

Metro Water Services of
**NASHVILLE AND
DAVIDSON COUNTY**

**Water and Sewer Financial Planning and
Cost of Service Study**

Revised Executive Summary and Appendix /
October 15, 2019





October 15, 2019

Mr. Scott Potter
Utility Director
MWS Services
Nashville and Davidson County
1600 2nd Avenue North
Nashville, TN 37208

Subject: REVISED Executive Summary and Appendices for the Water and Sewer Financial Plan and Cost of Service Study Report

Dear Mr. Potter,

Raftelis Financial Consultants, Inc. (Raftelis) is pleased to provide this Revised Executive Summary and Appendix for the Water and Sewer Financial Plan and Cost of Service Study for the Nashville and Davidson County Metro Water Services (MWS).

The Water and Sewer Financial Plan and Cost of Service Study Report results dated August 27, 2019 were based on MWS' fiscal year budget cycle of July to June. The original COS analysis assumed a fiscal year implementation of retail rates starting July 1, 2019 for FY2020. Based on the delayed timing of the implementation of rate adjustments to January 1, 2020, larger rate increases are needed than those that are shown in the original report. Given that the rates will only be in place for half the year, and the resulting deficit that would be created by having the revised rates in place for less time, the initial rate increase was revised to match the recommended FY 2021 rates proposed in the original report. Additionally, future rate increases in the original report assumed July 1 (fiscal year) implementation. The rates shown in this Revised Executive Summary reflect the adjustments from fiscal year to calendar year annual increases.

The information and results presented in the Water and Sewer Financial Plan and Cost of Service Study Report have not changed, however, the recommendations from the Report have been updated to reflect MWS's rate implementation timing.

It has been a pleasure working with you, and we thank you and MWS staff for the support provided during the course of this study.

Sincerely,

A handwritten signature in black ink that reads 'Melissa Levin'.

Melissa Levin
Senior Manager

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Executive Summary

Metro Water Services of Nashville and Davidson County (MWS) engaged Raftelis to perform a water and sewer financial planning and cost of service evaluation (Study) to support water and sewer rate recommendations according to commonly-accepted industry practices. The goals and objectives of the Study, as identified by MWS Staff, include developing a thorough understanding of the following items:

- The costs of providing water and sewer service to different customer classes
- Alignment of revenues under the existing rates with the costs of providing service
- Options for implementing tiered residential rates and the impacts of doing so
- Maintaining affordability of service for customers
- Multi-year water and sewer rate projections that support long-term financial needs.

At approximately the same time as MWS' engagement of Raftelis to perform the Study, the Tennessee Comptroller of the Treasury referred MWS to the Water and Wastewater Financing Board (WWFB). The WWFB found MWS' water and sewer fund to be "financially distressed" and directed MWS to provide a completed rate study and the implemented or proposed plan of action to address noted financial deficiencies on or before August 31, 2019.

BACKGROUND

For the past 20 years, MWS' water and sewer rates have been among the lowest for large metropolitan areas in the United States. Prior to the implementation of a three-year programmatic rate increase in 2009, the last time a water rate increase had been proposed and approved was in 1995, with a sewer rate increase in 1996. Water rates were subsequently reduced by 25% for residential customers and a lesser amount for commercial customers in 1999. Since 2011, water and sewer rates have not been adjusted.

MWS has relied on its system growth to provide sufficient revenue to fund utility operations and capital improvement costs, however, the sustained population and service area growth Nashville has experienced over the last two decades, along with increasing regulatory considerations, has required MWS to make substantial and costly infrastructure upgrades. In addition, in March 2009, the Metropolitan Government of Nashville and Davidson County entered a Consent Decree that requires an estimated \$1.5 billion in investment to bring the system into compliance with EPA's CSO Control Policy and minimize System Sewer Overflows.

MWS has reached the point where its capital and operational needs far exceed its expected revenue generation; its existing water and sewer rates no longer suffice.

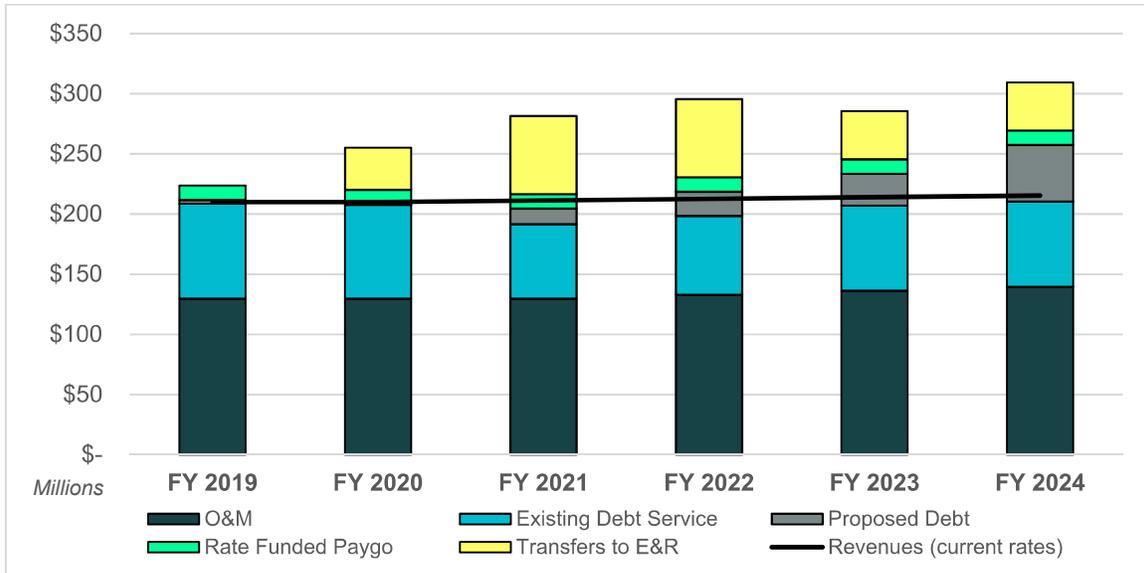
STUDY FINDINGS AND RECOMMENDATIONS

Revenue Sufficiency Under Existing Rates

Raftelis developed a financial plan for MWS that summarizes anticipated revenues and system expenditures for a five-year forecast period (FY 2020 through FY 2024). The financial plan identifies a baseline by calculating potential revenue shortfalls under MWS' existing rates and provides an indication of the additional revenues necessary to support the financial health of the utility.

Based on the financial plan, the level of revenues projected to be generated from MWS' existing rates are insufficient. The figure below shows projected water and sewer operating expenses, debt service, and capital funding in relation to projected revenues under current rates. If FY 2019 rates are held through FY 2024, annual net revenues will be nearly \$45 million short in FY 2020 and will increase to an over \$94 million shortfall in FY 2024.

Figure ES-1: Projected Revenue Sufficiency with No Rate Increases



While annual revenues exceed annual operating expenses (O&M) and existing debt service obligations, MWS will not be able to make needed capital improvements and will be at risk of defaulting on existing bond covenants without future rate increases.

MWS' legal debt covenants that are part of the bond indenture require MWS to maintain revenue at a level sufficient to repay all obligations. These ratios reflect the ability of the utility to repay debt, with higher values demonstrating a greater availability of net revenues being available to pay for debt service. As shown in the following table, Prior Second Lien debt, which includes revenue bonds used in refunding commercial paper, has a legal limit of 1.20x. Subordinate debt, including subordinate lien refunding bonds, requires a lower 1.10x coverage ratio. In addition to the rate covenant ratios, MWS is also required to conduct a two-part additional bonds test based on maximum annual debt service with 1.20x and 1.10x coverage targets in order to issue new debt. In all four cases, MWS is projected to fall short of the targeted coverage levels required within the forecast period.

Table ES-1: Rate Covenant Ratios and Additional Bonds Test

	FY 2019 <i>Estimated*</i>	FY 2020 <i>Projected</i>	FY 2021 <i>Projected</i>	FY 2022 <i>Projected</i>	FY 2023 <i>Projected</i>	FY 2024 <i>Projected</i>
Rate Covenant Ratios						
Prior Second Lien (1.20x Required)	1.67x	1.68x	1.91x	1.48x	1.18x	0.95x
Subordinate (1.10x Required)	1.21x	1.23x	1.37x	1.15x	0.96x	0.80x
Additional Bonds Test						
Part I (1.20x Required)	1.74x	1.36x	1.36x	1.10x	0.90x	0.89x
Part II (1.10x Required)	1.26x	1.08x	1.08x	0.92x	0.77x	0.76x

*Estimated values, FY2019 was unaudited at time of report

Rate increases are required to address the projected shortfall in revenues over for the five-year forecast period. Given the need for the rate adjustments and MWS' objective of determining the costs of providing water and sewer service to different customer classes, Raftelis performed a cost of service evaluation.

Cost of Service Analysis

The basic principle in the establishment of cost of service rates is to achieve equity in the recovery of costs from various classes of customers. The approach used in this Study is based on the principles endorsed by the AWWA and WEF, which allows the MWS to demonstrate rates have not been set in an arbitrary manner and one class of customer is not subsidizing another to an unjustifiable extent, or in a manner that is not approved and supported by MWS. Costs have been allocated between customer classes based on their estimated demand requirements and recognizing the different costs associated with serving different customer classes.

The results of the cost of service evaluation indicate that if MWS' existing rates were uniformly adjusted to recover the system expenditures identified for FY 2020, the revenue from water charges and sewer charges would not appropriately address the associated costs to deliver the respective services. Essentially, for FY 2020, the sewer revenues are subsidizing water expenses. Additionally, the cost of service evaluation indicates that non-residential customer classes are subsidizing the residential class for both water and sewer services.

Alternative Rate Structures

Raftelis considered MWS' programmatic goals and pricing objectives and developed alternative rate structures that are cost of service based, encourage wise water use/conservation, and provide for affordable water for essential residential use. Three rate design scenarios were developed for consideration. Each scenario began with common fixed charges for all classes but differed in the way volume charges were developed. The following table outlines the basic differences between rate scenarios.

