

Final Report

COMPREHENSIVE WATER AND WASTEWATER COST OF SERVICE AND RATE STUDY

Phase 2 – Cost of Service and Rate
Design

BLACK & VEATCH PROJECT NO. 192366

PREPARED FOR

Washington Suburban Sanitary Commission

5 MAY 2017



5 May 2017

Mr. Joe Beach
Chief Financial Officer
Washington Suburban Sanitary Commission
14501 Sweitzer Lane
Laurel, MD 20707-5902

Subject: Comprehensive Cost of Service Analysis and Rate Study - Phase II Final Report

Dear Mr. Beach:

We are pleased to present herewith our *Comprehensive Water and Wastewater Cost of Service and Rate Study – Phase II Report* for the Washington Suburban Sanitary Commission.

We wish to acknowledge the cooperation and assistance of WSSC staff in providing guidance and information for the study.

We appreciate the opportunity to continue to be of service to the Commission in this very important matter. If you have any questions, please do not hesitate to contact us.

Very truly yours,
BLACK & VEATCH MANAGEMENT CONSULTING LLC

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Table of Contents

1	Introduction	1
	Study Drivers.....	2
	Study Methodology	2
	Scope of Work	4
2	Rate Structure Overview	7
	Fixed Charges	7
	WSSC’s Current Fixed Charge Structure.....	7
	Volumetric (Usage) Charge.....	8
	WSSC’s Current Volumetric Rate Structure	9
	Alternative Rate Structures	10
3	Water and Sewer Financial Plans	11
	Water System Financial Plan	11
	Water System Revenue.....	11
	Water System Revenue Requirements	13
	Summary of Water System Revenue and Revenue Requirements.....	15
	Sewer System Financial Plan	17
	Sewer System Revenue	17
	Sewer System Revenue Requirements	18
	Summary of Sewer System Revenue and Revenue Requirements.....	20
4	Cost of Service Allocations.....	23
	Water System Cost of Service	23
	Cost of Service to be Allocated	23
	Functional Cost Components	24
	Allocation to Cost Components.....	24
	Distribution of Costs to Customer Classes.....	26
	Sewer System Cost of Service	29
	Cost of Service to be Allocated	30
	Functional Cost Components	30
	Allocation to Cost Components.....	31
	Distribution of Costs to Customer Classes.....	32
5	Rate Design	37
	Uniform Volumetric Charge.....	37
	4 Tier Volumetric Charge Structure (Option 1)	38
	4 Tier Volumetric Charge Structure (Option 2)	39

Considerations for Development of A Recommended FY2019 Rate
Structure..... 40
 Key Rate Design Principles 41
 Prioritized Rate Structure Objectives..... 41
 Recommended FY 2019 Rate Structure 42

LIST OF TABLES

Table 1 Current Ready-to-Serve Charges (FY 2017)	8
Table 2 Current Volumetric Charge Rate Structure (FY 2017)	9
Table 3 Projected Number of Customer Accounts.....	12
Table 4 Projected Billed Water Volume by Customer Class	12
Table 5 Projected Water Revenue Under Existing Rates	13
Table 6 Projected Other Revenue (Water System).....	13
Table 7 Projected Operation & Maintenance Expenses (Water System)	14
Table 8 Projected Major Capital Improvement Program (Water System)	14
Table 9 Projected Capital Financing Plans (Water System)	15
Table 10 Existing and Projected New Long-Term Debt Service (Water System).....	15
Table 11 Comparison of Projected Revenue under Existing Rates with Projected Revenue Requirements (Water System)	16
Table 12 Projected Billed Sewer Volume	17
Table 13 Projected Sewer Revenue Under Existing Rates	18
Table 14 Projected Other Revenue (Sewer System).....	18
Table 15 Projected Operation & Maintenance Expenses (Sewer System)	19
Table 16 Projected Major Capital Improvement Program (Sewer System).....	19
Table 17 Projected Capital Financing Plans (Sewer System).....	20
Table 18 Existing and Projected New Long-Term Debt Service (Sewer System).....	20
Table 19 Comparison of Projected Revenue under Existing Rates with Projected Revenue Requirements (Sewer System)	21
Table 20 Total Cost of Service to be Recovered from Water Rates	24
Table 21 Allocation of Net Plant Investment to Functional Cost Components (Water System).....	26
Table 22 Allocation of Operation & Maintenance Expenses to Functional Cost Components (Water System).....	26
Table 23 Estimated Units of Service (Water System).....	27
Table 24 Unit Cost of Service (Water System)	28
Table 25 Allocation of Cost of Service to Customer Classes (Water System).....	29
Table 26 Comparison of Adjusted Cost of Service with Revenue under Existing Rates (Water System).....	29
Table 27 Total Cost of Service to be Recovered from Sewer Rates	30
Table 28 Allocation of Net Plant Investment to Functional Cost Components (Sewer System).....	31
Table 29 Allocation of Operation & Maintenance Expenses to Functional Cost Components (Sewer System).....	32

Table 30 Estimated Units of Service (Sewer System) 34

Table 31 Unit Cost of Service (Sewer System) 34

Table 32 Allocation of Cost of Service to Customer Classes (Sewer System)..... 35

Table 33 Comparison of Adjusted Cost of Service with Revenue under Existing Rates (Sewer System)..... 35

Table 34 Comparison of Calculated Revenue under Uniform Volume Charge with Revenue Under Existing Rates..... 37

Table 35 Comparison of Calculated Typical Bills with Bills under Current Rates (Uniform Rates) 38

Table 36 Summary of Billed Volume under Option 1..... 38

Table 37 Summary of 4 Tier Volumetric Charge Structure (Option 1) 38

Table 38 Comparison of Calculated Revenue under 4 Tier Volume Charge with Revenue Under Existing Rates (Option 1) 39

Table 39 Comparison of Calculated Typical Bills with Bills under Current Rates (4 Tier Option 1)..... 39

Table 40 Summary of Billed Volume under Option 2..... 39

Table 41 Summary of 4 Tier Volumetric Charge Structure (Option 2) 40

Table 42 Comparison of Calculated Revenue under 4 Tier Volume Charge with Revenue Under Existing Rates (Option 2) 40

Table 43 Comparison of Calculated Typical Bills with Bills under Current Rates (4 Tier Option 2)..... 40

LIST OF FIGURES

Figure 1 Rate Study Methodology..... 3

Figure 2 Bi-County Working Group’s Rate Setting Priorities..... 42

1 Introduction

The Washington Suburban Sanitary Commission (WSSC) is a bi-county agency of the State of Maryland that provides water and wastewater utility services in Montgomery and Prince George's Counties. WSSC operates under a water/sewer enterprise fund, funded primarily by user rates and charges.

WSSC, which is one of the largest water and wastewater utilities in the nation, was created by the Maryland legislature in 1918. The statutes which govern WSSC are codified in Division II of the Public Utilities Article of the Annotated Code of Maryland. WSSC serves nearly 1.8 million residents in a service area of nearly 1,000 square miles, and manages a network of over 5,600 miles of fresh water pipeline and over 5,600 miles of sewer pipeline, along with three water reservoirs, two water filtration plants, and six wastewater treatment plants.

Over the last several years, WSSC has been examining its financial and rate recovery structures with an eye towards building financial resiliency to meet its current and future financial needs while balancing revenue stability, equity of cost recovery, and customer affordability. As part of these continuing efforts, in 2016, WSSC initiated a two-phased comprehensive water and sewer rate study (Study).

The primary purpose of the two-phased Study is to evaluate the existing volumetric charge rate structure and recommend alternative rate structures that better meet WSSC's goals and objectives. The two phases defined for the Study are:

Phase 1: Phase 1 of the Study includes a definition of the study objectives, an evaluation of the current volumetric rate structures and WSSC policies, and an identification of feasible rate structure alternatives. This phase of the work included significant input from stakeholders through the creation of a Bi-County Rate Structure Working Group and a Stakeholder Representatives Group.

Phase 2: Phase 2 of the Study involves a comprehensive cost of service analysis and a detailed evaluation of up to three volumetric rate structures based on the Phase 1 evaluation, and the development of rate schedules based on the recommended "best-fit" rate structure.

This Phase 2 report provides a comprehensive discussion of the results of a cost of service analysis for both the water and sewer systems, development of alternative volumetric rate designs for Fiscal Year (FY) 2018. The results of Phase 1 were summarized separately in a Phase 1 report dated March 31, 2017.

Phase 1

- Review current rate structure
- Evaluate alternative rate structures
- Select three viable alternative rate structures
- Deliver a Phase -1 Rate Structure Options Report

Phase 2

- Develop a multi-year financial plan
- Perform cost of service analysis for three viable options
- Develop draft rate schedules
- Perform bill impact comparison
- Develop a Phase 2 Rate Analysis Report
- Select the "best-fit" rate structure
- Finalize rate schedules for the recommended rate structure

STUDY DRIVERS

Over the last several years, WSSC has been examining its financial structure and its rate structure to build financial resiliency to meet its current and future financial needs while balancing revenue stability, equity of cost recovery, and customer affordability.

The key initiatives that WSSC has undertaken in the past include the following:

- In 2010, WSSC established the Bi-County Infrastructure Funding Working Group to identify effective alternative options for funding operations and the capital program.
- In 2012, based on the recommendations of the Working Group, WSSC commissioned a rate study that was completed in January 2014 and resulted in rate structure recommendations, which focused particularly on providing revenue predictability and dedicated funding for water and sewer infrastructure improvements. Based on this study, WSSC implemented a two-part Ready-to-Serve Charge, comprised of a recalibrated Account Maintenance Fee (AMF) and a new Infrastructure Investment Fee (IIF). The AMF is a fixed fee that recovers the direct and indirect costs associated with maintaining and servicing each customer account. The IIF is a fixed fee that recovers a portion of the debt service associated with WSSC's water and sewer pipe reconstruction programs from the approved Capital Improvements Program (CIP).
- While the previous rate study initiatives provided priorities for fiscal policies and rate design, and enhanced WSSC's revenue stability through the implementation of the Ready-to-Serve Charges, the existing volumetric charge rate structure has remained largely unchanged (other than overall increases in rates) since it was implemented in the 1970s. The only major change was the reduction in the number of tiers from 100 to 16 in 1993. The Working Group also recommended a comprehensive review of the basic rate structure.
- Hence, as part of a comprehensive water and sewer cost of service study, WSSC desired a review of alternative rate structures that could further enhance equity of cost recovery while helping sustain revenue stability.

STUDY METHODOLOGY

The development of user rates and charges requires the integration of three critical components: (i) financial plan; (ii) cost of service allocations; and (iii) rate design. Figure 1 illustrates the three components and the key tasks within each component.

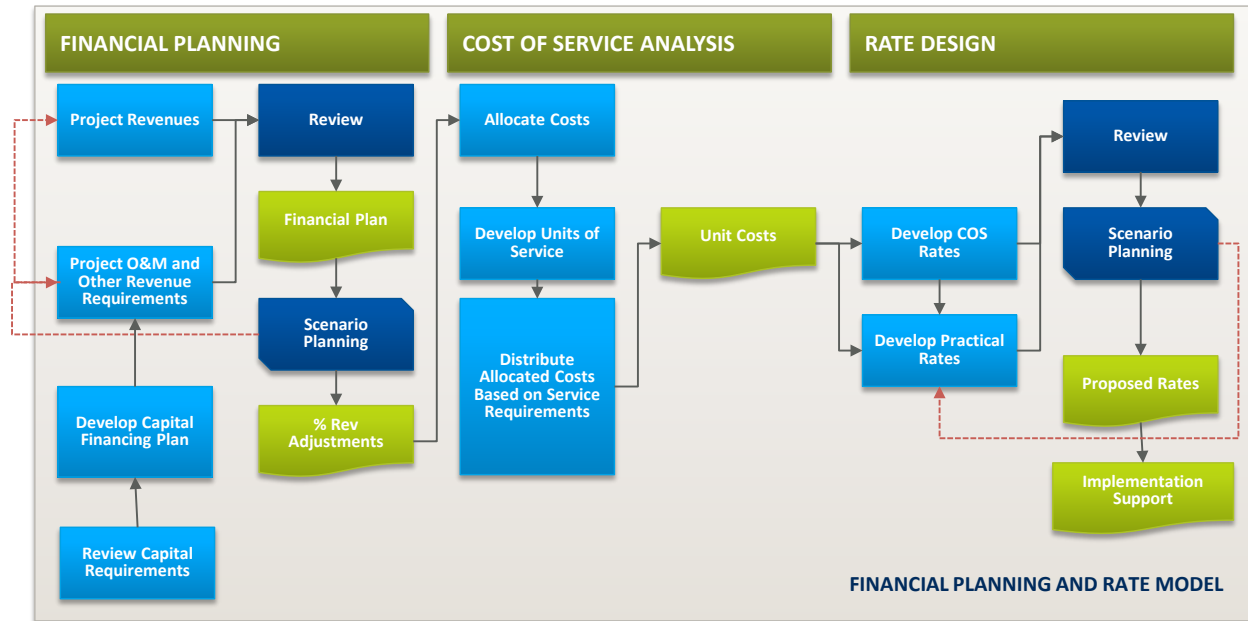


Figure 1 Rate Study Methodology

Financial Planning: The first building block in determining user rates and charges is the development of distinct water and sewer financial plans. The financial planning process helps to establish the annual revenue requirements that are necessary to meet all of the water and sewer systems' operating fund obligations.

