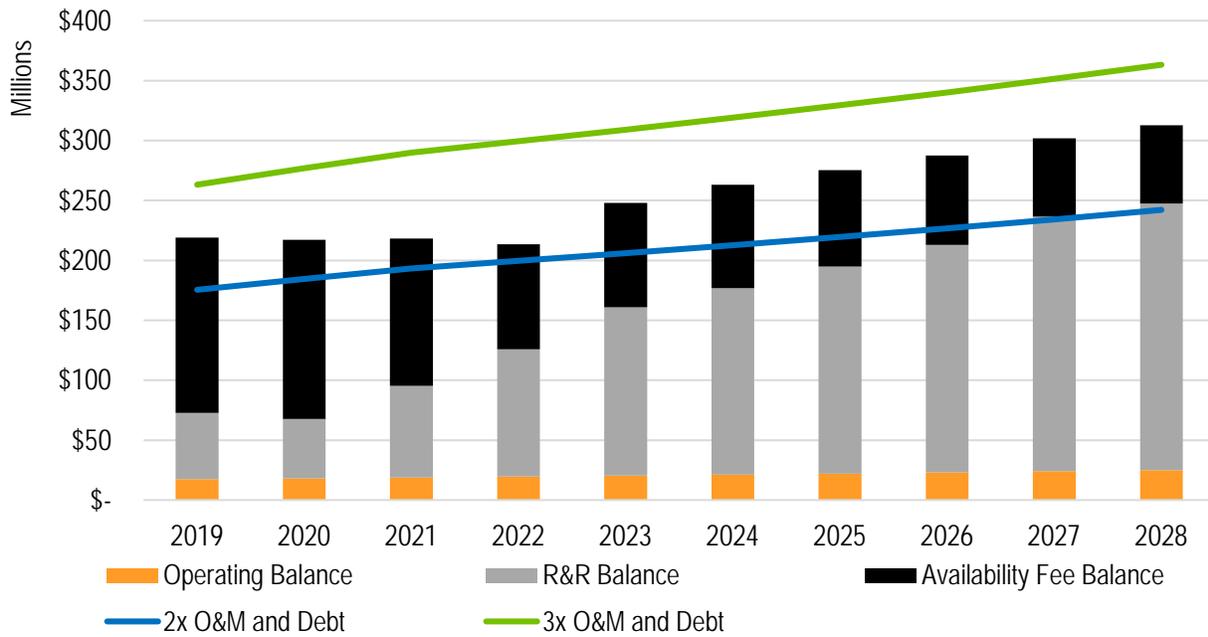
Table 6-1 Five-Year Pro-forma Cash Flow Forecast

	2019	2020	2021	2022	2023
Operating Revenues	\$100,492,713	\$106,643,688	\$112,963,164	\$118,968,396	\$125,034,419
Operating Expenses	(69,526,963)	(72,428,001)	(75,388,754)	(78,474,676)	(81,691,745)
Net Operating Revenues	30,965,750	34,215,687	37,574,410	40,493,720	43,342,674
Non-Operating Revenues	49,223,783	48,998,825	50,438,924	50,689,219	52,132,705
Net Revenue	80,189,533	83,214,512	88,013,334	91,182,939	95,475,379
Total Debt Service	(21,937,043)	(21,938,717)	(24,801,943)	(26,142,038)	(26,172,101)
Amount Available for Capital Projects	58,252,490	61,275,795	63,211,391	65,040,901	69,303,278
Beginning Cash Balance	234,223,060	219,148,050	217,063,845	218,267,486	213,543,537
Surplus Available for Capital Projects	58,252,490	61,275,795	63,211,391	65,040,901	69,303,278
Bond Proceeds	-	-	25,913,250	17,206,650	28,124,800
Capital Expenditures	(73,327,500)	(63,360,000)	(87,921,000)	(86,971,500)	(62,964,000)
Ending Cash Balance	\$219,148,050	\$217,063,845	\$218,267,486	\$213,543,537	\$248,007,615
Minimum Cash Balance	\$175,450,172	\$184,552,935	\$193,344,794	\$199,579,425	\$206,050,185

Table 6-1 demonstrates that under the proposed financial plan, Loudoun Water will maintain a cash balance (unrestricted net asset balance) that is above the minimum target in each year of the projection

period. It should be noted that the forecast presented in Table 6-1 assumes 3% adjustments to water, sewer and reclaimed water rates in 2022 and 2023. The unrestricted net asset balance is made up of cash that has been designated for specific purposes into individual accounts including the operating reserve account, repair and replacement reserve account and the availability charge account. Figure 6-1 presents the forecast of cash balances within each account over the long-term projection period and demonstrates that the cash balance will remain within the target range over the entire projection period. It should be noted that the long-term forecast assumes annual 3% increase in water and sewer rates.