Table ES-2: Rate Alternative Scenarios

	Scenario 1	Scenario 2	Scenario 3
Water			
Usage in base charge	0 ccf	2 ccf	2 ccf
Residential volume rate	3 Tiers	3 Tiers	3 Tiers
Non-residential volume rate	Uniform	Uniform	Uniform
Water Infrastructure Replacement Fee	0%	0%	10%
Sewer			
Usage in base charge	0 ccf	2 ccf	2 ccf
Residential volume rate	Uniform	Uniform	Uniform
Non-residential volume rate	Uniform	Uniform	Uniform
Sewer Infrastructure Replacement Fee	10%	10%	10%

Summary of Recommendations

The results of the Study indicate that MWS is in need of significant rate adjustments in the current fiscal year (FY 2020) and future years to meet required operating and capital needs. In addition, the existing rate structure is atypical and does not equitably recover costs from existing customer classes. A rate structure change is needed to address cost of service-related issues.

Based on the results of the Study, three recommendations are proposed.

1. A rate structure change based on the cost of service analysis that incorporates the needed rate increases for FY 2020.¹ The Alternative Rate Structures section of the Final Report details three rate scenarios, of which Scenario 3 is recommended. The following information summarizes the recommended structure.
 - The fixed meter charges are uniform across all customer classes and are cost justified, providing for more equitable cost recovery when compared to the existing fixed charges. This also removes the “small,” “medium,” and “large” designations so that all commercial customers are included in one class.
 - The first two ccf of water remains included in the fixed charges, allowing for an essential use water allowance for all customers at minimal costs.
 - The residential volumetric rate includes a tiered approach encouraging wise water use by charging more for discretionary water use.
 - A 10% Water Infrastructure Replacement (WIR) fee and 10% Sewer Infrastructure Replacement (SIR) fee is included. Both fees will provide for dedicated funding sources for the continual replacement of MWS’s aging water distribution and sewer collection infrastructure.

Table ES-3: Proposed Rates – Scenario 3

Scenario 3			
Fixed Charges		Water	Wastewater
5/8-Inch		\$5.09	\$8.14
3/4-Inch		12.12	36.00
1-Inch		15.28	46.58
1.5-Inch		26.85	90.67
2-Inch		37.91	127.38
3-Inch		60.58	158.59
4-Inch		137.72	449.98
6-Inch		171.93	536.44
8 & 10-Inch		223.72	686.89
Residential Rate	Thresholds	Water	Wastewater
Base Usage	0-2	\$-	\$-
Tier 1	2-6	3.50	5.85
Tier 2	6-10	4.20	5.85
Tier 3	>10	5.25	5.85
Non-Residential Rate		Water	Wastewater
All Usage		\$2.75	\$5.85

2. Future rate increases for the calendar years (CY) 2021-2024 of the forecast period. The Financial Plan section of the Final Report details increasing operating and capital requirements that cannot be addressed in a one-year rate adjustment, they must be addressed over multiple years. These operating and capital requirements have been segregated between water and sewer for each year of the forecast period to eliminate any future subsidies between the two utilities. The projected rate increases for the five-year forecast period are shown below.

¹ The original cost of service analysis assumed a fiscal year implementation of rates July 1, 2019 for FY2020. Based on the delayed timing of the implementation of rate adjustments (January 1, 2020), larger rate increases are needed compared to those that are shown in the original report. Given the half-year implementation and the resulting deficit, the initial rate increase was revised to match the recommended FY 2021 cost of service rates from the original report. Additionally, rate increases in the original report assumed July 1 (fiscal year) implementation. The rates shown in this Executive Summary reflect the adjustments to calendar year increases.

Table ES-4: Future Rate Increases

	FY 2019	CY 2020	CY 2021	CY 2022	CY 2023	CY 2024
Water		COS				
Fixed Charges	0.0%		4.0%	3.0%	3.0%	3.0%
Volume Charges	0.0%	Alignment	4.0%	3.0%	3.0%	3.0%
Wastewater						
Fixed Charges	0.0%		4.0%	3.0%	3.0%	3.0%
Volume Charges	0.0%		4.0%	3.0%	3.0%	3.0%

The percentages shown above are anticipated to be applied to both the fixed and variable components of the water and sewer rate structures, respectively. Based on these percentage rate increases, the recommended rates are shown below for both water and sewer.

Table ES-5: Proposed Rates – Water, Recommended Scenario

	CY 2020	CY 2021	CY 2022	CY 2023	CY 2024
Fixed Charges					
5/8-Inch	\$5.09	\$5.30	\$5.45	\$5.62	\$5.79
3/4-Inch	12.12	12.61	12.98	13.37	13.78
1-Inch	15.28	15.89	16.36	16.86	17.36
1.5-Inch	26.85	27.92	28.76	29.62	30.51
2-Inch	37.91	39.42	40.61	41.82	43.08
3-Inch	60.58	63.01	64.90	66.84	68.85
4-Inch	137.72	143.23	147.53	151.95	156.51
6-Inch	171.93	178.81	184.18	189.70	195.39
8 & 10-Inch	223.72	232.67	239.65	246.84	254.24
Residential Rate					
Tier 1 (0-2 ccf)	\$-	\$-	\$-	\$-	\$-
Tier 2 (2-6 ccf)	3.50	3.64	3.75	3.86	3.98
Tier 3 (6-10 ccf)	4.20	4.37	4.50	4.64	4.78
Tier 4 (>10 ccf)	5.25	5.46	5.63	5.80	5.97
Non-Residential Rate					
All Usage	\$2.75	\$2.86	\$2.95	\$3.04	\$3.13

Table ES-6: Proposed Rates - Sewer, Recommended Scenario

	CY 2020	CY 2021	CY 2022	CY 2023	CY 2024
Fixed Charges					
5/8-Inch	\$8.14	\$8.46	\$8.72	\$8.98	\$9.25
3/4-Inch	36.00	37.44	38.56	39.72	40.91
1-Inch	46.58	48.44	49.90	51.39	52.94
1.5-Inch	90.67	94.30	97.13	100.04	103.04
2-Inch	127.38	132.48	136.45	140.55	144.76
3-Inch	158.59	164.93	169.88	174.98	180.22
4-Inch	449.98	467.97	482.01	496.47	511.37
6-Inch	536.44	557.89	574.63	591.87	609.63
8 & 10-Inch	686.89	714.36	735.79	757.87	780.60
Residential Rate					
All Usage	\$5.85	\$6.08	\$6.26	\$6.45	\$6.64
Non-Residential Rate					
All Usage	\$5.85	\$6.08	\$6.26	\$6.45	\$6.64

- Beginning in 2025, small, regular rate increases based on the Consumer Price Index for All Urban Consumers (CPI-U) are proposed annually and in perpetuity. This will help to adjust for continually increasing operating and capital costs and to maintain MWS' debt service coverage requirements and Extension and Replacement fund balance requirements.

APPENDIX A:
REVISED
SELECT SCHEDULES FROM
COST OF SERVICE MODEL

Table A-1: Sample Water and Sewer Bills – Residential Customers

Residential – 5/8-Inch Meter		
CCF	Current Rates	Recommended Scenario
0	\$11.80	\$15.02
1	11.80	15.02
2	11.80	15.02
3	19.56	25.63
4	27.32	36.24
5	35.08	46.85
6	42.84	57.46
7	50.60	68.90
8	58.36	80.35
9	66.12	91.79
10	73.88	103.23
11	81.64	115.93
12	89.40	128.62
13	97.16	141.32
14	104.92	154.02
15	112.68	166.71
16	120.43	179.41
17	128.19	192.10
18	135.95	204.80
19	143.71	217.49
20	151.47	230.19
25	190.27	293.67
30	229.07	357.15
35	267.87	420.62
40	306.66	484.10
45	345.46	547.58
50	384.26	611.06
60	461.85	738.01
70	539.45	864.97
80	617.04	991.93
90	694.64	1,118.88
100	772.23	1,245.84
125	966.22	1,563.23
150	1,160.21	1,880.62
175	1,354.20	2,198.01
200	1,548.19	2,515.40
250	1,936.16	3,150.18

Note: projected bills include all applicable taxes and fees

Table A-2: Sample Water and Sewer Bills – Small Commercial Customers

Small Commercial - 3-Inch Meter		
CCF	Current Rates	Recommended Scenario
0	\$122.73	\$246.69
1	122.73	246.69
2	122.73	246.69
3	131.27	256.41
4	139.81	266.12
5	148.35	275.83
6	156.89	285.55
7	165.43	295.26
8	173.97	304.98
9	182.51	314.69
10	191.05	324.41
100	959.60	1,198.70
400	3,521.42	4,113.01
500	4,375.36	5,084.45
1500	12,914.76	14,798.82
2500	21,454.16	24,513.20
2600	22,308.10	25,484.64
2700	23,162.04	26,456.07
2800	24,015.98	27,427.51
2900	24,869.92	28,398.95
3000	25,723.86	29,370.39
3100	26,577.80	30,341.82
3200	27,431.74	31,313.26
3300	28,285.68	32,284.70
3400	29,139.62	33,256.14
3500	29,993.56	34,227.57
3600	30,847.50	35,199.01
3700	31,701.44	36,170.45
3800	32,555.38	37,141.89
3900	33,409.32	38,113.32
4000	34,263.26	39,084.76
4100	35,117.20	40,056.20
4200	35,971.14	41,027.64
4300	36,825.08	41,999.07
4400	37,679.02	42,970.51
4500	38,532.96	43,941.95
5000	42,802.66	48,799.14

Note: projected bills include all applicable taxes and fees

Table A-3: Sample Water and Sewer Bills – Intermediate Commercial Customers

Intermediate Commercial - 6-Inch Meter		
CCF	Current Rates	Recommended Scenario
0	\$330.20	795.11
1	330.20	795.11
2	330.20	795.11
3	337.29	804.82
4	344.38	814.54
5	351.47	824.25
6	358.56	833.97
7	365.65	843.68
8	372.74	853.40
9	379.83	863.11
10	386.92	872.83
100	1,025.01	1,747.12
400	3,152.00	4,661.43
500	3,860.99	5,632.87
1500	10,950.94	15,347.24
2500	18,040.89	25,061.62
2600	18,749.89	26,033.06
2700	19,458.88	27,004.49
2800	20,167.88	27,975.93
2900	20,876.87	28,947.37
3000	21,585.87	29,918.81
3100	22,294.86	30,890.24
3200	23,003.86	31,861.68
3300	23,712.85	32,833.12
3400	24,421.85	33,804.56
3500	25,130.84	34,775.99
3600	25,839.84	35,747.43
3700	26,548.83	36,718.87
3800	27,257.83	37,690.31
3900	27,966.82	38,661.74
4000	28,675.82	39,633.18
4100	29,384.81	40,604.62
4200	30,093.81	41,576.06
4300	30,802.80	42,547.49
4400	31,511.80	43,518.93
4500	32,220.79	44,490.37
5000	35,765.77	49,347.56