As illustrated in Figure 1, the key components of a financial plan are: (i) projection of revenues from user rates and other sources; (ii) development of a capital financing plan to decide the mix of debt and cash funding of capital program; (iii) projection of revenue requirements (O&M and capital costs, and target reserves); and determination of the level and timing of revenue adjustments needed to maintain financial viability.

The Operating Fund annual revenue requirements are typically developed on a *cash basis* for public utility rate setting. The revenue requirements, under the cash basis approach, include the following:

- Operations & Maintenance expenditures;
- Debt service expenses;
- Cash financing of capital program (Paygo);
- Contributions to operating reserves; and
- Other obligations such as payments and transfers for specific purposes

To establish financial stability, a financial plan is typically prepared for a multi-year period. A six-year financial plan was developed for the water and sewer systems' Operating Fund to achieve the financial objectives and target metrics defined to build and sustain financial integrity. The FY 2018 proposed budget is the baseline year for the study period. The financial plans for both the water and sewer systems reflect the FY 2018 Spending Affordability Guideline (SAG) resolutions that provided direction for the development of the FY 2018 budget. While it is anticipated that future SAG model projections may result in different recommendations for projected revenue increases,

the revenue increases incorporated in the FY2018 SAG model were used for the purpose of calculating future revenue needs.

Cost of Service: The second critical component in rate setting is the cost of service analysis. Simply put, cost of service is the amount of money that the Operating Fund needs to generate, *net of funding from other miscellaneous sources of revenues* (the “net revenue requirement”), through user rates and charges. The principle behind the COS analysis is to match the costs of providing service to the customer class that is generating the demand.

Because WSSC is a government agency *that cannot make a profit*, the equitable allocation of costs is a critical step that is necessary to establish a *reasonable nexus* between costs incurred in providing service and the fees charged from customers, and to establish defensible user rates and charges.

Rate Design: The third and final step is an evaluation of the existing rate structure elements and the development of proposed user rates. The user rates schedules typically include both fixed and volumetric components. Designed rates should recover the annual cost of service allocated to these different rate components, and incorporate on local policy and practical considerations. Although WSSC is required by statute to charge a uniform rate to all customers (and therefore cannot charge different rates to different customer classes), a cost of service analysis is a useful tool for evaluating the recovery of costs by customer class.

WSSC currently has in place both fixed charges, in the form of a two-part Ready-to-Serve Charge (Account Maintenance Fee and Infrastructure Investment Fee) and a 16 tier volumetric rate schedule. For this Study, the Ready-to-Serve charges remain at FY2017 levels throughout the study period. This Study evaluated alternative volumetric rate structures to replace the existing 16 tier rate structure.

The study methodology described above reflects the application of water and wastewater industry accepted rate setting approaches that are provided in the following two guidance manuals:

- American Water Works Association (AWWA) *Manual M-1: Principles of Water Rates, Fees, and Charges* for water rate setting; and
- Water Environment Foundation (WEF) *Financing and Charges for Wastewater Systems* for wastewater.

SCOPE OF WORK

This report presents the results of a comprehensive study of projected revenue requirements, costs of service, and proposed rates for water and sewer service. Revenues and revenue requirements are projected for the six fiscal years 2018 through 2023, recognizing the assumptions and analysis undertaken for the FY 2018 SAG process, including customer growth, changes in total billed volume, projected operation and maintenance expenses, capital improvement and debt service associated with capital improvements.

Allocated costs of service were developed for each class of customer and type of service based on considerations of utility revenue needs and projected customer service requirements. Rate adjustments are designed for customers in accordance with allocated costs of service and local policy and practical considerations.

There are two manuals that provide water and wastewater industry best practices for developing cost allocations that provide the basis for fair and equitable utility rates. For the water industry, the manual is the American Water Works Association (AWWA) *'Manual M-1: Principles of Water Rates, Fees, and Charges'* and for the wastewater industry it is the Water Environment Federation (WEF) *'Financing and Charges for Wastewater Systems'*. The analyses summarized in this report reflect Black & Veatch's application of these principles.

In conducting our analysis, Black & Veatch utilized the results of the SAG process utilized in the development of the FY 2018 budget. The SAG process includes various assumptions regarding future customers/volume, escalation of costs, and financing of projected capital improvement projects. Because the SAG process has not yet been conducted for FY 2019 budget development, the revenue required to be met by volumetric charges in FY 2019 is not yet known. Consequently, for this analysis, FY 2018 is used as the "Test Year" to develop alternative rate schedules, and compared to FY 2018 rates that will be in effect using the current rate structure. Actual rates under the rate structure and potential phase-in plan ultimately recommended by WSSC should take into consideration future revenue needs, and therefore, will differ from those rates presented herein.

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2 Rate Structure Overview

The primary purpose of this study is to evaluate WSSC's current volumetric charge structure and recommend potential changes to the volumetric charge structure that could better support WSSC's goals and objectives.

Following is a summary of WSSC's current charges for services. WSSC currently recovers necessary revenues for water and sewer system operations through both fixed charge and volumetric charge components.

FIXED CHARGES

In the utility industry, fixed charges are designed to recover one or more of the following types of costs, namely, (i) metering; (ii) billing; (iii) ready-to-serve cost; (iv) specific capital investment; and/or (v) other specific costs. The costs of providing these functions vary among types of customers and/or by factors such as size and capacity of the meters. Therefore, to provide for equitable cost recovery, water and sewer fixed charges are usually assessed based on meter size.

A utility's annual revenue requirements are comprised mostly of fixed costs such as debt service, cash financing for infrastructure renewal, salaries and benefits, pension obligations, and costs related to the provision of adequate capacity for service. These types of fixed costs occur on a recurring basis regardless of the amount of water used by the customer. Therefore, rate structures need to provide the ability to recover at least some of these fixed costs based on a billing parameter that is not related to water usage or wastewater flow. The fixed charges, which are assessed regardless of the volume of water used, provide a mechanism to reliably recover some of the fixed annual operating costs of the utility, and provide for some level of revenue stability.

WSSC's Current Fixed Charge Structure

WSSC's existing rate structure includes a two-part Ready-to-Serve Charge comprised of an Account Maintenance Fee (AMF) and an Infrastructure Investment Fee (IIF). The fees currently in place were developed in a 2014 study based on a detailed analysis of WSSC's goals and objectives related to fixed charges and costs to be recovered through such charges. The study resulted in the implementation of a revised AMF rate structure and a new IIF rate structure, both based on meter size. The IIF was phased-in over two fiscal years, becoming fully implemented as of July 1, 2016. When the new IIF was implemented, it was the intention of the Commission to hold the IIF at the FY2017 rate through FY2020. Table 1 summarizes current Ready-to-Serve charges.

Table 1 Current Ready-to-Serve Charges (FY 2017)

LINE NO.	METER SIZE	FY 2017 ACCOUNT MAINTENANCE FEE	FY 2017 INFRASTRUCTURE INVESTMENT FEE
Small Meters			
1	5/8"	\$16.00	\$11.00
2	3/4"	\$16.00	\$12.00
3	1"	\$16.00	\$14.00
Large Meters			
4	1-1/2"	\$16.00	\$90.00
5	2"	\$27.00	\$185.00
6	3"	\$66.00	\$585.00
7	4"	\$142.00	\$813.00
8	6"	\$154.00	\$1,265.00
9	8"	\$200.00	\$2,845.00
10	10"	\$246.00	\$4,425.00
Detector Check			
11	2"	\$33.00	NA
12	4"	\$177.00	NA
13	6"	\$255.00	NA
14	8"	\$461.00	NA
15	10"	\$633.00	NA
Fire Service Meter			
16	4"	\$182.00	\$499.00
17	6"	\$293.00	\$616.00
18	8"	\$452.00	\$2,524.00
19	10"	\$682.00	\$2,714.00
20	12"	\$989.00	\$5,214.00

This Study does not include any changes to the Ready-to-Serve charges shown in Table 1.

VOLUMETRIC (USAGE) CHARGE

In the utility industry, volumetric/usage charges are designed to recover all other costs (except those that are recovered through fixed charge) associated with the treatment and delivery of water service and the collection, treatment, and disposal of wastewater. In Phase 1 of the Study, WSSC sought significant stakeholder input regarding potential rate structures. The Bi-County Rate Structure Working Group selected three alternative rate structures for further study in Phase 2.

As usage patterns vary among customer classes and consequently different classes place different levels of service demands, different volumetric rates can be established for the various customer classes. However, WSSC is required by statute to charge a uniform rate to all customers. In designing the volumetric rate structure, practical considerations including conservation, equity, affordability, and ease of administration are addressed to result in a rate structure that provides the best balance of the utility's goals and objectives.

WSSC's Current Volumetric Rate Structure

In addition to the Ready-to-Serve Charges, WSSC's water and sewer customers pay a variable rate based on metered water usage and a 16-tier inclining rate structure. Under this structure, the rate charged for all water used is the rate at the highest tier reached during the billing cycle based on the customer's average daily consumption (ADC), calculated as total volume divided by the number of days in the billing cycle.

All customers, regardless of customer type, are billed based on the same rate structure. Table 2 summarizes the current volumetric rates.

Table 2 Current Volumetric Charge Rate Structure (FY 2017)

LINE NO.	TIER (GALLONS/DAY)	WATER RATES (\$/1,000 GAL)	SEWER RATES (\$/1,000 GAL)	COMBINED RATES (\$/1,000 GAL)
1	0 - 49	3.38	4.30	7.68
2	50 - 99	3.78	5.03	8.81
3	100 - 149	4.18	5.85	10.03
4	150 - 199	4.67	6.76	11.43
5	200 - 249	5.46	7.36	12.82
6	250 - 299	5.92	7.97	13.89
7	300 - 349	6.27	8.50	14.77
8	350 - 399	6.53	8.92	15.45
9	400 - 449	6.78	9.12	15.90
10	450 - 499	6.98	9.40	16.38
11	500 - 749	7.10	9.60	16.70
12	750 - 999	7.27	9.81	17.08
13	1,000 - 3,999	7.41	10.23	17.64
14	4,000 - 6,999	7.58	10.46	18.04
15	7,000 - 8,999	7.68	10.62	18.30
16	9,000 & Greater	7.81	10.90	18.71

WSSC's current rate structure is unique in the water and wastewater utility industry. This Study evaluates options for replacing the current volumetric rate structure with a more commonly used structure and one that would improve equity between customer classes.

Alternative Rate Structures

Based on input from the Stakeholder Representatives Group, the Bi-County Rate Structure Working Group selected the following volumetric charge structures for further evaluation:

- Uniform Volumetric Charge
- 4 Tier Structure with the following tier breaks (4 Tier Option 1):
 - 0-99 gpd
 - 100-240 gpd
 - 241-8,999 gpd
 - 9,000 gpd and over
- 4 Tier Structure with the following tier breaks (4 Tier Option 2):
 - 0-249 gpd
 - 250-600 gpd
 - 601-9,000 gpd
 - Over 9,000 gpd

This Study assumes that the same rate structure will be implemented for both the water and sewer. While the exact rates themselves will be determined based on each system's revenue requirements, the Bi-County Rate Structure Working Group determined that utilizing the same rate structure for both water and sewer rates will enhance customer understanding, and is consistent with the current rate structure.

3 Water and Sewer Financial Plans

To allow for the evaluation of cost of service for FY2019 and beyond, Black & Veatch developed a comprehensive rate model that allows for the projection of revenues from user fees and miscellaneous revenue sources, as well as the projection of revenue requirements, including operation and maintenance expenses and funding of the projected capital improvement program. The detailed projection of revenues and revenue requirements allows for the evaluation of the cost of providing services to customers in future years.

Each year prior to the development of detailed operating and capital budgets, WSSC undertakes a detailed Spending Affordability Guidelines (SAG) analysis to determine an acceptable overall system-wide revenue increase for both the water and sewer systems. Based on the result of the SAG study, WSSC then develops detailed operating and capital budgets for review and approval for the upcoming fiscal year. In completing this analysis, WSSC utilizes a SAG model that is similar to the financial planning components of the model developed for this Study. The rate model developed for this Study was developed to maintain consistency with the SAG analysis that was most recently completed for the development of the FY2018 budget. Black & Veatch did not conduct a separate analysis or develop differing assumptions regarding revenue or cost escalation over the study period.

While it is anticipated that future SAG analyses may result in different assumptions for revenues and expenses for future fiscal years, the FY2018 SAG analysis was used as the basis for this study. The following tables summarize the projected revenues and revenue requirements for each utility.

WATER SYSTEM FINANCIAL PLAN

Water System Revenue

Water system revenue is derived principally from charges for treated water service. Other sources of revenue include interest income, plumbing and inspection fees, cross connection fees, and other miscellaneous fee income and adjustments

Projected Customers and Billed Water Volume

Revenue from charges for treated water service are comprised of two components: fixed charges and volumetric charges. Fixed charges are assessed to each customer based on meter size. Table 3 summarizes the projected number of customer accounts by meter size for both the AMF and IIF.