Figure 6-1 Ten-Year Forecast of Cash Balance by Account



6.2 DEBT SERVICE COVERAGE

Another measure of the financial health of Loudoun Water is the system’s debt coverage. The main test of Loudoun Water’s debt coverage is the level of revenues less operating expenses compared to the annual debt service of the system. In order to maintain a favorable financial position, Loudoun Water’s debt covenants require the ratio of these totals to be 1.50. That is, net revenues less operating expenses should be at least 150% of annual debt service. Additional coverage tests are also included to demonstrate the impacts of not including a portion of availability charges and the inclusion of a portion of reserves, referred to as Test 2A and 2B respectively within Loudoun Water’s bond covenants. Table 6-2 shows the results of the financial plan on Loudoun Water’s debt coverage for each of the coverage tests.

Table 6-2 Debt Service Coverage Tests

	2019	2020	2021	2022	2023
Debt Coverage					
Net Revenues Available for Debt Service	\$76,789,250	\$79,397,658	\$83,660,021	\$86,325,065	\$89,705,990
Annual Debt Service	\$21,937,043	\$21,938,717	\$24,801,943	\$26,142,038	\$26,172,101
Coverage (Min 1.5)	3.50	3.62	3.37	3.30	3.43
Test 2A					
Net Revenues Available for Debt Service*	\$53,877,500	\$56,806,672	\$60,617,216	\$63,409,393	\$66,524,332
Senior Lien Annual Debt Service	\$21,409,988	\$21,411,662	\$24,274,889	\$25,614,984	\$25,645,047
Pass / Fail	Pass	Pass	Pass	Pass	Pass
Test 2B					
Net Revenues Available for Debt Service **	\$163,451,525	\$165,338,595	\$169,750,959	\$170,181,161	\$190,528,140
Senior Lien Annual Debt Service	\$21,409,988	\$21,411,662	\$24,274,889	\$25,614,984	\$25,645,047
Coverage (Min 1.0)	7.63	7.72	6.99	6.64	7.43

*Net revenues available for debt service less 50% of availability charge revenues

**Net revenues available for debt service less 50% of availability charge revenues plus 50% of cash balance

Table 6-2 demonstrates that the financial plan will allow Loudoun Water to meet all of the debt service coverage test requirements during each year of the projection period.

7. CUSTOMER IMPACTS AND UTILITY COMPARISONS

The recommended changes to the water, sewer and reclaimed water rates will have an impact on customers of the Loudoun Water systems. This section of the report provides a summary of the impacts in the form of sample bills. This section also provides comparisons of the water and sewer bills for customers served by comparable and/or local utilities within the region along with a comparison of availability charges for new customers joining the water and sewer system.

7.1 WATER AND SEWER USER RATE BILL IMPACTS

The recommended increases in water and sewer user rates will result in modest increases in Loudoun Water customer bills over the planning period. To demonstrate the impacts of the changes, sample bills are provided for a cross section of customers in Tables 7-1, 7-2 and 7-3.

Table 7-1 Quarterly Residential Bill (21,000 gallons)

	Current	2019	2020	2021
Water Bill	\$84.70	\$87.76	\$90.86	\$94.00
Sewer Bill*	\$115.03	\$119.09	\$123.19	\$127.50
Total Bill	\$199.73	\$206.85	\$214.05	\$221.50
Quarterly \$ Change		\$7.12	\$7.20	\$7.45
Quarterly % Change		3.5%	3.5%	3.5%

*Sewer bill based on 14,000 gallons of average winter quarter consumption (capped at 17,000 gallons)

Table 7-2 Monthly Commercial Bill (30,000 gallons - 1" Meter)