Note: projected bills include all applicable taxes and fees

Table A-4: Sample Water and Sewer Bills – Large Commercial Customers

Large Commercial - 6-Inch Meter		
CCF	Current Rates	Recommended Scenario
0	\$2,121.61	\$795.11
1	2,121.61	795.11
2	2,121.61	795.11
3	2,127.17	804.82
4	2,132.74	814.54
5	2,138.30	824.25
6	2,143.86	833.97
7	2,149.43	843.68
8	2,154.99	853.40
9	2,160.55	863.11
10	2,166.12	872.83
100	2,666.82	1,747.12
400	4,335.85	4,661.43
500	4,892.19	5,632.87
1500	10,455.62	15,347.24
2500	16,019.04	25,061.62
2600	16,575.39	26,033.06
2700	17,131.73	27,004.49
2800	17,688.07	27,975.93
2900	18,244.41	28,947.37
3000	18,800.76	29,918.81
3100	19,357.10	30,890.24
3200	19,913.44	31,861.68
3300	20,469.78	32,833.12
3400	21,026.13	33,804.56
3500	21,582.47	34,775.99
3600	22,138.81	35,747.43
3700	22,695.15	36,718.87
3800	23,251.50	37,690.31
3900	23,807.84	38,661.74
4000	24,364.18	39,633.18
4100	24,920.52	40,604.62
4200	25,476.87	41,576.06
4300	26,033.21	42,547.49
4400	26,589.55	43,518.93
4500	27,145.89	44,490.37
5000	29,927.61	49,347.81

Note: projected bills include all applicable taxes and fees

Table A-5: Total Water and Sewer Bills, Residential Class – 5/8-Inch Meter

CCF	Current Rates		Recommended Rates			
	2019	2020	2021	2022	2023	2024
Residential - 5/8" Meter						
2	\$11.80	\$15.02	\$15.63	\$16.09	\$16.58	\$17.08
4	27.32	36.24	37.68	38.81	39.98	41.13
6	42.84	57.46	59.74	61.52	63.37	65.18
8	58.36	80.35	83.54	86.03	88.63	91.19
10	73.88	103.23	107.34	110.53	113.88	117.20

Table A-6: Customer Accounts

	FY 2019 <i>Estimated</i>	FY 2020 <i>Projected</i>	FY 2021 <i>Projected</i>	FY 2022 <i>Projected</i>	FY 2023 <i>Projected</i>	FY 2024 <i>Projected</i>
Water Accounts						
Residential	164,614	164,614	166,258	167,918	169,595	171,290
Small Commercial	9,780	9,780	9,874	9,969	10,065	10,163
Intermediate Commercial	5,870	5,870	5,925	5,980	6,035	6,092
Large Commercial	80	80	80	80	80	80
Total Water	180,344	180,344	182,137	183,947	185,775	187,625
<i>% Change</i>		<i>0.0%</i>	<i>1.0%</i>	<i>1.0%</i>	<i>1.0%</i>	<i>1.0%</i>
Sewer Accounts						
Residential	178,130	178,130	179,909	181,706	183,521	185,355
Small Commercial	9,677	9,677	9,771	9,865	9,961	10,058
Intermediate Commercial	5,113	5,113	5,161	5,209	5,257	5,306
Large Commercial	68	68	68	68	68	68
Total Sewer	192,988	192,988	194,909	196,848	198,807	200,787
<i>% Change</i>		<i>0.0%</i>	<i>1.0%</i>	<i>1.0%</i>	<i>1.0%</i>	<i>1.0%</i>

Table A-7: Customer Usage

	FY 2019 <i>Estimated</i>	FY 2020 <i>Projected</i>	FY 2021 <i>Projected</i>	FY 2022 <i>Projected</i>	FY 2023 <i>Projected</i>	FY 2024 <i>Projected</i>
Water Usage (ccf)						
Residential	12,655,439	12,655,439	12,781,977	12,909,782	13,038,861	13,169,232
Small Commercial	1,105,442	1,105,442	1,116,483	1,127,632	1,138,893	1,150,268
Intermediate Commercial	12,281,165	12,281,165	12,403,959	12,527,982	12,653,250	12,779,766
Large Commercial	4,622,998	4,622,998	4,669,214	4,715,890	4,763,035	4,810,651
Total Water Usage	30,665,044	30,665,044	30,971,633	31,281,286	31,594,039	31,909,917
<i>% Change</i>		<i>0.0%</i>	<i>1.0%</i>	<i>1.0%</i>	<i>1.0%</i>	<i>1.0%</i>
Sewer Usage (ccf)						
Residential	10,460,037	10,460,036	10,512,335	10,564,896	10,617,719	10,670,807
Small Commercial	890,979	890,977	895,431	899,907	904,405	908,926
Intermediate Commercial	11,236,539	11,236,538	11,292,719	11,349,182	11,405,927	11,462,955
Large Commercial	2,913,700	2,913,699	2,928,267	2,942,907	2,957,620	2,972,407
Total Sewer Usage	25,501,255	25,501,250	25,628,752	25,756,892	25,885,671	26,015,095
<i>% Change</i>		<i>0.0%</i>	<i>0.5%</i>	<i>0.5%</i>	<i>0.5%</i>	<i>0.5%</i>

Table A-8: Operating Expenses

	2019	2020	2021	2022	2023	2024
Administration	\$ 11,272,600	\$ 11,272,600	\$ 11,272,600	\$ 11,554,415	\$ 11,843,275	\$ 12,139,357
Human Resources	1,106,100	1,106,100	1,106,100	1,133,753	1,162,096	1,191,149
Stores	336,300	336,300	336,300	344,708	353,325	362,158
Accounting	3,038,000	3,038,000	3,038,000	3,113,950	3,191,799	3,271,594
Information Services	4,361,000	4,361,000	4,361,000	4,470,025	4,581,776	4,696,320
Customer Service	9,121,100	9,121,100	9,121,100	9,349,128	9,582,856	9,822,427
Engineering	1,556,600	1,556,600	1,556,600	1,595,515	1,635,403	1,676,288
System Services	29,007,200	29,007,200	29,007,200	29,732,380	30,475,690	31,237,582
Operations	69,778,300	69,778,300	69,778,300	71,522,758	73,310,826	75,143,597
Total MWS Operating Budget	\$ 129,577,200	\$ 129,577,200	\$ 129,577,200	\$ 132,816,630	\$ 136,137,046	\$ 139,540,472
<i>Percent Change</i>		0.00%	0.00%	2.50%	2.50%	2.50%

Table A-9: Capital Program Budget

	FY 2019 <i>Projected*</i>	FY 2020 <i>Projected</i>	FY 2021 <i>Projected</i>	FY 2022 <i>Projected</i>	FY 2023 <i>Projected</i>	FY 2024 <i>Projected</i>	FY19-FY24 <i>Total</i>
Original Capital Budget							
General Construction	\$ 69,720,000	\$ 95,295,000	\$ 57,970,000	\$ 83,370,000	\$ 87,875,000	\$ 63,561,440	\$ 457,791,440
Engineering	19,550,000	39,750,000	65,450,000	49,800,000	33,300,000	27,055,000	234,905,000
Clean Water Nashville	45,195,155	60,466,125	247,125,340	176,407,390	114,082,250	167,465,443	810,741,703
Other	18,800,000	19,000,000	24,000,000	24,900,000	30,500,000	22,350,000	139,550,000
Original Capital Budget	\$ 153,265,155	\$ 214,511,125	\$ 394,545,340	\$ 334,477,390	\$ 265,757,250	\$ 280,431,883	\$ 1,642,988,143
Adjusted Capital Budget							
Water-related Projects	\$ 30,936,893	\$ 51,055,698	\$ 56,204,212	\$ 57,057,791	\$ 62,403,165	\$ 54,797,000	\$ 54,797,000
Sewer-related Projects	31,063,107	38,944,302	33,795,788	32,942,209	37,596,835	45,203,000	45,203,000
Clean Water Nashville	33,595,155	60,466,125	247,125,340	176,407,390	114,082,250	167,465,443	266,315,854
Adjusted Capital Budget	\$ 95,595,155	\$ 150,466,125	\$ 337,125,340	\$ 266,407,390	\$ 214,082,250	\$ 267,465,443	\$ 366,315,854

*Estimated values, FY2019 was unaudited at time of report.

Table A-10: Capital Program Funding Plan

	FY 2019 <i>Projected*</i>	FY 2020 <i>Projected</i>	FY 2021 <i>Projected</i>	FY 2022 <i>Projected</i>	FY 2023 <i>Projected</i>	FY 2024 <i>Projected</i>	FY19-FY24 <i>Total</i>
General CIP Project Funding							
Rate Funded PayGo	\$ 12,000,000	\$ 12,000,000	\$ 12,000,000	\$ 12,000,000	\$ 12,000,000	\$ 12,000,000	\$ 72,000,000
Commercial Paper	50,000,000	74,646,374	68,124,226	67,627,305	77,210,166	76,776,231	414,384,302
Clean Water Nashville Funding							
WIR & SIR Funded PayGo	-	15,020,414	25,401,183	26,613,598	27,615,800	28,655,895	123,306,889
E&R Fund PayGo	-	-	75,000,000	50,000,000	50,000,000	50,000,000	225,000,000
Commercial Paper	33,595,155	48,799,338	156,599,931	110,166,487	47,256,285	100,033,318	496,450,512
Total Capital Budget	\$ 95,595,155	\$ 150,466,125	\$ 337,125,340	\$ 266,407,390	\$ 214,082,250	\$ 267,465,443	\$ 1,331,141,703

*Estimated values, FY2019 was unaudited at time of report.