Table 3 Projected Number of Customer Accounts

Line No.	Description	Fiscal Year Ending June 30					
		FY 2018 (connections)	FY 2019 (connections)	FY 2020 (connections)	FY 2021 (connections)	FY 2022 (connections)	FY 2023 (connections)
Small Meters							
1	5/8"	138,807	139,588	140,370	141,149	141,930	142,708
2	3/4"	243,972	245,343	246,717	248,086	249,459	250,827
3	1"	56,788	57,107	57,427	57,746	58,065	58,383
Large Meters							
4	1.5"	4,694	4,721	4,748	4,775	4,802	4,829
5	2"	3,647	3,667	3,687	3,707	3,727	3,747
6	3"	940	945	950	955	960	965
7	4"	542	545	548	551	554	557
8	6"	118	118	118	118	118	118
9	8"	0	0	0	0	0	0
10	10"	1	1	1	1	1	1
11	Subtotal	449,509	452,035	454,566	457,088	459,616	462,135
Detector Check Meters							
12	2"	250	251	252	253	254	255
13	4"	56	56	56	56	56	56
14	6"	216	217	218	219	220	221
15	8"	95	96	97	98	99	100
16	10"	0	0	0	0	0	0
17	Subtotal	617	620	623	626	629	632
Fire Meters							
18	4"	95	95	95	95	95	95
19	6"	892	897	902	907	912	917
20	8"	597	600	603	606	609	612
21	10"	0	0	0	0	0	0
22	12"	0	0	0	0	0	0
23	Subtotal	1,584	1,592	1,600	1,608	1,616	1,624
24	Total	451,710	454,247	456,789	459,322	461,861	464,391

Existing volumetric charges are assessed on all billed volume used by each customer, based on the total volume divided by the number of days in the billing cycle to determine the “tier” each customer falls within for the billing cycle. Table 4 provides a summary of the total projected water volume billed by customer class. As shown, no change in total billed water volume is projected during the study period. As Table 3 above indicates modest customer growth, the projection of no change in total billed volume indicates a decline in average use per customer, continuing the trend experienced by WSSC over many years, and also being experienced across the industry.

Table 4 Projected Billed Water Volume by Customer Class

Line No.	Description	Fiscal Year Ending June 30					
		FY 2018 (kgal)	FY 2019 (kgal)	FY 2020 (kgal)	FY 2021 (kgal)	FY 2022 (kgal)	FY 2023 (kgal)
Customer Classes							
1	Residential	21,666,025	21,666,025	21,666,025	21,666,025	21,666,025	21,666,025
2	Multi-Family Residential	10,483,274	10,483,274	10,483,274	10,483,274	10,483,274	10,483,274
3	Non-Residential	11,528,137	11,528,137	11,528,137	11,528,137	11,528,137	11,528,137
4	Contract Wholesale	810,316	810,316	810,316	810,316	810,316	810,316
5	Subtotal	44,487,752	44,487,752	44,487,752	44,487,752	44,487,752	44,487,752

Water Revenue Under Existing Rates

The existing schedule of rates for water service presented in Tables 1 and 2 became effective July 1, 2016, and consist of a two part Ready-To-Serve Charge plus a volumetric charge, as previously discussed. Revenues from the Ready-to-Serve Charges are split between the water and sewer utilities based on a split of 51 percent Water and 49 percent Sewer.

A summary of projected water billings under existing rates is presented in Table 5 for the period FY 2018 through FY 2023. Estimates of future water service billings are based on the projected water customers and water volumes shown in Tables 3 and 4, respectively and unit rates of charge under existing rates.

Table 5 Projected Water Revenue Under Existing Rates

Line No.	Description	Fiscal Year Ending June 30					
		FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
		(\$)	(\$)	(\$)	(\$)	(\$)	(\$)
Ready-to-Serve Charges							
Account Maintenance							
1	Residential	13,949,200	14,027,500	14,105,900	14,184,000	14,262,400	14,340,400
2	Multi-Family Residential	617,100	620,400	623,700	627,200	630,600	633,900
3	Non-Residential	1,810,100	1,819,900	1,829,700	1,839,700	1,849,500	1,859,200
4	Contract Wholesale	4,000	4,000	4,000	4,000	4,000	4,000
Infrastructure Maintenance							
5	Residential	10,642,600	10,678,700	10,715,100	10,751,300	10,787,600	10,823,800
6	Multi-Family Residential	2,822,900	2,834,500	2,846,100	2,857,800	2,869,400	2,881,000
7	Non-Residential	6,065,900	6,083,800	6,101,600	6,119,400	6,137,200	6,155,000
8	Contract Wholesale	32,200	32,200	32,200	32,200	32,200	32,200
9	Subtotal	\$35,944,000	\$36,101,000	\$36,258,300	\$36,415,600	\$36,572,900	\$36,729,500
Volume Charges							
10	Residential	115,091,700	115,091,700	115,091,700	115,091,700	115,091,700	115,091,700
11	Multi-Family Residential	49,444,600	49,444,600	49,444,600	49,444,600	49,444,600	49,444,600
12	Non-Residential	88,729,300	88,729,300	88,729,300	88,729,300	88,729,300	88,729,300
13	Contract Wholesale	2,380,400	2,380,400	2,380,400	2,380,400	2,380,400	2,380,400
14	Subtotal	\$255,646,000	\$255,646,000	\$255,646,000	\$255,646,000	\$255,646,000	\$255,646,000
15	Total Water Rev. Under Existing Rates	\$291,590,000	\$291,747,000	\$291,904,300	\$292,061,600	\$292,218,900	\$292,375,500

Other Water Revenue

Projected other water system income is presented in Table 6. Other revenue includes interest income, plumbing and inspection fees, cross connection fees, and other miscellaneous fee income and adjustments are based on the FY 2018 proposed budget.

Table 6 Projected Other Revenue (Water System)

Line No.	Description	Fiscal Year Ending June 30					
		FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
		(\$)	(\$)	(\$)	(\$)	(\$)	(\$)
Other Miscellaneous Revenues							
1	Interest Income	100,000	17,100	17,100	37,200	40,200	41,600
2	Plumbing / Inspection Fees	6,560,000	5,680,000	5,740,000	5,800,000	5,860,000	5,860,000
3	Cross Connection Fee	253,000	304,000	365,000	438,000	525,000	525,000
4	Miscellaneous	10,847,000	10,500,000	10,800,000	11,100,000	11,400,000	11,400,000
5	Subtotal	\$17,760,000	\$16,501,100	\$16,922,100	\$17,375,200	\$17,825,200	\$17,826,600
Other Offsets							
6	Additional Operating Reserve Contribution	0	2,949,300	3,288,500	2,746,400	2,229,700	2,292,500
7	Subtotal	\$0	\$2,949,300	\$3,288,500	\$2,746,400	\$2,229,700	\$2,292,500
8	Total Other Revenue	\$17,760,000	\$19,450,400	\$20,210,600	\$20,121,600	\$20,054,900	\$20,119,100

Water System Revenue Requirements

The revenue required to adequately provide for the continued operation of the water system must be sufficient to meet the cash requirements for system operations. Revenue requirements include: (1) system operation and maintenance expense; (2) debt service on existing and proposed loans and bonds; (3) expenditures for routine capital and major capital improvements met from annual revenues, and (4) any required transfers between funds. Projections of the cash requirements to

meet these system expenditures for the period through FY 2023 are based on the FY2018 SAG analysis, and are presented as follows.

Water System Operation and Maintenance Expense

The elements of operation and maintenance expense for the water system include the annual expenses associated with supply, treatment, storage & distribution, meters, collection and accounting, and administrative and general services. These expenses include costs such as personnel costs (salaries and benefits), costs for materials and supplies, costs of utilities and contract services. Table 7 presents a summary of projected operation & maintenance expenses.

Table 7 Projected Operation & Maintenance Expenses (Water System)

Line No.	Description	Fiscal Year Ending June 30					
		FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
		(\$)	(\$)	(\$)	(\$)	(\$)	(\$)
O&M Expenses							
1	Salaries & Wages	64,169,200	67,056,800	70,074,400	73,227,800	76,523,000	79,966,600
2	Heat, Light & Power	11,760,500	14,762,000	15,221,000	15,686,000	16,168,000	16,173,000
3	All Other	125,372,000	129,585,000	134,568,000	139,751,000	145,141,000	150,747,000
4	Total	\$201,301,700	\$211,403,800	\$219,863,400	\$228,664,800	\$237,832,000	\$246,886,600

Major Capital Improvement Program – Water System

A summary of the projected major capital improvement program for the period FY 2018 through FY 2023 is presented in Table 8. Table 8 reflects WSSC’s FY2018-FY2023 CIP Budget.

Table 8 Projected Major Capital Improvement Program (Water System)

Line No.	Description	Fiscal Year Ending June 30					
		FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
		(\$)	(\$)	(\$)	(\$)	(\$)	(\$)
Capital Improvement Program							
1	Source of Supply	13,125,700	6,269,300	0	0	0	0
2	Pumping	10,920,400	4,869,700	949,700	0	0	0
3	Treatment	41,876,500	33,868,100	51,941,300	31,036,900	26,849,700	12,582,900
4	Transmission & Distribution	242,028,100	235,438,100	222,830,400	234,442,000	244,167,000	257,426,700
5	Meters and Services	6,394,000	25,728,300	26,500,100	27,295,100	2,409,500	0
6	General Plant	14,723,900	11,336,000	9,113,200	11,277,600	9,966,400	11,734,000
7	Total	\$329,068,600	\$317,509,500	\$311,334,700	\$304,051,600	\$283,392,600	\$281,743,600

Table 9 presents the capital improvement financing plan which summarizes the projected source and application of funds over the six-year study period. This plan anticipates that proposed capital improvements will be financed from a combination of bond proceeds, system development charges, contributions, and annual operating revenue.

Table 9 Projected Capital Financing Plans (Water System)

Line No.	Description	Fiscal Year Ending June 30					
		FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
		(\$)	(\$)	(\$)	(\$)	(\$)	(\$)
Source of Funds							
1	WSSC Bonds	287,309,100	275,417,400	276,357,600	269,362,600	247,479,100	242,185,500
2	System Development Charges	23,891,500	21,300,300	11,084,800	5,445,700	4,503,300	4,638,300
3	Contribution/Other	4,704,900	3,316,200	1,783,200	2,681,200	826,300	2,318,600
4	Cash Financed	13,163,000	17,476,000	22,109,000	26,562,000	30,584,000	32,601,000
5	Total Source of Funds	\$329,068,500	\$317,509,900	\$311,334,600	\$304,051,500	\$283,392,700	\$281,743,400
Use of Funds							
6	CIP - Water	182,941,900	148,733,700	139,553,500	120,561,600	119,866,900	110,652,500
7	CIP - General	146,126,600	168,776,200	171,781,100	183,489,900	163,525,800	171,090,900
8	Total Use of Funds	\$329,068,500	\$317,509,900	\$311,334,600	\$304,051,500	\$283,392,700	\$281,743,400

Existing and Projected Debt Service Requirements – Water System

Table 10 provides a summary of the water system’s existing and projected debt service requirements.

Table 10 Existing and Projected New Long-Term Debt Service (Water System)

Line No.	Description	Fiscal Year Ending June 30					
		FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
		(\$)	(\$)	(\$)	(\$)	(\$)	(\$)
Existing Long Term Debt							
1	Water Supply Bonds	74,151,627	68,587,690	69,773,015	66,956,249	64,784,167	62,921,141
2	Water Notes	6,156,000	6,016,000	6,948,000	6,728,000	6,508,000	6,288,000
3	Maryland Water Quality Bonds	1,098,876	1,074,591	1,050,307	1,026,022	0	0
Proposed New Long-Term Debt							
4	Water Supply Bonds	8,935,300	22,093,650	31,962,200	40,879,550	48,096,100	53,643,450
5	Reconstruction Program	10,161,250	17,713,050	25,741,500	34,251,150	43,229,750	52,680,400
6	Interfund Debt Service Transfer	5,817,000	5,725,000	5,793,000	5,835,000	5,852,000	5,805,000
7	Total	\$106,320,053	\$121,209,981	\$141,268,021	\$155,675,971	\$168,470,017	\$181,337,991

Summary of Water System Revenue and Revenue Requirements

Total revenue requirements of the water system recognized for purposes of this report include operation and maintenance expense, debt service costs on existing and proposed new debt, expenditures for routine capital and major capital improvements met from annual revenues, and any required transfers to other funds and/or reserves.

Table 11 shows the application of estimated future revenues under existing rates and estimated additional revenue from proposed rate increases necessary to meet projected obligations for the period FY 2018 through FY 2023. This table summarizes the financing of operation and maintenance expense, debt service requirements on existing and proposed new bonds/loans, the transfer of operating funds for major capital improvement financing and routine capital outlay, and operating transfers to and from the water system.