	Current	2019	2020	2021
Water Bill	\$129.33	\$133.78	\$138.58	\$143.42
Sewer Bill	\$178.20	\$184.50	\$190.84	\$197.52
Total Bill	\$307.53	\$318.28	\$329.42	\$340.94
Monthly \$ Change		\$10.75	\$11.14	\$11.52
Monthly % Change		3.5%	3.5%	3.5%

Table 7-3 Monthly Commercial Customer (150,000 gallons - 3" Meter)

	Current	2019	2020	2021
Water Bill	\$620.26	\$641.61	\$664.64	\$687.84
Sewer Bill	\$865.66	\$896.25	\$927.03	\$959.49
Total Bill	\$1,485.91	\$1,537.87	\$1,591.67	\$1,647.33
Monthly \$ Change		\$51.95	\$53.80	\$55.66
Monthly % Change		3.5%	3.5%	3.5%

7.2 RECLAIMED WATER BILL IMPACTS

The recommended increases in the reclaimed water rates will result in modest increases in Loudoun Water reclaimed customer bills over the planning period. Table 7-4 presents the bill impacts for the average reclaimed water customer. It should be noted that there is significant variation in the reclaimed water use by Loudoun Water's current reclaimed customers and that the average customer shown in the table represents the average use across the current 30 reclaimed customers.

Table 7-4 Monthly Reclaimed Water Customer (2,000,000 gallons)

	Current	2019	2020	2021
Reclaimed Water Bill	\$3,000.00	\$3,105.00	\$3,213.68	\$3,326.15
Monthly \$ Change		\$105.00	\$108.68	\$112.48
Monthly % Change		3.5%	3.5%	3.5%

7.3 WATER AND SEWER BILL COMPARISON SURVEY

To provide perspective on how the calculated water and sewer bills for Loudoun Water compare with neighboring communities, a bill comparison survey was developed of peer utilities. The figures below show a comparison of Loudoun Water's water, sewer and total residential monthly bill with those of neighboring utilities. The figures show the current water, sewer and combined bills for Loudoun Water and the bills under the recommended rate adjustments for 2019. As can be seen in the figures, the Loudoun Water bills are in the bottom range of benchmarked utilities. It should be noted that the bills for most of the comparison utilities represent current bills, and do not include likely future annual increases which are not yet publicly available.