Table A-11: Projected Debt Service

	FY 2019 <i>Estimated*</i>	FY 2020 <i>Projected</i>	FY 2021 <i>Projected</i>	FY 2022 <i>Projected</i>	FY 2023 <i>Projected</i>	FY 2024 <i>Projected</i>
Existing Debt Service	\$ 79,024,583	\$ 78,008,692	\$ 62,048,555	\$ 65,603,405	\$ 70,887,655	\$ 70,886,080
Proposed Revenue Bonds	-	-	8,804,633	17,609,265	26,413,898	35,218,530
Commercial Paper Interest	3,128,927	480,613	3,851,475	2,018,382	3,885,379	2,037,522
Total Debt Service	\$ 82,153,510	\$ 78,489,305	\$ 74,704,663	\$ 85,231,052	\$ 101,186,931	\$ 108,142,132
<i>% Change</i>		-4.5%	-4.8%	14.1%	18.7%	6.9%

*Estimated values, FY2019 was unaudited at time of report.

Table A-12: Miscellaneous Revenues

	FY 2019 <i>Estimated*</i>	FY 2020 <i>Projected</i>	FY 2021 <i>Projected</i>	FY 2022 <i>Projected</i>	FY 2023 <i>Projected</i>	FY 2024 <i>Projected</i>
Miscellaneous Revenues						
WIR and SIR Fees	\$ -	\$ 15,020,414	\$ 25,401,183	\$ 26,613,598	\$ 27,615,800	\$ 28,655,895
Surcharges	15,700,000	4,100,000	4,100,000	4,100,000	4,100,000	4,100,000
Wholesale Revenues	14,085,310	14,085,310	14,085,310	14,085,310	14,085,310	14,085,310
Customer Related	4,069,500	4,069,500	4,069,500	4,069,500	4,069,500	4,069,500
Maintenance and Testing Fees	2,930,000	2,930,000	2,930,000	2,930,000	2,930,000	2,930,000
Fire Protection	995,140	995,140	995,140	995,140	995,140	995,140
Wind Turbine	899	899	899	899	899	899
Total System Revenues	\$ 37,780,849	\$ 41,201,262	\$ 51,582,032	\$ 52,794,447	\$ 53,796,648	\$ 54,836,743
% Change		9.1%	25.2%	2.4%	1.9%	1.9%

*Estimated values, FY2019 was unaudited at time of report.

Table A-13: Rate Revenues by Service and Class

	FY 2019 <i>Estimated*</i>	FY 2020 <i>Projected</i>	FY 2021 <i>Projected</i>	FY 2022 <i>Projected</i>	FY 2023 <i>Projected</i>	FY 2024 <i>Projected</i>
Water Revenue						
Residential	\$ 26,511,871	\$ 34,545,272	\$ 47,020,223	\$ 49,187,005	\$ 51,168,602	\$ 53,230,249
Small Commercial	3,259,949	3,491,670	3,916,271	4,094,448	4,257,413	4,427,029
Intermediate Commercial	28,277,548	31,607,627	37,239,414	38,952,011	40,517,438	42,146,233
Large Commercial	9,023,157	10,630,129	13,223,833	13,831,653	14,387,290	14,965,265
Subtotal Water Revenue	\$ 67,072,526	\$ 80,274,698	\$ 101,399,741	\$ 106,065,117	\$ 110,330,743	\$ 114,768,775
% Change		19.7%	26.3%	4.6%	4.0%	4.0%
Sewer Revenue						
Residential	\$ 48,117,153	\$ 51,830,638	\$ 58,361,762	\$ 60,845,747	\$ 63,084,295	\$ 65,406,079
Small Commercial	5,807,349	6,493,573	7,628,547	7,953,090	8,245,975	8,549,503
Intermediate Commercial	52,217,348	61,002,074	74,927,680	78,026,929	80,803,651	83,680,287
Large Commercial	10,526,021	13,419,174	17,847,252	18,575,109	19,225,563	19,898,809
Subtotal Sewer Revenue	\$ 116,667,872	\$ 132,745,459	\$ 158,765,242	\$ 165,400,874	\$ 171,359,483	\$ 177,534,679
% Change		13.8%	19.6%	4.2%	3.6%	3.6%
Total User Charge Revenue	\$ 183,740,399	\$ 213,020,157	\$ 260,164,983	\$ 271,465,991	\$ 281,690,226	\$ 292,303,454
% Change		15.9%	22.1%	4.3%	3.8%	3.8%

*Estimated values, FY2019 was unaudited at time of report.

Table A-14: Summary of Projected Cashflows

	2019	2020	2021	2022	2023	2024
	<i>Estimated*</i>	<i>Projected</i>	<i>Projected</i>	<i>Projected</i>	<i>Projected</i>	<i>Projected</i>
System Revenues						
Water Revenues	\$ 67,072,526	\$ 80,274,698	\$ 101,399,741	\$ 106,065,117	\$ 110,330,743	\$ 114,768,775
Sewer Revenues	116,667,872	132,745,459	158,765,242	165,400,874	171,359,483	177,534,679
Subtotal: User Revenues	183,740,399	213,020,157	260,164,983	271,465,991	281,690,226	292,303,454
WIR and SIR Revenues	0	15,020,414	25,401,183	26,613,598	27,615,800	28,655,895
Miscellaneous Revenues	37,780,849	26,180,849	26,180,849	26,180,849	26,180,849	26,180,849
Total System Revenues	\$ 221,521,247	\$ 254,221,420	\$ 311,747,015	\$ 324,260,438	\$ 335,486,874	\$ 347,140,198
Revenue Requirements						
Operating Expenses	\$ 129,577,200	\$ 129,577,200	\$ 129,577,200	\$ 132,816,630	\$ 136,137,046	\$ 139,540,472
<u>Debt Service</u>						
Existing Debt	79,024,583	78,008,692	62,048,555	65,603,405	70,887,655	70,886,080
Proposed Debt	3,128,927	480,613	12,656,108	19,627,647	30,299,277	37,256,053
Subtotal: Debt Service	82,153,510	78,489,305	74,704,663	85,231,052	101,186,931	108,142,132
<u>Other Expenditures</u>						
Cash Funded Capital	12,000,000	12,000,000	12,000,000	12,000,000	12,000,000	12,000,000
WIR and SIR Funded Capital	0	15,020,414	25,401,183	26,613,598	27,615,800	28,655,895
Transfers to R&E	0	19,000,000	65,000,000	65,000,000	40,000,000	40,000,000
Total Revenue Requirements	\$ 223,730,710	\$ 254,086,919	\$ 306,683,046	\$ 321,661,280	\$ 316,939,777	\$ 328,338,499
System Surplus/(Deficit)	(2,209,463)	134,501	5,063,969	2,599,158	18,547,097	18,801,699

*Estimated values, FY2019 was unaudited at time of report.

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APPENDIX A: SELECT SCHEDULES FROM COST OF SERVICE MODEL

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Executive Summary

Metro Water Services of Nashville and Davidson County (MWS) engaged Raftelis to perform a water and sewer financial planning and cost of service evaluation (Study) to support water and sewer rate recommendations according to commonly-accepted industry practices. The goals and objectives of the Study, as identified by MWS Staff, include developing a thorough understanding of the following items:

- The costs of providing water and sewer service to different customer classes
- Alignment of revenues under the existing rates with the costs of providing service
- Options for implementing tiered residential rates and the impacts of doing so
- Maintaining affordability of service for customers
- Multi-year water and sewer rate projections that support long-term financial needs.

At approximately the same time as MWS' engagement of Raftelis to perform the Study, the Tennessee Comptroller of the Treasury referred MWS to the Water and Wastewater Financing Board (WFFB). The WFFB found MWS' water and sewer fund to be "financially distressed" and directed MWS to provide a completed rate study and the implemented or proposed plan of action to address noted financial deficiencies on or before August 31, 2019.

BACKGROUND

For the past 20 years, MWS' water and sewer rates have been among the lowest for large metropolitan areas in the United States. Prior to the implementation of a three-year programmatic rate increase in 2009, the last time a water rate increase had been proposed and approved was in 1995, with a sewer rate increase in 1996. Water rates were subsequently reduced by 25% for residential customers and a lesser amount for commercial customers in 1999. Since 2011, water and sewer rates have not been adjusted.

MWS has relied on its system growth to provide sufficient revenue to fund utility operations and capital improvement costs, however, the sustained population and service area growth Nashville has experienced over the last two decades, along with increasing regulatory considerations, has required MWS to make substantial and costly infrastructure upgrades. In addition, in March 2009, the Metropolitan Government of Nashville and Davidson County entered a Consent Decree that requires an estimated \$1.5 billion in investment to bring the system into compliance with EPA's CSO Control Policy and minimize System Sewer Overflows.

MWS has reached the point where its capital and operational needs far exceed its expected revenue generation; its existing water and sewer rates no longer suffice.