Table 11 Comparison of Projected Revenue under Existing Rates with Projected Revenue Requirements (Water System)¹

Line No.	Description	Fiscal Year Ending June 30					
		FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
		(\$)	(\$)	(\$)	(\$)	(\$)	(\$)
Revenue							
Rate Revenue							
1	Water Sales	291,590,200	291,747,300	291,904,400	292,061,500	292,218,600	292,375,700
	Year	Months	Revenue Adj				
2	FY 2018	12	3.9%	11,433,400	11,433,400	11,433,400	11,433,400
3	FY 2019	12	10.0%		30,447,100	30,447,100	30,447,100
4	FY 2020	12	9.8%			32,727,900	32,727,900
5	FY 2021	12	7.4%				27,080,900
6	FY 2022	12	6.4%				25,370,800
7	FY 2023	12	5.7%				23,727,800
8	Increased Revenue Due to Adjustments			11,433,400	41,880,500	74,608,400	101,689,300
9	Subtotal Rate Revenue			\$303,023,600	\$333,627,800	\$366,512,800	\$393,750,800
10	Other Operating Revenue			17,760,000	19,440,900	20,200,900	20,101,100
11	Total Revenue			\$320,783,600	\$353,068,700	\$386,713,700	\$413,851,900
Revenue Requirements							
12	O&M Expenses			201,301,700	211,403,800	219,863,400	228,664,800
13	Long-Term Debt			106,320,100	121,210,100	141,268,000	155,676,000
14	Transfers			13,163,000	20,425,300	25,397,500	29,308,400
15	Total Revenue Requirements			\$320,784,800	\$353,039,200	\$386,528,900	\$413,649,200
16	Net Annual Cash Balance			(1,200)	29,500	184,800	202,700
17	Beginning Fund Balance			9,032,000	9,030,800	9,060,300	9,245,100
18	Net Cumulative Fund Balance			\$9,030,800	\$9,060,300	\$9,245,100	\$9,447,800
19	Working Capital Reserves			30,302,400	33,362,800	36,651,300	39,375,100
20	Debt Service Coverage			1.12	1.17	1.18	1.19

Line 1 of Table 11 shows projected revenue under existing rates as previously presented in Table 5. Lines 2 through 8 show indicated increases in revenues associated with rate increases assumed to be in effect for the number of months shown. The magnitude of the increases shown for each year are consistent with those used in the FY18 SAG model and reflect revenue increases projected to be necessary to meet cash requirements, provide minimum debt service coverage and maintain necessary minimum fund balances.

Other revenue available for system operations, shown on Line 10 reflects non-rate revenue of the water system as shown previously in Table 6.

Operation and maintenance expense, previously projected in Table 7, is shown on Line 12.

Total projected debt service requirements on currently outstanding revenue bonds and other debt and estimated debt service requirements on new revenue bonds and/or loans projected to be issued to help finance major capital program expenditures are shown on Line 13, as outlined in Table 11.

Transfers shown in Line 14 reflect transfer to operating reserve and Paygo. Line 16 indicates the estimated net annual balance from operations remaining at the end of each year of the study period. Line 17 presents the projected operating funds available at the beginning of each fiscal year, and

¹ The projected revenue requirements for FY 2019 – FY 2023 are estimates only and do not have any impact on the rate designs discussed in Section 4.

Line 18 presents the projected ending operating fund balance at the end of each fiscal year. Line 19 represents a working capital reserve of 10 percent of ready to serve charges and volumetric rate revenues.

Debt service coverage is an indication of the ability of the water system's revenues to repay annual principal and interest payments on long-term debt. Line 20 presents the calculated debt service coverage in each year of the projection period, and is calculated as follows: Net revenue available for debt service is calculated as total revenues (Line 11) minus total operating expenses (Line 12). Net revenue available for debt service divided by annual debt service on long-term debt (Line 13) equals calculated debt service coverage.

SEWER SYSTEM FINANCIAL PLAN

Sewer System Revenue

Sewer system revenue is derived principally from charges for providing collection, conveyance and treatment of wastewater contributed to the sewer system by customers. Other sources of revenue include income from plumbing and inspection fees, cross connection fees, interest income, and other miscellaneous fee revenues and adjustments.

Projected Customers and Billed Volume

Revenue from charges for wastewater treatment service are comprised of two components: fixed charges and volumetric charges. Fixed charges are assessed to each customer based on meter size. Table 3, presented previously, summarizes the projected number of customer accounts by meter size for both the AMF and IIF.

Existing volumetric charges are assessed on all billed volume used by each customer, based on the total volume divided by the number of days in the billing cycle to determine the "tier" each customer falls within the billing cycle. Table 12 provides a summary of the total projected volume billed by customer class. As shown, no change in total billed volume is projected during the study period. As Table 3 above indicates modest customer growth, the projection of no change in total billed volume indicates a decline in average use per customer, continuing the trend experienced by WSSC over many years, and also being experienced across the industry.

Table 12 Projected Billed Sewer Volume

Line No.	Description	Fiscal Year Ending June 30					
		FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
		(kgal)	(kgal)	(kgal)	(kgal)	(kgal)	(kgal)
Customer Classes							
1	Residential	20,419,719	20,419,719	20,419,719	20,419,719	20,419,719	20,419,719
2	Multi-Family Residential	10,235,721	10,235,721	10,235,721	10,235,721	10,235,721	10,235,721
3	Non-Residential	9,600,208	9,600,208	9,600,208	9,600,208	9,600,208	9,600,208
4	Subtotal	40,255,648	40,255,648	40,255,648	40,255,648	40,255,648	40,255,648

Sewer Revenue Under Existing Rates

The existing schedule of rates for sewer service is presented in tables 1 and 2. The rates, which became effective July 1, 2016, consist of a two part Ready-To-Serve Charge plus a volume charge, as previously discussed. Revenues from the Ready-to-Serve Charges are split between the water and sewer utilities based on a split of 51 percent Water and 49 percent Sewer.

A summary of projected sewer service billings under existing rates is presented in Table 13 for the period FY 2018 through FY 2023. Estimates of future sewer service billings are based on the projected customers and sewer volumes shown in Tables 3 and 12, respectively and unit rates of charge under existing rates.

Table 13 Projected Sewer Revenue Under Existing Rates

Line No.	Description	Fiscal Year Ending June 30					
		FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
		(\$)	(\$)	(\$)	(\$)	(\$)	(\$)
Readiness-to-Serve Charges							
1	Account Maintenance						
2	Residential	13,402,200	13,477,400	13,552,800	13,627,900	13,703,100	13,778,100
3	Multi-Family Residential	592,900	596,100	599,400	602,500	605,800	609,000
4	Non-Residential	1,739,200	1,748,600	1,758,000	1,767,400	1,776,900	1,786,300
5	Contract Wholesale	3,800	3,800	3,800	3,800	3,800	3,800
6	Infrastructure Maintenance						
7	Residential	10,225,200	10,260,000	10,294,900	10,329,700	10,364,600	10,399,300
8	Multi-Family Residential	2,712,200	2,723,300	2,734,600	2,745,700	2,756,800	2,768,000
9	Non-Residential	5,828,100	5,845,100	5,862,300	5,879,400	5,896,400	5,913,600
10	Contract Wholesale	31,000	31,000	31,000	31,000	31,000	31,000
11	Subtotal	\$34,534,600	\$34,685,300	\$34,836,800	\$34,987,400	\$35,138,400	\$35,289,100
Volume Charges							
12	Residential	151,851,800	151,851,800	151,851,800	151,851,800	151,851,800	151,851,800
13	Multi-Family Residential	68,474,900	68,474,900	68,474,900	68,474,900	68,474,900	68,474,900
14	Non-Residential	104,607,300	104,607,300	104,607,300	104,607,300	104,607,300	104,607,300
15	Subtotal	\$324,934,000	\$324,934,000	\$324,934,000	\$324,934,000	\$324,934,000	\$324,934,000
16	Total Sewer Rev. Under Existing Rates	\$359,468,600	\$359,619,300	\$359,770,800	\$359,921,400	\$360,072,400	\$360,223,100

Other Sewer Revenue

Historical and projected miscellaneous other sewer system income is presented in Table 14. Revenue interest income, plumbing and inspection fees, cross connection fees, and other miscellaneous fee income and adjustments are based on the FY 2018 proposed budget.

Table 14 Projected Other Revenue (Sewer System)

Line No.	Description	Fiscal Year Ending June 30					
		FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
		(\$)	(\$)	(\$)	(\$)	(\$)	(\$)
Other Miscellaneous Revenues							
1	Interest Income	600,000	131,900	129,700	257,700	256,300	253,400
2	Plumbing / Inspection Fees	4,740,000	4,000,000	4,040,000	4,080,000	4,120,000	4,120,000
3	Rockville Sewer Use	2,632,000	2,664,000	2,680,000	2,711,000	2,741,000	2,771,000
4	Miscellaneous	8,500,000	8,000,000	8,200,000	8,400,000	8,700,000	8,700,000
5	Subtotal	\$16,472,000	\$14,795,900	\$15,049,700	\$15,448,700	\$15,817,300	\$15,844,400
Other Offsets							
6	Reconstruction Debt Service Offset	7,700,000	5,600,000	3,500,000	1,400,000	0	0
7	Subtotal	\$7,700,000	\$5,600,000	\$3,500,000	\$1,400,000	\$0	\$0
Other Offsets							
8	Additional Operating Reserve Contr	0	2,833,700	3,159,500	2,638,700	2,142,300	2,202,600
9	Subtotal	\$0	\$2,833,700	\$3,159,500	\$2,638,700	\$2,142,300	\$2,202,600
10	Total Other Revenue	\$24,172,000	\$23,229,600	\$21,709,200	\$19,487,400	\$17,959,600	\$18,047,000

Sewer System Revenue Requirements

The revenue required to provide adequately for the continued operation of the sewer system must be sufficient to meet the cash requirements for system operations. Revenue requirements include:

(1) system operation and maintenance expense; (2) debt service on existing and proposed loans and bonds; (3) expenditures for routine capital and major capital improvements met from annual revenues, and (4) any required transfers between funds. Projections of the cash requirements to meet these system expenditures for the period through FY 2023 are based on the FY2018 SAG analysis, and are presented as follows.

Sewer System Operation and Maintenance Expense

The elements of operation and maintenance expense for the sewer system include the annual expenses associated with collection, treatment, disposal, meters, collection and accounting, and administrative and general services. These expenses include costs such as personnel costs (salaries and benefits), costs for materials and supplies, costs of utilities and contract services. Table 15 presents a summary of projected operation & maintenance expenses.

Table 15 Projected Operation & Maintenance Expenses (Sewer System)

Line No.	Description	Fiscal Year Ending June 30					
		FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
		(\$)	(\$)	(\$)	(\$)	(\$)	(\$)
O&M Expenses							
1	Salaries & Wages	56,106,700	58,631,500	61,270,000	64,027,200	66,908,300	69,919,200
2	Heat, Light & Power	10,254,400	12,078,000	12,454,000	12,834,000	13,229,000	13,232,000
3	Regional Sewage Disposal	53,617,000	55,600,800	57,658,000	59,791,300	62,003,600	64,297,700
4	All Other	115,963,000	115,347,000	119,761,000	124,351,000	129,125,000	134,090,000
5	Subtotal	\$235,941,100	\$241,657,300	\$251,143,000	\$261,003,500	\$271,265,900	\$281,538,900

Major Capital Improvement Program – Sewer System

A summary of the projected major capital improvement program for the period FY 2018 through FY 2023 is presented in Table 16. Table 16 reflects WSSC's FY2018-FY2023 CIP Budget.

Table 16 Projected Major Capital Improvement Program (Sewer System)

Line No.	Description	Fiscal Year Ending June 30					
		FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
		(\$)	(\$)	(\$)	(\$)	(\$)	(\$)
Capital Improvement Program							
1	Collection	214,168,800	131,474,700	141,399,500	117,223,200	109,848,500	116,295,200
2	Pumping	19,615,300	15,598,400	6,289,500	0	0	0
3	Treatment Plants	14,382,400	92,316,100	100,039,900	61,971,300	7,028,700	1,475,000
4	Other Treatment Plants	72,783,100	49,907,300	51,142,900	45,905,400	41,844,300	42,999,400
5	General Plant	18,540,300	9,820,400	4,740,600	6,773,800	5,327,500	6,955,900
6	Subtotal	\$339,489,900	\$299,116,900	\$303,612,400	\$231,873,700	\$164,049,000	\$167,725,500

Table 17 presents the capital improvement financing plan which summarizes the projected source and application of funds over the six-year study period. This plan anticipates that proposed capital improvements will be financed from a combination of bond proceeds, system development charges, contributions, and annual operating revenue.

Table 17 Projected Capital Financing Plans (Sewer System)

Line No.	Description	Fiscal Year Ending June 30					
		FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
		(\$)	(\$)	(\$)	(\$)	(\$)	(\$)
Source of Funds							
1	WSSC Bonds	282,199,100	242,559,700	246,131,400	178,033,800	109,206,800	106,991,100
2	System Development Charges	5,722,400	6,508,100	5,304,800	0	0	0
3	Contribution/Other	17,216,700	12,241,300	2,918,400	2,028,700	1,097,600	2,423,200
4	State Aid	14,149,600	14,409,200	21,793,700	21,615,200	21,744,800	22,397,200
5	City of Rockville	3,172,200	2,488,500	2,471,300	2,243,900	1,977,700	2,004,100
6	Cash Financed	17,030,000	20,910,000	24,993,000	27,952,000	30,022,000	33,910,000
7	Total Source of Funds	\$339,490,000	\$299,116,800	\$303,612,600	\$231,873,600	\$164,048,900	\$167,725,600
Use of Funds							
8	CIP - Sewer	257,589,100	222,087,900	227,837,300	149,737,700	78,772,000	75,947,900
9	CIP - General	81,900,900	77,028,900	75,775,300	82,135,900	85,276,900	91,777,700
10	Total Use of Funds	\$339,490,000	\$299,116,800	\$303,612,600	\$231,873,600	\$164,048,900	\$167,725,600

Existing and Projected Debt Service Requirements – Sewer System

Table 18 provides a summary of the sewer system’s existing and projected debt service requirements.