Figure 7-1 Water Bill Comparison

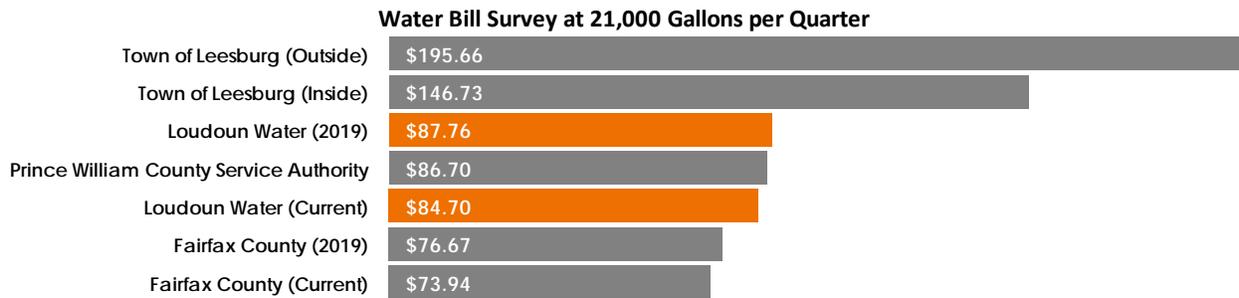


Figure 7-2 Sewer Bill Comparison

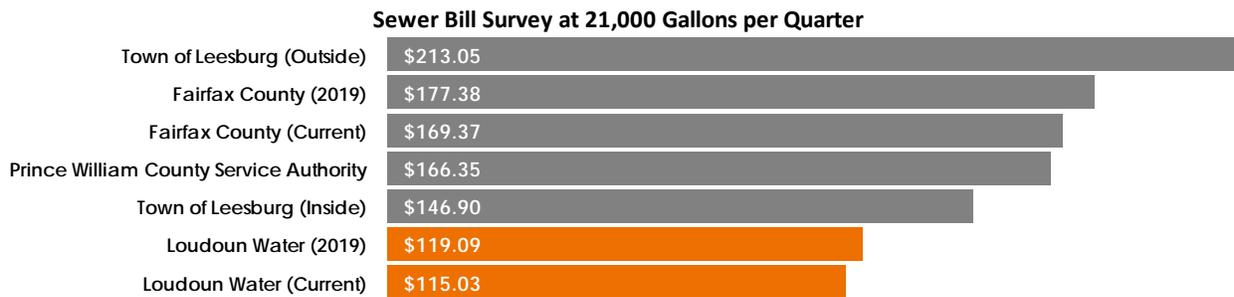
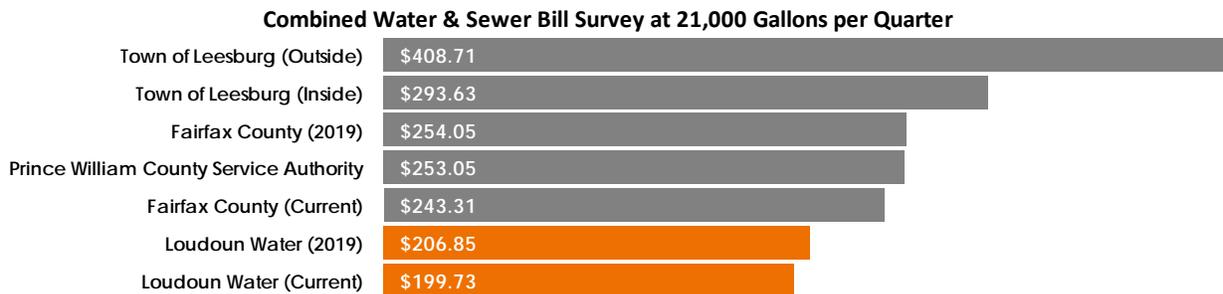


Figure 7-3 Combined Bill Comparison

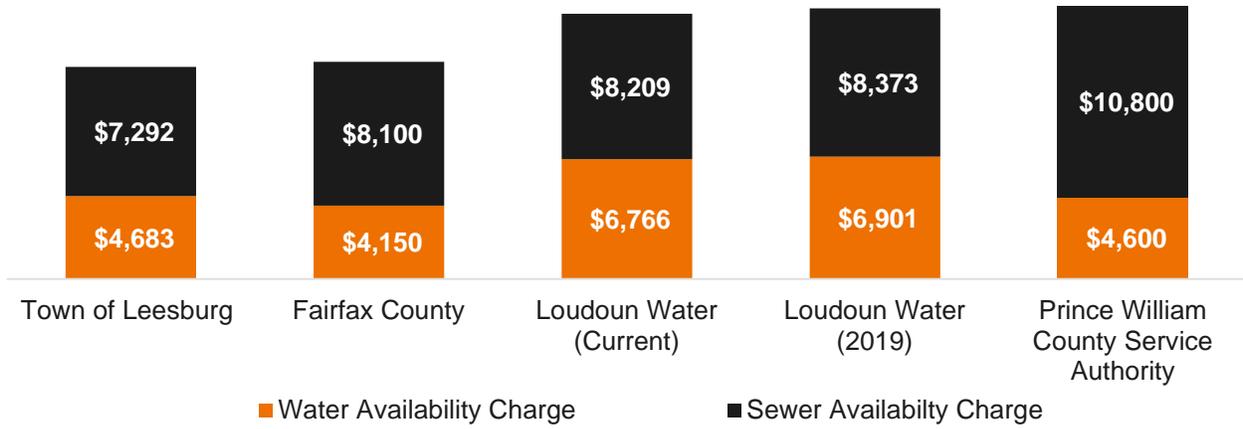


It is important to note that while bill comparisons can be informative, there are a number of factors that determine water and sewer rates within a community at a given time. Factors such as level of system reinvestment, support from the general fund or other sources and rate structure will all have a significant influence on the bills and must be taken into account. Therefore, bill comparisons should be taken as one data point for consideration, but the needs of each community are unique and the rates may be based on different variables.

7.4 AVAILABILITY CHARGE COMPARISONS

All of the utilities included in the bill survey also collect availability charges from new customers joining their respective utility. A comparison of the availability charge for each community is presented in Figure 7-4.

Figure 7-4 Availability Charge Comparisons



The comparison of availability charges demonstrates that Loudoun Water’s charges are at the higher end of the range, but in line with comparable utilities such as the Prince William County Service Authority.

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