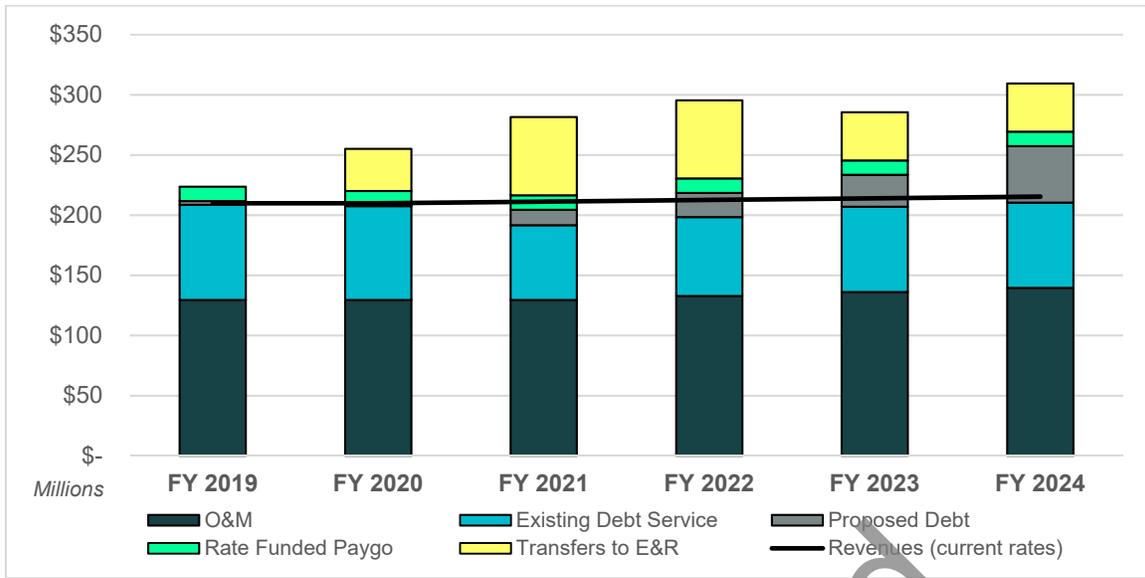
STUDY FINDINGS AND RECOMMENDATIONS

Revenue Sufficiency Under Existing Rates

Raftelis developed a financial plan for MWS that summarizes anticipated revenues and system expenditures for a five-year forecast period (FY 2020 through FY 2024). The financial plan identifies a baseline by calculating potential revenue shortfalls under MWS' existing rates and provides an indication of the additional revenues necessary to support the financial health of the utility.

Based on the financial plan, the level of revenues projected to be generated from MWS' existing rates are insufficient. The figure below shows projected water and sewer operating expenses, debt service, and capital funding in relation to projected revenues under current rates. If FY 2019 rates are held through FY 2024, annual net revenues will be nearly \$45 million short in FY 2020 and will increase to an over \$94 million shortfall in FY 2024.

Figure ES-1: Projected Revenue Sufficiency with No Rate Increases



While annual revenues exceed annual operating expenses (O&M) and existing debt service obligations, MWS will not be able to make needed capital improvements and will be at risk of defaulting on existing bond covenants without future rate increases.

MWS’ legal debt covenants that are part of the bond indenture require MWS to maintain revenue at a level sufficient to repay all obligations. These ratios reflect the ability of the utility to repay debt, with higher values demonstrating a greater availability of net revenues being available to pay for debt service. As shown in the following table, Prior Second Lien debt, which includes revenue bonds used in refunding commercial paper, has a legal limit of 1.20x. Subordinate debt, including subordinate lien refunding bonds, requires a lower 1.10x coverage ratio. In addition to the rate covenant ratios, MWS is also required to conduct a two-part additional bonds test based on maximum annual debt service with 1.20x and 1.10x coverage targets in order to issue new debt. In all four cases, MWS is projected to fall short of the targeted coverage levels required within the forecast period.

Table ES-1: Rate Covenant Ratios and Additional Bonds Test

	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
	<i>Estimated*</i>	<i>Projected</i>	<i>Projected</i>	<i>Projected</i>	<i>Projected</i>	<i>Projected</i>
Rate Covenant Ratios						
Prior Second Lien (1.20x Required)	1.67x	1.68x	1.91x	1.48x	1.18x	0.95x
Subordinate (1.10x Required)	1.21x	1.23x	1.37x	1.15x	0.96x	0.80x
Additional Bonds Test						
Part I (1.20x Required)	1.74x	1.36x	1.36x	1.10x	0.90x	0.89x
Part II (1.10x Required)	1.26x	1.08x	1.08x	0.92x	0.77x	0.76x

*Estimated values, FY2019 was unaudited at time of report

Rate increases are required to address the projected shortfall in revenues over for the five-year forecast period. Given the need for the rate adjustments and MWS’ objective of determining the costs of providing water and sewer service to different customer classes, Raftelis performed a cost of service evaluation.

Cost of Service Analysis

The basic principle in the establishment of cost of service rates is to achieve equity in the recovery of costs from various classes of customers. The approach used in this Study is based on the principles endorsed by the AWWA and WEF, which allows the MWS to demonstrate rates have not been set in an arbitrary manner and one class of customer is not subsidizing another to an unjustifiable extent, or in a manner that is not approved and supported by MWS. Costs have been allocated between customer classes based on their estimated demand requirements and recognizing the different costs associated with serving different customer classes.

The results of the cost of service evaluation indicate that if MWS' existing rates were uniformly adjusted to recover the system expenditures identified for FY 2020, the revenue from water charges and sewer charges would not appropriately address the associated costs to deliver the respective services. Essentially, for FY 2020, the sewer revenues are subsidizing water expenses. Additionally, the cost of service evaluation indicates that non-residential customer classes are subsidizing the residential class for both water and sewer services.

Alternative Rate Structures

Raftelis considered MWS' programmatic goals and pricing objectives and developed alternative rate structures that are cost of service based, encourage wise water use/conservation, and provide for affordable water for essential residential use. Three rate design scenarios were developed for consideration. Each scenario began with common fixed charges for all classes but differed in the way volume charges were developed. The following table outlines the basic differences between rate scenarios.

Table ES-2: Rate Alternative Scenarios

	Scenario 1	Scenario 2	Scenario 3
Water			
Usage in base charge	0 ccf	2 ccf	2 ccf
Residential volume rate	3 Tiers	3 Tiers	3 Tiers
Non-residential volume rate	Uniform	Uniform	Uniform
Water Infrastructure Replacement Fee	0%	0%	10%
Sewer			
Usage in base charge	0 ccf	2 ccf	2 ccf
Residential volume rate	Uniform	Uniform	Uniform
Non-residential volume rate	Uniform	Uniform	Uniform
Sewer Infrastructure Replacement Fee	10%	10%	10%

Summary of Recommendations

The results of the Study indicate that MWS is in need of significant rate adjustments in the current fiscal year (FY 2020) and future years to meet required operating and capital needs. In addition, the existing rate structure is atypical and does not equitably recover costs from existing customer classes. A rate structure change is needed to address cost of service-related issues.

Based on the results of the Study, three recommendations are proposed.

1. A rate structure change based on the cost of service analysis that incorporates the needed rate increases for FY 2020. The Alternative Rate Structures section of the Final Report details three rate scenarios, of which Scenario 3 is recommended. The following information summarizes the recommended structure.
 - The fixed meter charges are uniform across all customer classes and are cost justified, providing for more equitable cost recovery when compared to the existing fixed charges. This also removes the “small,” “medium,” and “large” designations so that all commercial customers are included in one class.

- The first two ccf of water remains included in the fixed charges, allowing for an essential use water allowance for all customers at minimal costs.
- The residential volumetric rate includes a tiered approach encouraging wise water use by charging more for discretionary water use.
- A 10% Water Infrastructure Replacement (WIR) fee and 10% Sewer Infrastructure Replacement (SIR) fee is included. Both fees will provide for dedicated funding sources for the continual replacement of MWS's aging water distribution and sewer collection infrastructure.

Table ES-3: Proposed Rates – Scenario 3

Scenario 3			
Fixed Charges		Water	Wastewater
5/8-Inch		\$4.72	\$7.20
3/4-Inch		11.22	31.83
1-Inch		14.15	41.19
1.5-Inch		24.86	80.18
2-Inch		35.10	112.65
3-Inch		56.10	140.25
4-Inch		127.52	397.92
6-Inch		159.20	474.39
8 & 10-Inch		207.15	607.43
Residential Rate	Thresholds	Water	Wastewater
Base Usage	0-2	\$-	\$-
Tier 1	2-6	3.24	5.16
Tier 2	6-10	3.89	5.16
Tier 3	>10	4.86	5.16
Non-Residential Rate		Water	Wastewater
All Usage		\$2.55	\$5.16

- Future rate increases for the fiscal years 2021-2024 of the forecast period. The Financial Plan section of the Final Report details increasing operating and capital requirements that cannot be addressed in a one-year rate adjustment, they must be addressed over multiple years. These operating and capital requirements have been segregated between water and sewer for each year of the forecast period to eliminate any future subsidies between the two utilities. The projected rate increases for the five-year forecast period are shown below.

Table ES-4: Future Rate Increases

	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Water						
Fixed Charges	0.0%	Scenario 3	8.0%	6.0%	2.0%	2.0%
Volume Charges	0.0%		8.0%	6.0%	2.0%	2.0%
Wastewater		COS				
Fixed Charges	0.0%	Alignment	13.0%	4.0%	2.0%	2.0%
Volume Charges	0.0%		13.0%	4.0%	2.0%	2.0%

The percentages shown above are anticipated to be applied to both the fixed and variable components of the water and sewer rate structures, respectively. Based on these percentage rate increases, the recommended rates are shown below for both water and sewer.

Table ES-5: Proposed Rates – Water, Recommended Scenario

	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Fixed Charges					
5/8-Inch	\$4.72	\$5.09	\$5.40	\$5.51	\$5.62
3/4-Inch	11.22	12.12	12.85	13.11	13.37
1-Inch	14.15	15.28	16.19	16.52	16.85
1.5-Inch	24.86	26.85	28.46	29.03	29.61
2-Inch	35.10	37.91	40.18	40.98	41.80
3-Inch	56.10	60.58	64.22	65.50	66.81
4-Inch	127.52	137.72	145.99	148.90	151.88
6-Inch	159.20	171.93	182.25	185.90	189.61
8 & 10-Inch	207.15	223.72	237.14	241.89	246.72
Residential Rate					
Tier 1 (0-2 ccf)	\$-	\$-	\$-	\$-	\$-
Tier 2 (2-6 ccf)	3.24	3.50	3.71	3.79	3.86
Tier 3 (6-10 ccf)	3.89	4.20	4.46	4.54	4.63
Tier 4 (>10 ccf)	4.86	5.25	5.57	5.68	5.79
Non-Residential Rate					
All Usage	\$2.55	\$2.75	\$2.92	\$2.98	\$3.04

Table ES-6: Proposed Rates - Sewer, Recommended Scenario

	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Fixed Charges					
5/8-Inch	\$7.20	\$8.14	\$8.46	\$8.63	\$8.80
3/4-Inch	31.86	36.00	37.44	38.19	38.95
1-Inch	41.22	46.58	48.44	49.41	50.40
1.5-Inch	80.24	90.67	94.30	96.18	98.11
2-Inch	112.73	127.38	132.48	135.13	137.83
3-Inch	140.34	158.59	164.93	168.23	171.59
4-Inch	398.21	449.98	467.97	477.33	486.88
6-Inch	474.72	536.44	557.89	569.05	580.43
8 & 10-Inch	607.87	686.89	714.36	728.65	743.22
Residential Rate					
All Usage	\$5.16	\$5.85	\$6.08	\$6.20	\$6.33
Non-Residential Rate					
All Usage	\$5.16	\$5.85	\$6.08	\$6.20	\$6.33

- Beginning in 2025, small, regular rate increases based on the Consumer Price Index for All Urban Consumers (CPI-U) are proposed annually and in perpetuity. This will help to adjust for continually increasing operating and capital costs and to maintain MWS' debt service coverage requirements and Extension and Replacement fund balance requirements.