Table 18 Existing and Projected New Long-Term Debt Service (Sewer System)

Line No.	Description	Fiscal Year Ending June 30					
		FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
		(\$)	(\$)	(\$)	(\$)	(\$)	(\$)
Existing Long Term Debt							
1	Sewage Disposal Bonds	95,877,317	91,819,129	91,244,665	88,800,190	84,753,117	81,040,821
2	Sewage Notes	3,993,000	3,902,000	4,503,000	4,360,000	4,217,000	4,074,000
3	Maryland Water Quality Bonds	15,556,260	15,520,218	15,484,172	15,448,125	15,138,339	15,108,923
Proposed New Long-Term Debt							
4	Sewage Disposal Bonds	18,562,950	32,315,453	43,945,612	52,791,485	56,425,744	57,351,156
5	Reconstruction Program	5,683,450	9,914,200	14,402,550	19,164,200	24,215,800	29,575,100
6	Interfund Debt Service Transfer	11,464,000	11,324,000	11,343,000	11,359,000	11,450,000	11,388,000
7	Subtotal	\$151,136,977	\$164,795,000	\$180,923,000	\$191,923,000	\$196,200,000	\$198,538,000

Summary of Sewer System Revenue and Revenue Requirements

Total revenue requirements of the sewer system recognized for purposes of this report include operation and maintenance expense, debt service costs on existing and proposed new debt, expenditures for routine capital and major capital improvements met from annual revenues, and any required transfers to other funds and/or reserves.

Table 19 shows the application of estimated future revenues under existing rates and estimated additional revenue from proposed rate increases necessary to meet projected obligations for the period FY 2018 through FY 2023. This table summarizes the financing of operation and maintenance expense, debt service requirements on existing and proposed new bonds/loans, the transfer of operating funds for major capital improvement financing and routine capital outlay, and operating transfers to and from the sewer system.

Table 19 Comparison of Projected Revenue under Existing Rates with Projected Revenue Requirements (Sewer System)²

Line No.	Description	Fiscal Year Ending June 30					
		FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
		(\$)	(\$)	(\$)	(\$)	(\$)	(\$)
Revenue							
Rate Revenue							
1	Sewer Sales	359,468,500	359,619,500	359,770,200	359,921,400	360,072,200	360,223,100
	Year	Months Effective	Revenue Adj				
2	FY 2018	12	2.5%	8,888,300	8,888,300	8,888,300	8,888,300
3	FY 2019	12	10.5%		38,723,400	38,723,400	38,723,400
4	FY 2020	12	7.7%			31,293,800	31,293,800
5	FY 2021	12	5.8%				25,441,900
6	FY 2022	12	3.8%				17,600,500
7	FY 2023	12	3.3%				16,087,700
8	Increased Revenue Due to Adjustments			8,888,300	47,611,700	78,905,500	104,347,400
						121,947,900	138,035,600
9	Subtotal Rate Revenue	\$368,356,800	\$407,231,200	\$438,675,700	\$464,268,800	\$482,020,100	\$498,258,700
10	Other Operating Revenue	16,472,000	17,630,000	18,211,600	18,095,500	17,971,200	18,061,700
11	Total Revenue	\$384,828,800	\$424,861,200	\$456,887,300	\$482,364,300	\$499,991,300	\$516,320,400
Revenue Requirements							
12	O&M Expenses	235,941,100	241,657,300	251,143,000	261,003,500	271,265,900	281,538,900
13	Long-Term Debt	151,137,100	164,795,000	180,923,100	191,923,000	196,199,900	198,538,000
14	Transfers	17,030,000	23,743,700	28,152,500	30,590,700	32,164,300	36,112,600
15	Other	(7,700,000)	(5,600,000)	(3,500,000)	(1,400,000)	0	0
16	Total Revenue Requirements	\$396,408,200	\$424,596,000	\$456,718,600	\$482,117,200	\$499,630,100	\$516,189,500
17	Net Annual Cash Balance	(11,579,400)	265,200	168,700	247,100	361,200	130,900
18	Beginning Fund Balance	120,126,000	108,546,600	108,811,800	108,980,500	109,227,600	109,588,800
19	Net Cumulative Fund Balance	\$108,546,600	\$108,811,800	\$108,980,500	\$109,227,600	\$109,588,800	\$109,719,700
20	Working Capital Reserves	36,835,700	40,723,100	43,867,600	46,426,900	48,202,000	49,825,900
21	Debt Service Coverage	0.99	1.11	1.14	1.15	1.17	1.18

Line 1 of Table 9 shows projected revenue under existing rates as previously presented in Table 13. Lines 2 through 8 show indicated increases in revenues associated with rate increases assumed to be in effect for the number of months shown. The magnitude of the increases shown for each year are consistent with those used in the FY18 SAG model and reflect revenue increases projected to be necessary to meet cash requirements, provide minimum debt service coverage and maintain necessary minimum fund balances.

Other revenue available for system operations, shown on Line 10 reflects non-rate revenue of the sewer system as shown previously in Table 14.

Operation and maintenance expense, previously projected in Table 15, is shown on Line 12.

Total projected debt service requirements on currently outstanding revenue bonds and other debt and estimated debt service requirements on new revenue bonds and/or loans projected to be issued to help finance major capital program expenditures are shown on Line 13, as outlined in Table 18.

Transfers shown in Line 14 reflect transfers to operating reserve and Paygo. Other expenses, as summarized in Line 15, reflect SDC Debt Service Offset and Reconstruction Debt Service Offset. Line

² The projected revenue requirements for FY 2019 – FY 2023 are estimates only and do not have any impact on the rate designs discussed in Section 4.

17 indicates the estimated net annual balance from operations remaining at the end of each year of the study period. Line 18 presents the projected operating funds available at the beginning of each fiscal year, and Line 19 presents the projected ending operating fund balance at the end of each fiscal year. Line 20 represents working capital reserve of 10 percent of Ready-to-Serve charges and volumetric rate revenues.

Debt service coverage is an indication of the ability of the sewer system's revenues to repay annual principal and interest payments on long-term debt. Line 21 presents the calculated debt service coverage in each year of the projection period, and is calculated as follows: Net revenue available for debt service is calculated as total revenues (Line 11) minus total operating expenses (Line 12). Net revenue available for debt service divided by annual debt service on long-term debt (Line 13) equals calculated debt service coverage.

4 Cost of Service Allocations

A key step in developing an equitable rate structure involves the cost of service analysis. The cost of service analysis provides a mechanism to defensibly allocate the total annual revenue requirements to the various customer classes, recognizing customer demand characteristics. The cost of service analysis generally uses a single specific year (“Test Year”) to illustrate the design of rates and charges. For the Study, the new rate structure under consideration is for FY 2019; however, the SAG analysis has not yet been completed for FY 2019, and therefore the revenue required to be met by volumetric charges in FY 2019 is not yet known. Consequently, for this analysis, FY 2018 shall serve as the Test Year for allocating costs of service and determining cost of service based rates. The analysis compares alternative rates using FY 2018 requirement with FY 2018 rates that will be in effect using the current rate structure. Based on the impact of cost of service based rates on certain customers, WSSC should consider developing phase-in plans, allowing implementation of the new rate structure over a number of years.

WATER SYSTEM COST OF SERVICE

The methodology used in performing a cost of service analysis for the water system is the same regardless of the test year being evaluated. The following sections outline the cost of service approach and results of the analysis for FY 2018. The key components of the cost of service analysis are:

- Determination of Cost of Service (net revenue requirements);
- Determination of Functional Costs;
- Allocation of Functional Costs to Cost Components; and
- Determination of Unit Cost of Service.

Cost of Service to be Allocated

The first key step is to determine the cost of service that is to be recovered from user rates and charges. As briefly discussed in Section 1, Cost of Service is defined as and is synonymous with the “net revenue requirement” that is to be recovered, for the test year, through user rates and charges. In determining costs of service to be met from charges for water service, the following are deducted from total revenue requirements:

- Income from non-rate revenues; and
- Change in fund balance.

Table 20 presents the derivation of the cost of service to be recovered through water charges. As Line 8 in Table 20 indicates, the water cost of service for FY 2018 is projected to be \$303,023,600. This cost of service consists of \$183,540,500 of O&M expenditures and \$119,483,100 of capital costs.

Table 20 Total Cost of Service to be Recovered from Water Rates

LINE NO.	DESCRIPTION	OPERATING EXPENSE (\$)	CAPITAL COST (\$)	TOTAL COST (\$)
Revenue Requirements				
1	O&M Expenses	201,301,700	0	201,301,700
2	Debt Service	0	106,320,100	106,320,100
3	Cash Financed Capital	0	13,163,000	13,163,000
4	Subtotal	\$201,301,700	\$119,483,100	\$320,784,800
Less Revenue Requirements Met from Other Sources and Adjustments				
5	Other Operating Revenues	17,760,000	0	17,760,000
6	Annual Cash Balance Adjustments	1,200	0	1,200
7	Subtotal	\$17,761,200	\$0	\$17,761,200
8	COS to be Recovered from Rates (Line 4 – Line 7)	\$183,540,500	\$119,483,100	\$303,023,600

Functional Cost Components

The costs of water service are analyzed by system function in order to properly allocate the costs to various classes of customers. In this analysis, costs are separated to the basic functional components of Base, Extra Capacity, Customer, and Infrastructure Investment Fee (IIF).

Base costs are those which vary directly with the total quantity of water used, as well as those costs associated with serving customers under average load conditions without the elements necessary to meet water use variations or peak demands. Base costs include operating costs of supply, treatment, pumping and distribution facilities, and a portion of administrative and general costs, as well as capital costs on water plant investment associated with serving customers to the extent required for a constant, or average annual rate of use.

Extra Capacity costs include operating costs incurred due to demands in excess of average load conditions and capital costs for additional plant and system capacity beyond that required for the average rate of use. Maximum Day Extra Capacity costs are incurred in meeting demands in excess of average day requirements. Maximum Hour Extra Capacity costs are incurred in meeting demands in excess of maximum day use.

Customer costs are defined as costs that tend to vary in proportion to the number of customers connected to the system. These include meter reading, billing, collection and accounting costs, and maintenance and capital costs associated with meters and services. Infrastructure Investment Fee (IIF) costs are those costs directly allocated to IIF to be recovered through the IIF fee.

Allocation to Cost Components

The water system is comprised of various facilities, each designed and operated to fulfill a given function. In order to provide adequate service to its customers at all times, the system must be capable of meeting not only volume requirements, but also the maximum rates of demand placed on the system.

Since all customers do not exert their maximum demand for water at the same time, capacities of the various system components are established to meet the peak coincidental demands of all classes of customers as a whole. For every water service facility on the system, there is an underlying average demand, or uniform rate of usage exerted by the customers for which the base cost component is applicable. For those facilities designed solely to meet average day demand, costs are allocated 100 percent to the base cost component. Extra capacity requirements associated with coincidental demands in excess of average use are further related to maximum daily and maximum hourly demands.

Analysis of the total system's historical maximum day and maximum hour demands to average day demands results in appropriate ratios for the allocation of capital costs and operating expenses to base and extra capacity cost components. A maximum day to average day ratio of 1.43 is used based on experienced demands in WSSC's water system. This ratio indicates that approximately 69.9 percent ($1.0/1.43$) of the capacity of facilities designed and operated to meet maximum day demand is required for average day or base usage. The remaining 30.1 percent ($[(1.43-1)/1.43]$) is required for maximum day extra capacity requirements.

The costs associated with facilities required to meet maximum hour demand are allocable to base, maximum day extra capacity, and maximum hour extra capacity. A maximum hour to annual average day water use ratio of 1.89 is used based on the experienced demands of the water system. This ratio indicates that approximately 52.9 percent ($1/1.89$) of the capacity of facilities designed and operated to meet maximum hour demand is required for average day or base usage while 22.8 percent ($[(1.43-1)/1.89]$) is utilized for maximum day extra capacity uses, and the remaining 24.3 percent ($[(1.89-1.43)/1.89]$) is required to meet maximum hour extra capacity demand in excess of maximum day demand.

Allocation of Plant Investment

The estimated test year value of water system facilities is allocated to appropriate cost functions as the basis for further distribution to the various customer classes. The estimated test year net plant investment in existing water facilities consists of plant in service as of June 30, 2016, and the estimated cost of proposed capital improvements expected to be in service by the end of 2017. Table 21 shows the allocation of total estimated water net plant value for the test year on an original cost less depreciation value basis. Total net plant investment is estimated to be \$2,563,379,200, as shown on Line 8 of the table.

Plant investment is allocated to cost components on a design basis recognizing the principal component that governs the design of the facility. Land for source of supply is often sized principally to meet annual supply requirements in total and therefore, investment in this asset is allocated 100 percent to the base component. The treatment plant and transmission mains are designed primarily to meet maximum day requirements and are therefore, allocated to 69.9 percent to the base cost function and 30.1 percent to the maximum day extra capacity cost component. The small water distribution mains and reservoirs principally serve to meet the maximum hour requirements. Accordingly, the estimated value of these facilities is allocated 52.9 percent to base, 22.8 percent to maximum day and 24.3 percent to maximum hour.

Customer meters are allocable to the meters and services cost function and hydrants are direct fire protection related facilities. Administrative and general plant includes facilities not directly

allocable to specific cost function, the value of which is allocated to cost components on Line 15 in proportion to the total of the preceding items of plant value.

Projected test year net capital costs, totaling \$119,483,100, are assigned to the functional cost components on the basis of the allocation of plant investment shown in Table 21.

Table 21 Allocation of Net Plant Investment to Functional Cost Components (Water System)

Line No.	Description	Total Costs	Common to All Customers				Customer	Fire Protection
			Base	Extra Capacity		Meters & Svc		
			Base	Max. Day	Max. Hour	Meters & Svc		
		(\$)	(\$)	(\$)	(\$)	(\$)	(\$)	
Plant Assets								
1	Source of Supply	51,359,300	51,359,300	0	0	0	0	0
2	Pumping	56,211,100	39,791,600	16,419,500	0	0	0	0
3	Treatment	336,925,200	238,786,800	98,138,400	0	0	0	0
4	Transmission & Distribution	1,845,007,000	993,016,300	412,216,000	439,774,700	0	0	0
5	Meters and Services	156,436,400	0	0	0	156,436,400	0	0
6	Hydrants	27,261,100	0	0	0	0	0	27,261,100
7	General Plant	90,179,100	48,238,200	19,207,500	16,035,300	5,704,100	0	994,000
8	Net Plant Assets	\$2,563,379,200	\$1,371,192,200	\$545,981,400	\$455,810,000	\$162,140,500	0	\$28,255,100

Allocation of Operating Expense

Test year operation and maintenance expenses are allocated to functional cost components as shown in Table 22. The allocation is similar to the allocation of plant value.

Table 22 Allocation of Operation & Maintenance Expenses to Functional Cost Components (Water System)

Line No.	Description	Total Costs	Common to All Customers					Customer	Fire Protection
			Base	Extra Capacity		Meters & Svc	IIF		
			Base	Max. Day	Max. Hour	Meters & Svc	Cust/Bill.		
		(\$)	(\$)	(\$)	(\$)	(\$)	(\$)	(\$)	
Operating Expenses									
1	Staff Offices Team	32,981,500	18,294,700	6,108,700	4,239,500	481,700	2,350,700	1,447,400	58,800
2	Customer Relations Team	7,107,100	0	0	0	0	7,107,100	0	0
3	Engineering & Construction T	26,944,600	11,661,200	3,811,400	3,599,600	585,900	0	7,184,400	102,100
4	Finance Office Team	23,354,300	12,873,900	4,361,300	2,810,100	369,300	1,491,500	1,410,200	38,000
5	Information Technology Team	18,716,800	10,315,500	3,496,200	2,246,800	296,700	1,190,500	1,140,700	30,400
6	Logistics Office Team	8,373,300	4,614,600	1,564,200	1,005,100	132,800	532,600	510,400	13,600
7	Production Team	41,328,300	29,186,000	8,669,000	2,903,800	485,000	0	0	84,500
8	Utility Services Team	42,495,600	24,117,800	9,538,600	7,646,000	798,100	390,400	0	4,700
9	Operating Reserve Contributi	0	0	0	0	0	0	0	0
10	Subtotal	\$201,301,500	\$111,063,700	\$37,549,400	\$24,450,900	\$3,149,500	\$13,062,800	\$11,693,100	\$332,100
Less Other Revenue									
11	Miscellaneous Revenues	17,760,000	9,798,700	3,312,800	2,157,200	277,900	1,152,500	1,031,600	29,300
12	Other Adjustments	1,200	700	200	100	0	100	100	0
13	Net Operating Expenses	\$183,540,300	\$101,264,300	\$34,236,400	\$22,293,600	\$2,871,600	\$11,910,200	\$10,661,400	\$302,800

Distribution of Costs to Customer Classes

The total cost responsibility of each class of service may be established by developing unit costs of service for each cost function and assignment of those costs to the customer classes based on the respective service requirement to each. To properly recognize the cost of service, each customer class is allocated its share of base, extra capacity and customer costs.

Customer Classifications

For purposes of cost of service analysis and rate design, the water system’s customers are classified to reflect groups of customers with similar service requirements who can be served at a similar average cost and the classification used by the WSSC for record keeping purposes. The specific categories used in the cost of service study include Single Family Residential, Multifamily, and

Nonresidential. Contract customers include Howard County, District of Columbia, Montgomery County, and Charles County. Fire protection consists of public and private fire protection. Public fire protection reflects public fire hydrants and private fire protection reflects connections for fire suppression units inside private buildings.

Units of Service

In allocating the responsibility for costs of service, base, extra capacity, and customer costs may be distributed to customer classes according to respective service requirements of the classes.

The cost of service responsibility for base costs varies with the volume of water requirements and may be distributed to customer classes on that basis. Extra capacity costs are those associated with meeting peak rates of water use and are distributed to customer classes on the basis of their respective system capacity requirements in excess of average requirement rates. Customer costs, which consist of meter related costs and billing, collection and accounting costs, are allocated on the basis of the number of equivalent meters and bills, respectively.

The estimated test year units of service requirements for the various customer classifications are shown in Table 23.

Table 23 Estimated Units of Service (Water System)

Line No.	Description	(1)	(2)	(4)			(7)			(9)	(10)	(11)	(12)	(13)
		Consumption Annual	Avg. Day	Factor	Total	Extra	Factor	Total	Extra	AMF Meters	IIF Meters	Bills	Fire Protection	Fire Protection
Units of Measure		(kgal)	(kgal/day)	(kgal/day)		(kgal/day)	(kgal/day)		(kgal/day)	(EMs)	(EMs)	(Bills)	(EHs)	(ECs)
1	Residential	21,666,025	59,359	213%	126,241	66,882	352%	208,951	82,710	469,291	469,123	1,706,420		
2	Multi-Family Residential	10,483,274	28,721	175%	50,129	21,408	289%	82,972	32,843	26,421	26,403	17,252		
3	Non-Residential	11,528,137	31,584	218%	68,910	37,326	291%	91,879	22,970	73,257	73,145	74,360		
4	Contract Wholesale	810,316	2,220	205%	4,558	2,338	205%	4,558	0	45	136	4		
5	Subtotal	44,487,752	121,884		249,838	127,954		388,361	138,523	569,014	568,807	1,798,036		
6	Private Fire				51	51		405	354	91,366	73,142	8,804	2,648	294,813
7	Public Fire				792	792		6,333	5,542				41,457	4,614,617
8	Subtotal				842	842		6,738	5,896	91,366	73,142	8,804	44,105	4,909,430
9	Total Water System	44,487,752	121,884		250,680	128,796		395,099	144,419	660,380	641,949	1,806,840	44,105	4,909,430

Estimates of the test year annual water requirements, shown in Column 1, are based on the projections of total water sales previously developed in this report. Columns 3 through 8 of Table 23 show the estimated maximum day and maximum hour capacity factors for each customer class, the resulting demands, and extra capacity requirements, respectively. Estimates of peak requirements are based upon an analysis of historical monthly billing data.

Meter related costs are allocated on the basis of the number of equivalent 5/8-inch meters serving each customer class which are shown in Columns 9 and 10 of Table 23. The number of equivalent meters and services estimated for each customer classification is based upon the total number of various size meters connected to the water system by the respective classes and the ratio of the cost of various sized meters and services to the cost of a 5/8-inch meter installation. The number of meters varies slightly between meters charged the Account Maintenance Fee (AMF) and Infrastructure Investment Fee (IIF). Customer costs are distributed to classes on the basis of the number of bills rendered for each customer class as indicated in Column 11.

Fire protection costs are either direct or demand related. Direct costs are specifically identified as fire protection costs in the allocation of operating and capital costs to cost components. Units of service for direct fire protection costs are represented by the number of hydrants and private fire

connections in the system. Demand related fire protection costs represent the portion of extra capacity costs related to meeting potential fire demands. Total system fire demands recognize fire flow standards of the Insurance Services Office. Fire demand quantities have been assigned to public and private fire protection on the basis of the number of equivalent 6-inch hydrants.

Customer Class Costs of Service

Unit costs are developed by dividing the total cost allocated to each functional cost component by the total applicable units of service. The customer class responsibility for service is obtained by applying unit costs of service to the number of units for which the customer class is responsible.

Table 24 presents the development of unit costs of service applicable to each cost function. Total allocated costs shown on Lines 1 through 4 reflect the total cost of service to be recovered from rates. Line 5 shows the total units of service in Table 23. Unit costs of service for each component are determined simply by dividing the allocated cost by the total units of service for each cost component, as shown in Line 6.

Table 24 Unit Cost of Service (Water System)

Line No.	Description	Total Costs	Common to All Customers						Fire Protection
			Base	Extra Capacity		Customer			
			Base	Max. Day	Max. Hour	Meters	Cust/Bill.	IIF	
		(\$)	(\$)	(\$)	(\$)	(\$)	(\$)	(\$)	
Unit Cost of Service									
1	Net Operating Expense	183,540,500	101,264,500	34,236,400	22,293,600	2,871,600	11,910,200	10,661,400	302,800
2	Capital Costs	13,163,000	7,041,100	2,803,600	2,340,600	832,600	0	0	145,100
3	Debt Service	106,320,100	51,191,500	20,383,400	17,017,000	6,053,300	0	10,620,000	1,054,900
4	Total	\$303,023,600	\$159,497,100	\$57,423,400	\$41,651,200	\$9,757,500	\$11,910,200	\$21,281,400	\$1,502,800
5	Units of Service (Total)		44,487,752	128,796	144,419	660,380	1,806,840	641,949	4,909,430
6	Cost per Unit		\$3.59 per kgal	\$445.85 per kgal/day	\$288.41 per kgal/day	\$14.78 per EM	\$6.59 per Bill	\$33.15 per EM	\$0.31 per EH

Table 25 shows the allocation of cost of service to customer classes. Costs are allocated to various customer classes by applying the appropriate unit cost of service to the respective service requirements of each customer class.

Table 25 Allocation of Cost of Service to Customer Classes (Water System)

Line No.	Description	Total Costs (\$)	Common to All Customers						Fire Protection (\$)
			Base	Extra Capacity		Customer			
			Base (\$)	Max. Day (\$)	Max. Hour (\$)	Meters (\$)	Cust/Bill (\$)	IIF (\$)	
1	Cost per Unit		\$3.59 per kgal	\$445.85 per kgal/day	\$288.41 per kgal/day	\$14.78 per EM	\$6.59 per Bill	\$33.15 per EM	\$0.31 per EH
Residential									
1	Units		21,666,025	66,882	82,710	469,291	1,706,420	469,291	0
2	Allocation of costs of service	165,083,400	77,676,900	29,819,400	23,854,100	6,934,000	11,248,300	15,550,700	0
Multi-Family Residential									
1	Units		10,483,274	21,408	32,843	26,421	17,252	26,421	0
3	Allocation of costs of service	57,981,100	37,584,500	9,544,500	9,472,100	390,400	113,700	875,900	0
Non-Residential									
2	Units		11,528,137	37,326	22,970	73,257	74,360	73,257	0
4	Allocation of costs of service	68,597,900	41,330,600	16,641,500	6,624,600	1,082,400	490,200	2,428,600	0
Contract Wholesale									
3	Units		810,316	2,338	0	45	4	45	0
5	Allocation of costs of service	3,949,800	2,905,100	1,042,500	0	700	0	1,500	0
Private Fire									
5	Units		0	51	354	91,366	8,804	73,142	294,813
6	Allocation of costs of service	4,047,500	0	22,500	102,100	1,350,000	58,000	2,424,700	90,200
Public Fire									
6	Units		0	792	5,542	0	0	0	4,614,617
7	Allocation of costs of service	3,363,900	0	353,000	1,598,300	0	0	0	1,412,600
8	Total	\$303,023,600	\$159,497,100	\$57,423,400	\$41,651,200	\$9,757,500	\$11,910,200	\$21,281,400	\$1,502,800

Table 26 shows allocated and adjusted cost of service by customer class, revenue under existing rates, and the indicated revenue adjustment by each class. Costs associated with public fire protection are not recovered through direct charges; therefore, the cost of service for this class is reallocated to all other customers in proportion to their allocated cost of service as shown in Column 2. The test year adjusted cost of service, reflecting the reallocation of these costs, is shown in Column 3. The indicated increase or decrease in revenue required to meet adjusted cost of service is shown in Column 5 of Table 26.

Table 26 Comparison of Adjusted Cost of Service with Revenue under Existing Rates (Water System)

Line No.	Description	(1) Allocated COS (\$)	(2) Beneficial Use Allocation (\$)	(3) Adjusted COS (\$)	(4) Rev under Exst Rates (\$)	(5) Indicated Rev Increase (%)
Customer Class						
1	Residential	165,083,400	1,904,000	166,987,400	139,594,900	19.6%
2	Multi-Family Residential	57,981,100	668,700	58,649,800	50,982,200	15.0%
3	Non-Residential	68,597,900	791,200	69,389,100	93,218,800	-25.6%
4	Contract Wholesale	3,949,800	0	3,949,800	2,392,300	65.1%
5	Subtotal	\$ 295,612,200	\$ 3,363,900	\$ 298,976,100	\$ 286,188,200	4.5%
6	Private Fire	4,047,500	0	4,047,500	5,401,800	-25.1%
7	Public Fire	3,363,900	(3,363,900)	0	0	0.0%
8	Subtotal	\$ 7,411,400	\$ (3,363,900)	\$ 4,047,500	\$ 5,401,800	-25.1%
9	Total Water System	\$ 303,023,600	\$ -	\$ 303,023,600	\$ 291,590,000	3.9%

SEWER SYSTEM COST OF SERVICE

The methodology used in performing a cost of service analysis for the sewer system is the same regardless of the test year being evaluated. The following sections outline the cost of service

approach and results of the analysis for FY 2018. The key components of the cost of service analysis are similar to that undertaken for the sewer system:

- Determination of Cost of Service (net revenue requirements);
- Determination of Functional Costs;
- Allocation of Functional Costs to Cost Components; and
- Determination of Unit Cost of Service.