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Final Report

Background of the Study

MWS Services of Nashville and Davidson County (MWS or “MWS”) engaged Raftelis to perform a water and sewer financial planning and cost of service evaluation (Study) to support water and sewer rate recommendations according to commonly-accepted industry practices. This report summarizes the data, analyses, and recommendations resulting from our Study.

PROJECT OBJECTIVES

The goals and objectives of the Study as identified by MWS Staff include developing a thorough understanding of the following items:

- The costs of providing water and sewer service to different customer classes
- Alignment of revenues under the existing rates with the costs of service
- Options for implementing tiered residential rates and the impacts of doing so
- Maintaining affordability of customer service
- Multi-year water and sewer rate projections that support long-term financial needs.

Shortly after MWS’s engagement of Raftelis to perform the Study, the Tennessee Water and Wastewater Financing Board directed MWS to provide a completed rate study by August 31, 2019 that included an implemented or proposed plan of action to address noted financial deficiencies. This report presents the results of the Study and also provides a plan of action that satisfies the Board’s direction.

UTILITIES BACKGROUND INFORMATION

The Need for a Financial Plan and Rate Study

In many ways, MWS is in an enviable position. The Cumberland River is a plentiful, high-quality water source, the service population and service area continue to benefit from regular growth, and the utility’s staff is dedicated, highly trained, and extremely competent. However, despite these strengths, and in some ways because of them, MWS finds itself financially challenged.

For the past 20 years, MWS customers have enjoyed water and sewer rates among the lowest for large metropolitan areas in the United States. With only three modest rate increases since 1998, MWS has relied on the system growth to provide enough revenues to fund utility operations and its capital improvement program. Water supply and treatment capacity can be very expensive for a utility to provide; however, the Cumberland River provides ample water supply and the water and sewer treatment facilities have excess capacity to meet the continued growth in the region. Since the water supply and treatment capacity are readily available, some cost increases felt by comparable utilities could be deferred or reduced. Additionally, the staff prides itself on running a lean operation, making do with available resources, and avoiding operating cost increases when possible.

Nonetheless, in providing service for more than 190,000 water and 200,000 sewer accounts in support of Clean Water Nashville¹, MWS has reached the point where its capital and operational needs far exceed its expected revenue generation. This shortfall has several primary driving forces:

¹ Clean Water Nashville is an initiative led by Metro Water Services (MWS) in coordination with partner agencies including the U.S. Environmental Protection Agency (EPA) and the Tennessee Department of Environment and Conservation (TDEC) for the purpose of improving the sewer system to continue meeting the requirements of the Clean Water Act and, in the process, ensuring the environmental health of the Cumberland River and its tributaries for future generations.

- Sustained population and service area growth has required installation of miles of water and sewer mains which carry a steep price tag
- Increasingly stringent regulatory requirements require investments in system assets and technology
- Aging infrastructure that requires repair and replacement
- A history of minimal rate increases against an environment of continually increasing costs.

System Growth

According to the US Census Bureau, the Nashville-Davidson-Murfreesboro-Franklin Metropolitan Statistical Area (MSA), whose population was 1.9 million in 2017, grew 1.8 percent from 2016 and accounted for nearly one-third of the State's total population. For 2017, this represents an estimated gain of 94 people per day, which is down slightly from growth of 108 people per day in 2016 and 101 people per day in 2015. Of the 1.9 million residents in the MSA, approximately 691,000 live in the Metropolitan Area of Nashville and Davidson County (Metro Nashville), which represents a 10.3% increase in population from 2010. This growth has manifested in both an increase in population density, from 1,243 per square mile in 2010 to an estimated 1,377 per square mile in 2017, and an increase in housing units, from almost 284,000 in 2010 to 314,000 in 2017. Since 1990, MWS' water service area has increased by 25.5 square miles (6.2%) and sewer service area by 50.3 miles (10.8%). This increase in population and development, as well as the service area expansion for both water and sewer service, has required MWS to make substantial infrastructure upgrades. While the water supply is abundant and treatment capacity is more than sufficient to meet the area's growth projections, installing distribution and collection mains to keep pace with growth is expensive and requires substantial organizational resources to support these capital projects.

Regulatory Mandates and Aging Infrastructure

Maintaining compliance with the Clean Water Act and Safe Drinking Water Act is of paramount importance for any water service provider. Since 1990, MWS has worked to implement an aggressive wastewater infrastructure improvement program, with the goal of reducing the frequency and volume of Combined Sewer Overflows (CSOs) and Sanitary Sewer Overflows (SSOs). The United States of America, the State of Tennessee, and the Metropolitan Government of Nashville and Davidson County entered a Consent Decree in March 2009. The Consent Decree requires MWS to use its best efforts to achieve full compliance with its National Pollutant Discharge Elimination System (NPDES) permits, the Clean Water Act, the Tennessee Water Quality Control Act, and their regulations. The Consent Decree also requires addressing the conditions contributing to SSOs with the goal of minimizing the 27 overflows listed in the Consent Decree, and compliance with the EPA's CSO Control Policy. These improvements were estimated to cost \$1.5 billion between 2011 and 2022.

Whereas the Consent Decree is focused on wastewater, the drinking water side has been influenced by other water-specific regulatory requirements and industry guidelines, which have further strained MWS' limited resources. These include recent requirements relating to disinfection byproducts which have increased costs with year-round powder-activated carbon in treatment processes; necessitated online instrumentation; increased levels of preventative maintenance; and additional monitoring activities. Emerging contaminants and the Unregulated Contaminants Monitoring Rule has required additional sampling, as well as higher costs related to shipping samples to an EPA-designated lab and performing advanced analysis.

Like many utilities, MWS continuously makes investments to provide reliable service and maintain regulatory compliance as its infrastructure ages. More than 65% of MWS' water mains are more than 40 years old. MWS has a goal to replace approximately 1% of its water mains (20 miles) each year with pipes that have an estimated 100-year lifespan, far exceeding the lifespan of the system's existing mains to reverse this aging asset challenge. Fifty-eight percent (58%) of sewer mains are more than 40 years old and approximately 1% is being replaced through MWS' Consent Decree during the previously noted 11-year timeframe.

Since 2017, several major water, sewer, and stormwater capital projects have been delayed because of the utility’s insufficient funding.

Previous Rate Adjustments

Water, wastewater, and stormwater rates must be proposed by Metro Nashville’s administration and approved by City Council. Prior to the implementation of a three-year programmatic rate increase in 2009 (Table 1), the last time a water rate increase had been proposed and approved was in 1995, with a sewer rate increase in 1996. Water rates were subsequently reduced by 25% for residential customers and a lesser amount for commercial customers in 1999. Water and sewer rates have not been adjusted since 2011.

Table 1: MWS’ Most Recent Water & Sewer Rate Increases

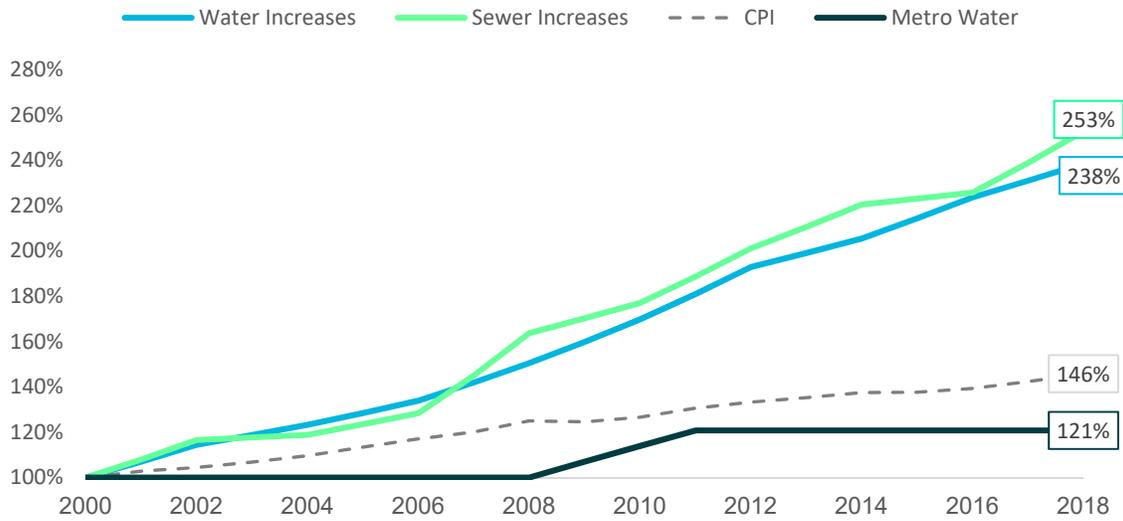
	2009	2010	2011
Water Rate Increase	5%	5%	5%
Sewer Rate Increase	9%	8%	7%

MWS has long recognized that its rates fail to provide sufficient revenues to meet its water and sewer operational and capital requirements. The organization has a strong focus on continuous improvement, and has completed several internal process audits, external financial audits, external performance audits, and proactive infrastructure and facility inspections, to find and correct inefficiencies and other issues. MWS also completed a strategic plan in 2016, which identified financial viability as a priority area, and included proposing a program of automatic rate adjustments as one strategy to help the utility be financially sound, now and in the future. Later in 2016, Raftelis recommended the necessary rate adjustments, with a proposed implementation in FY 2017. When these rates were not implemented, MWS was forced to scale back on capital activities and now faces the noted action by the Tennessee Comptroller of the Treasury.