Cost of Service to be Allocated

In analyzing costs of service for allocation to customer classes, the projected annual revenue requirements for FY 2018 have been used as the test year. In determining costs of service to be met from charges for sewer service, the “net revenue requirement” for the test year is determined by deducting the following from total revenue requirements:

- Income from non-rate revenues; and
- Change in fund balance.

Table 27 presents the derivation of the cost of service to be recovered through sewer charges. As Line 14 in Table 20 indicates, the sewer cost of service for FY 2018 is projected to be \$368,356,800. This cost of service consists of \$207,889,700 of O&M expenditures and \$160,467,100 of capital costs.

Table 27 Total Cost of Service to be Recovered from Sewer Rates

LINE NO.	DESCRIPTION	OPERATING EXPENSE (\$)	CAPITAL COST (\$)	TOTAL COST (\$)
Revenue Requirements				
1	O&M Expenses	235,941,100	0	235,941,100
2	Debt Service	0	151,137,100	151,137,100
3	Cash Financed Capital	0	17,030,000	17,030,000
4	Subtotal	\$235,941,100	\$168,167,100	\$404,108,200
Less Revenue Requirements Met from Other Sources and Adjustments				
5	Other Operating Revenues	16,472,000	0	16,472,000
6	Reconstruction Debt Service Offset		7,700,000	7,700,000
7	Annual Cash Balance Adjustments	11,579,400	0	11,579,400
8	Subtotal	\$280,514,000	7,700,000	\$357,514,000
9	COS to be Recovered from Rates (Line 4 – Line 8)	\$207,889,700	\$160,467,100	\$368,356,800

Functional Cost Components

The costs of sewer service are analyzed by system function in order to properly allocate the costs to various classes of customers. In this analysis, costs are separated to the basic functional components of Volume, Capacity, Customer, and Infrastructure Investment Fee (IIF).

Volume costs are those that vary directly with the quantity of wastewater contributed. These costs consist of capital costs related to investment in system facilities that are sized on the basis of, or required because of sewer volume. This also includes operation and maintenance expenses related to those facilities and the expense of volume related treatment chemicals and purchased power.

Capacity related costs include capital costs related to investment in system facilities which are sized on the basis of, or required because of the maximum rates of sewer flow, and the operation and maintenance expense related with those facilities.

Customer costs are those which tend to vary in proportion to the number of customers served. These include the sewer utility share of customer related billing, collection and accounting expenses. Infrastructure Investment Fee (IIF) costs are those costs directly allocated to IIF to be recovered through the IIF fee.

Allocation to Cost Components

In establishing the costs associated with each functional cost component, the net capital portion of the test year cost of service is distributed to cost functions based on an allocation of the estimated test year value of sewer system facilities. Net operating expense is similarly allocated to cost functions based on the projected test year expense estimated for each sewer system component.

Allocation of Plant Investment

The estimated test year value of sewer system facilities is allocated to appropriate cost functions as the basis for further distribution to the various customer classes. The estimated test year net plant investment in existing sewer system facilities consists of plant in service as of June 30, 2016, and the estimated cost of proposed capital improvements expected to be in service by the end of 2017. Table 28 shows the allocation of total estimated sewer system net plant value for the test year on an original cost less depreciation value basis. Total net plant investment is estimated to be \$3,124,690,700, as shown on Line 8 of the table.

Table 28 Allocation of Net Plant Investment to Functional Cost Components (Sewer System)

Line No.	Description	Total Costs	Common to All Customers		
			Base		Customer
			Volume	Capacity	Billing
		(\$)	(\$)	(\$)	(\$)
	Plant Assets				
1	Collection	967,097,300	6,002,300	961,095,000	0
2	Pumping	138,504,700	2,665,700	135,839,000	0
3	Treatment Plants	556,551,500	470,146,400	86,405,100	0
4	Other Treatment Plants	1,169,747,700	994,285,500	175,462,200	0
5	Rockville	(46,375,200)	0	(46,375,200)	0
6	Connection Services	237,476,800	0	0	237,476,800
7	General Plant	101,687,900	49,552,200	44,147,400	7,988,300
8	Net Plant Assets	\$3,124,690,700	\$1,522,652,100	\$1,356,573,500	\$245,465,100

Each item of plant investment is allocated to a functional component, or components, primarily in accordance with the function which determines the amount of investment. Projected test year net

capital costs, totaling \$160,467,100 are assigned to the functional cost components on the basis of the allocation of plant investment shown in Table 28.

Allocation of Operating Expense

Test year operation and maintenance expenses are allocated to functional cost components as shown in Table 29. The allocation is similar to the allocation of plant value.

Table 29 Allocation of Operation & Maintenance Expenses to Functional Cost Components (Sewer System)

Line No.	Description	Total Costs	Common to All Customers			
			Base		Customer	
			Volume	Capacity	Billing	IIF
		(\$)	(\$)	(\$)	(\$)	(\$)
Operating Expenses						
1	Staff Offices Team	28,953,200	16,154,200	10,412,300	2,032,300	354,400
2	Customer Relations Team	7,004,900	0	0	7,004,900	0
3	Engineering & Construction Team	16,512,500	7,699,800	5,957,000	446,100	2,409,600
4	Finance Office Team	21,015,900	13,093,800	6,518,200	1,095,500	308,400
5	Information Technology Team	16,479,400	10,303,400	5,083,800	849,100	243,100
6	Logistics Office Team	6,158,600	3,850,600	1,899,900	317,300	90,800
7	Production Team	103,818,800	94,421,200	8,688,000	709,600	0
8	Utility Services Team	35,997,700	0	35,743,000	254,700	0
9	Operating Reserve Contribution	0	0	0	0	0
10	Subtotal	\$235,941,000	\$145,523,000	\$74,302,200	\$12,709,500	\$3,406,300
Less Other Revenue						
11	Miscellaneous Revenues	16,472,000	10,159,600	5,187,300	887,300	237,800
12	Other Adjustments	11,579,400	7,141,800	3,646,600	623,800	167,200
13	Net Operating Expenses	\$207,889,600	\$128,221,600	\$65,468,300	\$11,198,400	\$3,001,300

Distribution of Costs to Customer Classes

The total cost responsibility of each class of service may be established by developing unit costs of service for each cost function and assignment of those costs to the customer classes based on the respective service requirement to each. To properly recognize the cost of service, each customer class is allocated its share of volume, capacity and customer costs.

Customer Classifications

For purposes of cost of service analysis and rate design, the sewer system's customers are classified to reflect groups of customers with similar service requirements who can be served at a similar average cost and the classification used by the WSSC for record keeping purposes. The specific categories used in the cost of service study include Single Family Residential, Multifamily, and Nonresidential.

Units of Service

In allocating the responsibility for costs of service, volume, capacity, and customer costs may be distributed to customer classes according to respective service requirements of the classes.

The cost of service responsibility for volume costs varies with the volume of wastewater contributed to the sewer system is distributed to customer classes on that basis. Capacity related costs are those costs associated with providing maximum capacity for sewer flows and are distributed to customer classes on the basis of estimated maximum rates of sewer flow. Customer

costs, which consist of billing, collection and accounting costs, are allocated on the basis of the number of monthly bills.

The estimated test year service requirements or units of service for the various customer classes are shown in Table 30. Wastewater collected and treated by the utility is made up of two elements (1) sanitary sewer flow and (2) infiltration/inflow (I/I) of ground water and surface water into the sewers. Contributed sewer volume is that portion of the billable annual water use of each class estimated to enter the sanitary sewer system. The balance of sewer flow processed by the treatment plants is assumed to comprise I/I. Based on a review of historical influent sewer flow at each of the wastewater treatment plants and billed volume, it is estimated that the test year amount of flow entering the sewers as I/I will average approximately 43 percent of the total volume transported by the sewer system. Each customer class should bear its proportionate share of the costs associated with I/I, as the sewer system must be adequate to convey and process the total sewer flow. Recognizing that I/I occurs both due to problematic connections to the system, as well as cracks in pipes within the system, half of the projected I/I volume associated with the sewer collection system is allocated to customer classes based on the number of customers with the remaining half allocated on the basis of contributed volume entering the treatment plant through the sanitary sewer system.

Capacity requirements are based on estimated contributed wastewater and I/I rate of flow. The capacity units include a peak rate of contributed flow of 1.5 times the average, and peak rate of I/I of 3.0 times the average.

The estimated test year units of service requirements for the various customer classifications are shown in Table 30.

Table 30 Estimated Units of Service (Sewer System)

Line No.	Description	Volume			Total Sewer System
		Single Family Residential	Multi-Family Residential	Non Residential	
All Customers					
Wastewater Volume (kgal)					
1	Billed Volume	20,419,719	10,235,721	9,600,208	40,255,648
2	Infiltration/Inflow				
3	Customer Related	12,391,190	697,622	1,934,283	15,023,094
4	Volume Related	7,620,480	3,819,891	3,582,723	15,023,094
5	Subtotal I/I	20,011,670	4,517,513	5,517,005	30,046,189
6	Total	40,431,389	14,753,234	15,117,213	70,301,837
Wastewater Capacity Flow Rate (kgal/day)					
7	Billed Volume	83,917	42,065	39,453	165,435
8	Infiltration/Inflow				
9	Customer Related	101,845	5,734	15,898	123,477
10	Volume Related	62,634	31,396	29,447	123,477
11	Subtotal I/I	164,479	37,130	45,345	246,954
12	Total	248,396	79,195	84,798	412,389
Customer Units					
13	Equivalent Bills	1,706,420	17,252	74,360	1,798,032
14	Equivalent Meters	469,291	26,421	73,257	568,969

Customer Class Costs of Service

Unit costs are developed by dividing the total cost allocated to each functional cost component by the total applicable units of service. The customer class responsibility for service is obtained by applying unit costs of service to the number of units for which the customer class is responsible.

Table 31 presents the development of unit costs of service applicable to each cost function. Total allocated costs shown on Lines 1 through 4 reflect the total cost of service to be recovered from rates. Line 5 shows the total units of service in Table 30. Unit costs of service for each component are determined simply by dividing the allocated cost by the total units of service for each cost component, as shown in Line 6.

Table 31 Unit Cost of Service (Sewer System)

Line No.	Description	Total Costs	Common to All Customers			
			Base		Customer	
			Volume	Capacity	Billing	IIF
		(\$)	(\$)	(\$)	(\$)	(\$)
Unit Cost of Service						
1	Net Operating Expense	207,889,700	128,221,700	65,468,300	11,198,400	3,001,300
2	Capital Costs	17,030,000	8,298,700	7,393,500	1,337,800	0
3	Debt Service	143,437,100	67,256,000	59,920,300	10,842,300	5,418,500
4	Total	\$368,356,800	\$203,776,400	\$132,782,100	\$23,378,500	\$8,419,800
5	Units of Service (Total)		70,301,837	412,389	1,798,032	641,949
6	Cost per Unit		\$2.90	\$321.98	\$13.00	\$13.12
			per kgal	per kgpd	per bill	per EM

Table 32 shows the allocation of cost of service to customer classes. Costs are allocated to various customer classes by applying the appropriate unit cost of service to the respective service requirements of each customer class.

Table 32 Allocation of Cost of Service to Customer Classes (Sewer System)

Line No.	Description	Total Costs (\$)	Common to All Customers			
			Base		Customer	
			Volume (\$)	Capacity (\$)	Billing (\$)	IIF (\$)
1	Cost per Unit		\$2.90 per kgal	\$321.98 per kgpd	\$13.00 per bill	\$13.12 per EM
Residential						
2	Units		40,431,389	248,396	1,706,420	469,291
3	Allocation of costs of service	226,473,300	117,194,200	79,979,200	22,187,400	7,112,500
Multi-Family Residential						
4	Units		14,753,234	79,195	17,252	26,421
5	Allocation of costs of service	68,833,800	42,763,600	25,499,400	224,300	346,500
Non-Residential						
6	Units		15,117,213	84,798	74,360	73,257
7	Allocation of costs of service	73,049,700	43,818,600	27,303,500	966,800	960,800
8	Total	\$368,356,800	\$203,776,400	\$132,782,100	\$23,378,500	\$8,419,800

Table 33 shows allocated and adjusted cost of service by customer class, revenue under existing rates, and the indicated revenue adjustment by each class. The test year cost of service is shown in Column 1. The indicated increase or decrease in revenue required to meet adjusted cost of service is shown in Column 3 of Table 33.