Industry Trends

Water and wastewater rates are increasing across the United States. According to the 2019 Water and Wastewater Rate Survey, recently published by the American Water Works Association (AWWA) and Raftelis, rates for both services have increased annually by approximately 5.1% and 5.6% since 2004, for water and sewer service, respectively. Figure 1 shows how the national average increase in rates have been significantly outpaced by the consumer price index (CPI), which significantly outpaces the rates charged by MWS.

Figure 1: National Rate Increases, CPI, and MWS Rates Since 2000



Based on the 2019 Rate Survey, the median monthly water charge for 10 hundred cubic feet (ccf) is reported to be \$34.44, and the median monthly sewer charge for 10 ccf is reported to be \$50.29. For reference, MWS currently charges \$21.77 for 10 ccf of water and \$45.54 for 10 ccf of sewer.

Comparison with Peer Utilities

The following comparisons provide additional context for MWS’ current water and sewer rates by looking at peer utilities in the southern region and across the United States. MWS’ average residential customer uses 5.5 ccf of water per month, so this rate comparison is shown at 6 ccf. In addition, a rate comparison is also shown at 2 ccf given that this usage level is the amount included in MWS’ current monthly minimum charge. MWS charges \$3.13 for 2 ccf and \$12.45 for 6 ccf of water service, both of which are considerably below the peer utilities’ charges, as shown in Figure 2.

The same comparison is shown in Figure 3 for MWS and peer sewer utilities. Of the 15 utilities shown, more than half, including Louisville, Memphis, St. Louis, New Orleans, Cincinnati, Birmingham, Knoxville, DC Water, and Atlanta, are operating under EPA Consent Decrees, which require heavy investments in infrastructure over a condensed timeline. Given that MWS has operated under a Consent Decree for several years, its sewer rates are very low.

Figure 2: Water Rate Comparison for 2 ccf and 6 ccf

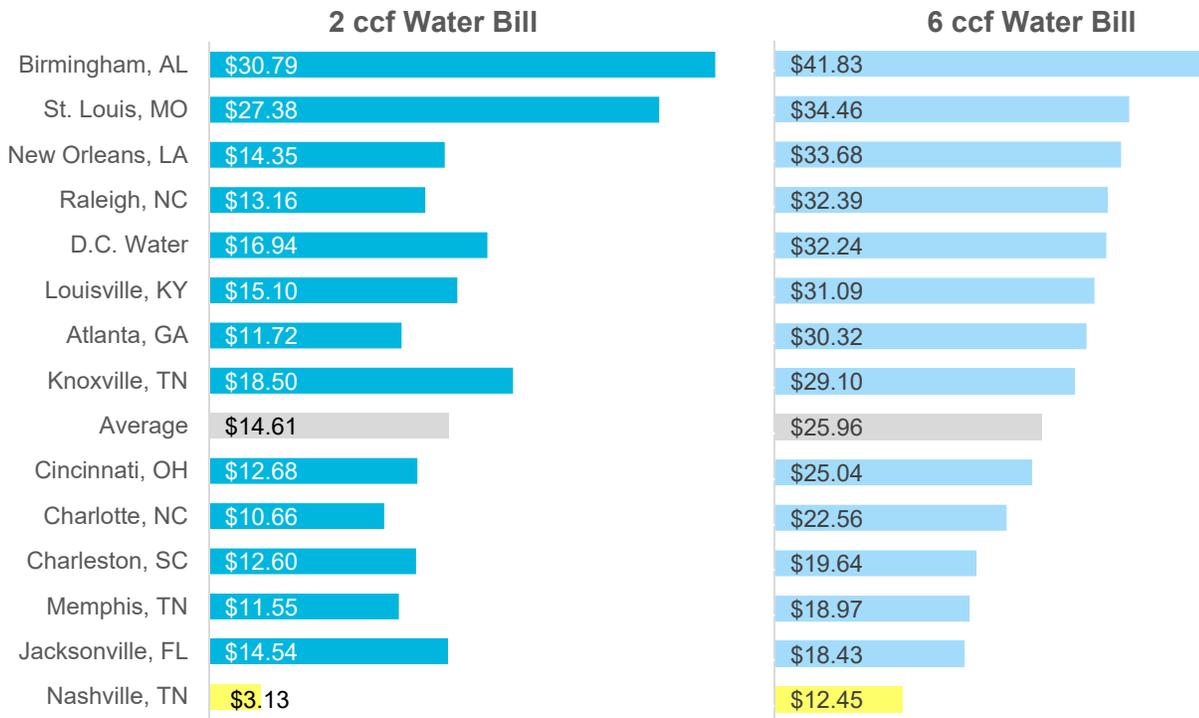
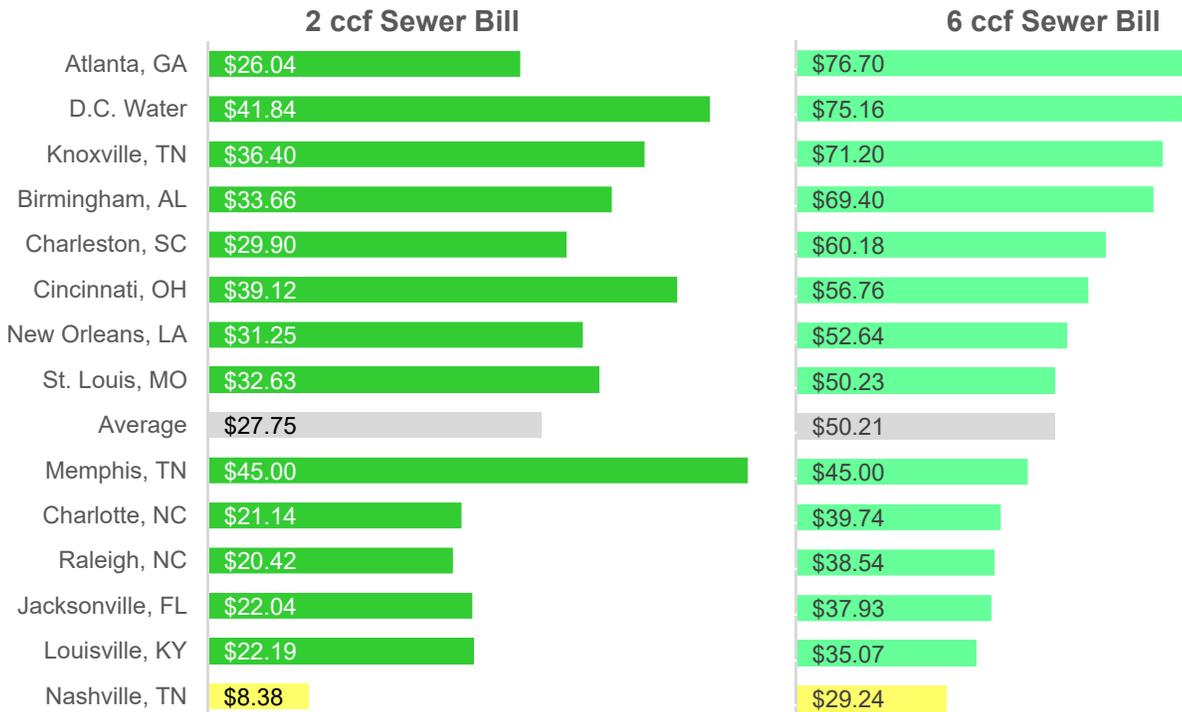


Figure 3: Sewer Rate Comparison for 2 ccf and 6 ccf



Note: Bills do not include taxes, Nashville, TN bills include SIR surcharges

The State's Reaction

In January 2018, the Tennessee Comptroller of the Treasury referred MWS to the Water and Wastewater Financing Board (WWFB), which ensures that water and sewer enterprises are financially self-supporting and establishes parameters for water accountability. This action was pursuant to Tennessee Code § 68-221-1010, in response to MWS' total net position deficit in FY 2018. The WWFB found MWS' water and sewer fund to be "financially distressed" and directed MWS to provide a completed rate study and the implemented or proposed plan of action on or before August 31, 2019.

The Tennessee Department of Environment and Conservation (TDEC) also conducted a financial analysis and review to determine MWS' eligibility to participate in the low-interest State Revolving Fund (SRF) Loan Program. TDEC determined that the Metropolitan Government of Nashville and Davidson County "requires an additional \$37,617,318 per year or \$3,134,777 per month (equal to 17.21%) from the Department of Water and Sewerage Service Fund in order to financially qualify." This determination has effectively restricted MWS' access to low-interest state revolving fund loans.

Financial Plan

The underlying purpose of this rate study is to develop a projection of rates and charges that will promote the recovery of revenues that are sufficient to fund the full costs of operating the system. This projection of system revenues, operating expenses and capital investments is referred to as the financial plan. The financial plan developed for MWS summarizes anticipated revenues and system expenditures for a five-year forecast period (FY 2020 through FY 2024). The system expenditures also incorporate legally-binding debt service coverage requirements, compliance with additional bond coverage tests, and reserve fund balances. The financial plan identifies a baseline by calculating potential revenue shortfalls under MWS' existing rates and provides an indication of the additional revenues necessary to support the financial health of the utility.

REVENUE REQUIREMENTS

MWS's total annual system expenditures are comprised of operating and maintenance (O&M) expenses, outstanding and future debt obligations, annual capital investment needs, and provisions for compliance with all reserve requirements and bond covenants. Collectively, these items are commonly called the revenue requirements when developing utility rate recommendations. The financial plan projects MWS's total revenue requirements over the five-year forecast period as described below.

Operating Expenses

The primary function of MWS is to operate and maintain the system in order to provide safe and reliable access to clean drinking water and wastewater treatment to its customers. Operating costs include salaries for staff, materials and supplies for operating the plants, electricity and utilities, and other recurring expenses. The FY 2018 and FY 2019 operating budgets serve as the baseline for operating expenses in the financial plan. Projecting operating costs throughout the forecast is based on historical cost escalation trends, known and expected changes for the future, and common inflationary factors.