Table 33 Comparison of Adjusted Cost of Service with Revenue under Existing Rates (Sewer System)

Line No.	Description	(1)	(2)	(3)
		Allocated COS (\$)	Rev under Exst Rates (\$)	Indicated Rev Increase (%)
Customer Class				
1	Residential	226,473,300	175,479,200	29.1%
2	Multi-Family Residential	68,833,800	71,780,000	-4.1%
3	Non-Residential	73,049,700	112,209,400	-34.9%
4	Subtotal	\$ 368,356,800	\$ 359,468,600	2.5%
5	Total Sewer System	\$ 368,356,800	\$ 359,468,600	2.5%

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5 Rate Design

The cost of service analysis discussed in the previous section provides a guideline for evaluating the proportionate cost responsibility by customer class. In addition, it provides a reasonable basis for the development of water and sewer volumetric charges that recover the allocated cost of service under the three alternative rate structures identified by the Bi-County Rate Structure Working Group. Customer demand characteristics influence the magnitude of cost of service that is calculated for each customer class, and rate structure when designed distinctly for *each class* allows the precise recovery of the calculated cost of service from each customer class. However, WSSC is restricted by statute to have a single rate structure for all customer classes. In such a situation, it is only feasible under recognized Cost of Service Study principles to design a rate structure that closely recovers the calculated cost of service by customer class.

It should be recognized that the cost allocation process involves engineering estimates, consideration of historical data and assumptions based on practical considerations such as customer bill impact, stakeholder acceptance, administrative concerns and other policy objectives that should be recognized in making rate adjustments. The following rates have been developed to meet cost of service recovery to the extent possible. Determination of proposed rates under the selected rate structure should take into consideration the additional factors previously mentioned.

Following is a summary of the calculated rates based on cost of service for the three alternative rate structures. As previously discussed, this study does not reflect any changes to the existing Ready-to-Serve charges.

UNIFORM VOLUMETRIC CHARGE

Under a uniform volumetric charge, all usage, regardless of amount, is billed at the same unit rate. For FY 2018, the uniform volume charge is calculated to be \$5.94 per thousand gallons (Kgal) for water and \$8.29/Kgal for sewer, for a total combined rate of \$14.23/Kgal. Table 34 provides a comparison of calculated revenue under a uniform volume charge with revenue existing rates for water and sewer combined.

Table 34 Comparison of Calculated Revenue under Uniform Volume Charge with Revenue Under Existing Rates

LINE NO.	CUSTOMER CLASS	TOTAL COS (\$)	REVENUE UNDER NEW RATES (\$)	PERCENT RECOVERY OF COS (%)
1	Residential	520,944,300	500,301,700	96.0%
2	Non-Residential	142,438,800	163,622,700	114.9%
3	Contract Wholesale	3,949,800	3,408,300	86.3%
4	Private Fire	4,047,500	4,047,500	100.0%
5	Total Water and Sewer System	\$671,380,400	\$671,380,200	100.0%

Table 35 presents a comparison of typical bills for customers with a ¾ inch, 2 inch and 6 inch meter based on the average volume per bill for each meter size.

Table 35 Comparison of Calculated Typical Bills with Bills under Current Rates (Uniform Rates)

LINE NO.	DESCRIPTION	CALCULATED QUARTERLY BILL		
		¾ inch	2 inch	6 inch
1	Average Daily Consumption (gallons per day)	137	2,170	11,638
2	Average Billed Volume per Quarter (gallons) ³	13,000	198,000	1,062,000
3	Existing Rate Structure (FY 2018 Rates)	\$162.94	\$3,827.48	\$21,979.32
4	Uniform Volumetric Charge	\$213.02	\$3,030.05	\$16,534.01
5	Increase/Decrease - \$	\$50.08	(\$797.43)	(\$5,445.31)
6	Increase/Decrease - %	30.7%	-20.8%	-24.8%

4 TIER VOLUMETRIC CHARGE STRUCTURE (OPTION 1)

Under the 4 tier volumetric charge structure, volume would be billed incrementally within each block, rather than all volume being billed at the highest tier reached. Table 36 provides a summary of the percentage of volume billed within each tier by customer class. Table 37 provides a summary of the cost of service rates for Option 1. Table 38 provides a summary of revenue recovery under Option 1 compared to revenue under existing rates.

Table 36 Summary of Billed Volume under Option 1

LINE NO.	DESCRIPTION	RESIDENTIAL	NON-RESIDENTIAL
1	0 – 99 gallons/day	48.5%	4.3%
2	100 – 249 gallons/day	22.7%	3.9%
3	250 – 8,999 gallons/day	20.02%	42.4%
4	9,000 and over gallons/day	8.8%	49.4%
5	Total	100.0%	100.0%

Table 37 Summary of 4 Tier Volumetric Charge Structure (Option 1)

LINE NO.	DESCRIPTION	WATER	SEWER	COMBINED
4-Tier Option 1				
1	0 – 99 gallons/day	\$7.31	\$10.06	\$17.37
2	100 – 249 gallons/day	\$6.58	\$9.05	\$15.63
3	250 – 8,999 gallons/day	\$4.75	\$6.54	\$11.29
4	9,000 and over gallons/day	\$4.39	\$6.04	\$10.43

³ Calculated as gallons per day times 365, divided by 4; rounded to nearest 1,000 gallons.

Table 38 Comparison of Calculated Revenue under 4 Tier Volume Charge with Revenue Under Existing Rates (Option 1)

LINE NO.	CUSTOMER CLASS	TOTAL COS (\$)	REVENUE UNDER NEW RATES (\$)	PERCENT RECOVERY OF COS (%)
1	Residential	520,944,300	530,375,300	101.8%
2	Non-Residential	142,438,800	133,604,100	93.8%
3	Contract Wholesale	3,949,800	3,353,100	84.9%
4	Private Fire	4,047,500	4,047,500	100.0%
5	Total Water and Sewer System	\$671,380,400	\$671,380,200	100.0%

Table 39 presents a comparison of typical bills for customers with a ¾ inch, 2 inch and 6 inch meter based on the average volume per bill for each meter size.

Table 39 Comparison of Calculated Typical Bills with Bills under Current Rates (4 Tier Option 1)

LINE NO.	DESCRIPTION	CALCULATED QUARTERLY BILL		
		¾ inch	2 inch	6 inch
1	Average Daily Consumption (gallons per day)	137	2,170	11,638
2	Average Billed Volume per Quarter (gallons) ⁴	13,000	198,000	1,062,000
3	Existing Rate Structure (FY 2018 Rates)	\$162.94	\$3,827.48	\$21,979.32
4	4 Tier Structure (Option 1)	\$246.91	\$2,561.75	\$13,316.19
5	Increase/Decrease - \$	\$83.97	(\$1,265.73)	(\$8,663.13)
6	Increase/Decrease - %	51.5%	-33.1%	-39.4%

4 TIER VOLUMETRIC CHARGE STRUCTURE (OPTION 2)

Under the 4 tier volumetric charge structure, volume would be billed incrementally within each block, rather than all volume being billed at the highest tier reached. Table 40 provides a summary of the percentage of volume billed within each tier by customer class. Table 41 provides a summary of the cost of service rates for Option 2. Table 42 provides a summary of revenue recovery under Option 2 compared to revenue under existing rates.

Table 40 Summary of Billed Volume under Option 2

LINE NO.	DESCRIPTION	RESIDENTIAL	NON-RESIDENTIAL
1	0 – 240 gallons/day	70.6%	8.0%
2	241 - 600 gallons/day	7.0%	6.7%
3	601 – 9,000 gallons/day	12.7%	35.8%
4	Over 9,000 gallons/day	8.8%	49.4%
5	Total	100.0%	100.0%

⁴ Calculated as gallons per day times 365, divided by 4; rounded to nearest 1,000 gallons.

Table 41 Summary of 4 Tier Volumetric Charge Structure (Option 2)

LINE NO.	DESCRIPTION	WATER	SEWER	COMBINED
4-Tier Option 2				
1	0 – 240 gallons/day	\$6.84	\$9.46	\$16.30
2	241 - 600 gallons/day	\$6.16	\$8.51	\$14.67
3	601 – 9,000 gallons/day	\$5.13	\$7.10	\$12.23
4	Over 9,000 gallons/day	\$4.10	\$5.68	\$9.78

Table 42 Comparison of Calculated Revenue under 4 Tier Volume Charge with Revenue Under Existing Rates (Option 2)

LINE NO.	DESCRIPTION	TOTAL COS (\$)	REVENUE UNDER NEW RATES (\$)	PERCENT RECOVERY OF COS (%)
Customer Class				
1	Residential	520,944,300	527,170,500	101.2%
2	Non-Residential	142,438,800	136,245,600	95.7%
3	Contract Wholesale	3,949,800	3,916,900	99.2%
4	Private Fire	4,047,500	4,047,500	100.0%
5	Total Water and Sewer System	\$671,380,400	\$671,380,200	100.0%

Table 43 presents a comparison of typical bills for customers with a ¾ inch, 2 inch and 6 inch meter based on the average volume per bill for each meter size.

Table 43 Comparison of Calculated Typical Bills with Bills under Current Rates (4 Tier Option 2)

LINE NO.	DESCRIPTION	CALCULATED QUARTERLY BILL		
		¾ inch	2 inch	6 inch
1	Average Daily Consumption (gallons per day)	137	2,170	11,638
2	Average Billed Volume per Quarter (gallons) ⁵	13,000	198,000	1,062,000
3	Existing Rate Structure (FY 2018 Rates)	\$162.94	\$3,827.48	\$21,979.32
4	4 Tier Structure (Option 2)	\$239.90	\$2,802.83	\$13,986.71
5	Increase/Decrease - \$	\$76.96	(\$1,024.65)	(\$7,992.61)
6	Increase/Decrease - %	47.2%	-26.8%	-36.4%

CONSIDERATIONS FOR DEVELOPMENT OF A RECOMMENDED FY2019 RATE STRUCTURE

The preceding discussion of three alternative rate structures provides an indication of the impact that would occur if the rate structures were to be implemented for FY 2018. In developing a

⁵ Calculated as gallons per day times 365, divided by 4; rounded to nearest 1,000 gallons.

recommended rate structure for FY2019, similar impacts can be expected, with the specific dollar (\$) impact varying depending upon decisions regarding total revenue needs for FY2019.

In developing a recommended rate structure for FY 2019 and beyond, it is important to incorporate the key objectives prioritized by the Bi-County Rate Structure Working Group. In addition, adherence to industry best practices and rate design principles proffered by industry organizations such as the American Water Works Association (AWWA) and the Water Environment Federation (WEF) are also important for establishing defensible rates.

Key Rate Design Principles

The key principles and considerations that influence the design of water and sewer rate structures and schedules are as follows:

- Equitable and non-discriminating (cost of service based)
- Revenue Stability / Financial Sustainability
- Ability to provide appropriate Price Signals
- Recognizes Customer Usage Patterns & Demands
- Easy to Understand and Administer
- Enables Customer Acceptance
- Consistent with WSSC Policies
- Legally Acceptable/Defensible
- Facilitates consistent interpretation and application of the rate structure in billing

Prioritized Rate Structure Objectives

To facilitate a discussion on the rate structure objectives, the Bi-County Rate Structure Working Group discussed and prioritized a list of objectives. It is often the case that some of the objectives could become competing objectives, and therefore it is not practical in any rate design to achieve all stated objectives. The prioritization of objectives therefore helps to identify the most critical objectives in the evaluation of alternative rate structures.

Figure 2 summarizes the top five rate setting priorities that emerged from the Bi-County Rate Structure Working Group's prioritization work.

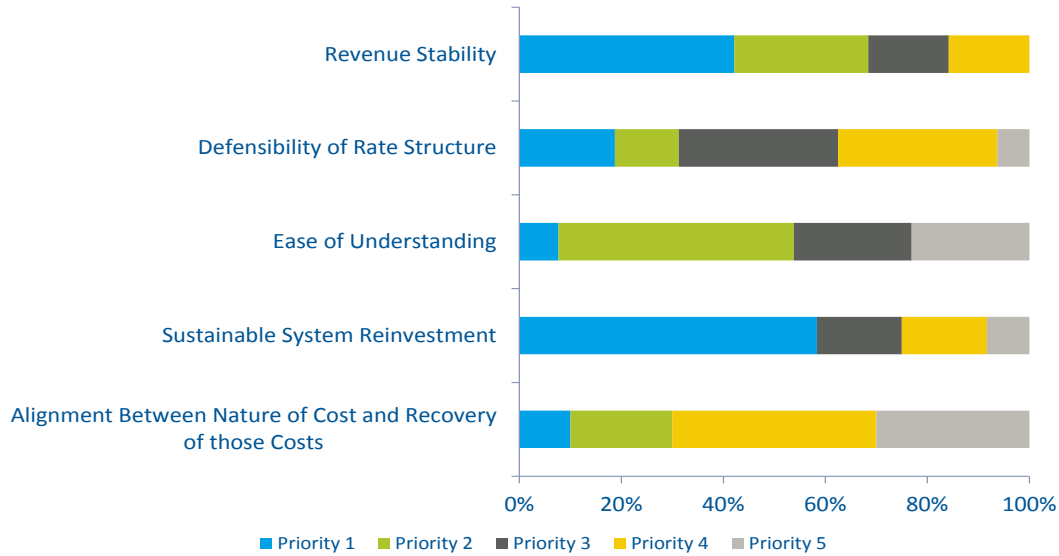


Figure 2 Bi-County Working Group’s Rate Setting Priorities

Recommended FY 2019 Rate Structure

Due to the significant shift in revenue recovery by customer class that would occur under any of the alternative rate structures, WSSC may want to consider developing a phase-in plan that would allow movement toward a final rate structure over a period of time. In addition, the above analysis is based on the results of the cost of service analysis only. While cost of service is an important element of rate design, it is important that WSSC also consider other policy objectives in developing a recommended rate structure for FY 2019 and beyond.