Based on discussion with MWS staff and a review of historical information, operating costs are projected to remain constant for FY 2020 and FY 2021, and then projected to increase by 2.5% annually beginning in FY 2022. Total annual operating expenses are projected to increase by approximately \$10M between FY 2019 and FY 2024. The FY 2019 budgeted and FY 2020 through FY 2024 projected operating expenses are shown in Table 2.

Table 2: Projected Operating Expenses

	FY 2019 ¹ <i>Budget</i>	FY 2020 ² <i>Projected</i>	FY 2021 ² <i>Projected</i>	FY 2022 <i>Projected</i>	FY 2023 <i>Projected</i>	FY 2024 <i>Projected</i>
Administration	\$11,272,600	\$11,272,600	\$11,272,600	\$11,554,415	\$11,843,275	\$12,139,357
Human Resources	1,106,100	1,106,100	1,106,100	1,133,753	1,162,096	1,191,149
Stores	336,300	336,300	336,300	344,708	353,325	362,158
Accounting	3,038,000	3,038,000	3,038,000	3,113,950	3,191,799	3,271,594
Information Services	4,361,000	4,361,000	4,361,000	4,470,025	4,581,776	4,696,320
Customer Service	9,121,100	9,121,100	9,121,100	9,349,128	9,582,856	9,822,427
Engineering	1,556,600	1,556,600	1,556,600	1,595,515	1,635,403	1,676,288
System Services	29,007,200	29,007,200	29,007,200	29,732,380	30,475,690	31,237,582
Operations	69,778,300	69,778,300	69,778,300	71,522,758	73,310,826	75,143,597
Total	\$129,577,200	\$129,577,200	\$129,577,200	\$132,816,630	\$136,137,046	\$139,540,472
Percent Change		0%	0%	2.5%	2.5%	2.5%

¹Estimated values, FY2019 was unaudited at time of report.

²Total projected expenses revised to \$130,400,200 after COS analysis was completed with majority of the additional costs in the Administration and Operations categories.

Capital Improvement Plan

MWS has expansive infrastructure that needs to be maintained, rehabilitated, and upgraded to comply with tightening regulations, provide service for regional growth, and allow for the continued delivery of safe and reliable service. The financial plan integrates the anticipated capital needs and develops a financing plan to balance cash and debt funding of the program. MWS's Capital Improvement Plan (CIP) identifies the anticipated capital expenditures for the water and sewer systems for FY 2019 through FY 2024. The projects listed in the CIP are categorized into four classes: General Construction, Engineering, Clean Water Nashville, and Other.

- General Construction – Improvements associated with treatment plants, information systems, customer service, laboratory, and treatment processes
- Engineering – costs associated with design and construction of water treatment and sewer pipeline projects
- Clean Water Nashville – Consent Decree-related projects
- Other – Administration and vehicle purchases.

For these four categories of capital improvements, the total project costs were provided based on the full CIP needs which reflect the optimal spending plan. However, historically MWS underspends the projected CIP due to project delays, contracting and construction management issues, and limited funding capacity. The total projected capital spending on non-Clean Water Nashville projects (General Construction, Engineering, Other) over the forecast period has been adjusted to account for this reality. Clean Water Nashville projects are driven by the legally binding consent decree and failure to meet the agreed upon schedule could result in severe penalties or fines.

The projected investments as a part of the Clean Water Nashville program for the forecast period is anticipated to be \$810.7M. The total annual adjusted costs for non-Clean Water Nashville projects is projected to be \$62.0 million for FY 2019, \$90.0 million per year for FY 2020 through FY 2022, and \$100 million for FY 2023 and 2024. These estimates are based on MWS' historical cash spending. FY 2019 reflects deferring more projects due to MWS' current need for additional revenues. The original CIP and adjusted CIP are shown below in Table 3.

Table 3: Water & Sewer CIP

	FY 2019 Projected*	FY 2020 Projected	FY 2021 Projected	FY 2022 Projected	FY 2023 Projected	FY 2024 Projected	FY19-FY24 Total
Original Capital Budget							
General Construction	\$ 69,720,000	\$ 95,295,000	\$ 57,970,000	\$ 83,370,000	\$ 87,875,000	\$ 63,561,440	\$ 457,791,440
Engineering	19,550,000	39,750,000	65,450,000	49,800,000	33,300,000	27,055,000	234,905,000
Clean Water Nashville	45,195,155	60,466,125	247,125,340	176,407,390	114,082,250	167,465,443	810,741,703
Other	18,800,000	19,000,000	24,000,000	24,900,000	30,500,000	22,350,000	139,550,000
Original Capital Budget	\$ 153,265,155	\$ 214,511,125	\$ 394,545,340	\$ 334,477,390	\$ 265,757,250	\$ 280,431,883	\$ 1,642,988,143
Adjusted Capital Budget							
Water-related Projects	\$ 30,936,893	\$ 51,055,698	\$ 56,204,212	\$ 57,057,791	\$ 62,403,165	\$ 54,797,000	\$ 312,454,759
Sewer-related Projects	31,063,107	38,944,302	33,795,788	32,942,209	37,596,835	45,203,000	219,545,241
Clean Water Nashville	45,195,155	60,466,125	247,125,340	176,407,390	114,082,250	167,465,443	810,741,703
Adjusted Capital Budget	\$ 107,195,155	\$ 150,466,125	\$ 337,125,340	\$ 266,407,390	\$ 214,082,250	\$ 267,465,443	\$ 1,342,741,703

*Estimated values, FY2019 was unaudited at time of report.

Utilities frequently utilize long-term debt to finance their capital improvements due to the significant investments required to build and maintain water and sewer systems. This allows a utility to leverage its revenue stream and for future customers to pay for the system that benefits them. MWS has a long history of using a commercial paper and revenue bond program to finance capital projects. Commercial paper is a type of short term borrowing that MWS accumulates over a period of years which is then refunded by issuing revenue bonds once the balance

reaches approximately \$300 million. Additionally, Extension and Replacement (E&R) fund² cash reserves and annual system revenues (PayGo financing) are used to fund system improvements. MWS assesses a 10% Sewer Infrastructure Replacement (SIR) fee on customer's total sewer bill. The revenues from this fee have historically been used to offset sewer operating expenses. However, it is the intent of MWS staff to designate the revenues from this fee to support the investments of the Clean Water Nashville Program and as such, the revenues from this fee are shown as a funding source of the CIP. The anticipated funding sources of the MWS CIP are presented in Table 4.

Table 4: Water & Sewer Capital Funding Sources

	FY 2019 <i>Projected*</i>	FY 2020 <i>Projected</i>	FY 2021 <i>Projected</i>	FY 2022 <i>Projected</i>	FY 2023 <i>Projected</i>	FY 2024 <i>Projected</i>	FY19-FY24 <i>Total</i>
General CIP Project Funding							
Rate Funded PayGo	\$ 12,000,000	\$ 12,000,000	\$ 12,000,000	\$ 12,000,000	\$ 12,000,000	\$ 12,000,000	\$ 72,000,000
Commercial Paper	50,000,000	78,000,000	78,000,000	78,000,000	88,000,000	88,000,000	460,000,000
Clean Water Nashville Funding							
SIR Funded PayGo	-	11,666,787	13,737,541	15,614,248	16,333,783	16,757,912	74,110,271
E&R Fund PayGo	-	-	75,000,000	50,000,000	50,000,000	50,000,000	225,000,000
Commercial Paper	33,595,155	48,799,338	158,387,799	110,793,142	47,748,467	100,707,531	500,031,432
Total Capital Budget	\$ 95,595,155	\$ 150,466,125	\$ 337,125,340	\$ 266,407,390	\$ 214,082,250	\$ 267,465,443	\$ 1,331,141,703

*Estimated values, FY2019 was unaudited at time of report.

Debt Service Obligations

MWS's capital structure includes existing obligations for twelve outstanding bonds and loans. As noted above, capital projects are anticipated to be funded by commercial paper, which will then be refunded by revenue bonds resulting in the proposed debt service. Commercial paper interest charges are assumed to be 1.5% per year on the total outstanding balance, and once the outstanding balance approaches \$300M, refunding of commercial paper is triggered through a revenue bond issue. For the forecast period, \$300M revenue bonds are projected to be issued in 2020, 2022, and 2024. The existing and projected debt obligations for the forecast period are shown in Table 5. Funding the \$1.34 billion capital needs between FY 2019 and 2024 will result in \$26.6 million in additional annual debt obligations, or a 32% increase.

Table 5: Debt Service Requirements

	FY 2019 <i>Estimated*</i>	FY 2020 <i>Projected</i>	FY 2021 <i>Projected</i>	FY 2022 <i>Projected</i>	FY 2023 <i>Projected</i>	FY 2024 <i>Projected</i>
Existing Debt Service	\$ 79,024,583	\$ 78,008,692	\$ 62,048,555	\$ 65,603,405	\$ 70,887,655	\$ 70,886,080
Proposed Revenue Bonds	-	-	8,804,633	17,609,265	26,413,898	35,218,530
Commercial Paper Interest	3,128,927	530,917	4,076,734	2,408,632	4,444,859	2,775,471
Total Debt Service	\$ 82,153,510	\$ 78,539,610	\$ 74,929,922	\$ 85,621,301	\$ 101,746,411	\$ 108,880,082
% Change		-4.4%	-4.6%	14.3%	18.8%	7.0%

*Estimated values, FY2019 was unaudited at time of report.

REVENUES

MWS generates the majority of its annual water and sewer revenue from operating revenues that consist primarily of revenues from rates and charges assessed to system customers, commonly referred to as user charge revenue. Other operating revenues include late payment fees and revenues from wholesale customers. MWS also receives non-operating revenues that include tap and connection fees, and various other customer service-related fees. For

² The E&R fund is MWS' cash reserve fund. To meet required debt service coverage ratios, additional revenues for capital, outside of the \$12.0M rate funded PayGo, are needed throughout the forecast period. These revenues are projected to flow into the E&R fund from rate revenues and then be used in the following years to pay for capital projects.

the purpose of the Study, other operating revenues and non-operating revenues are referred to as miscellaneous revenues.

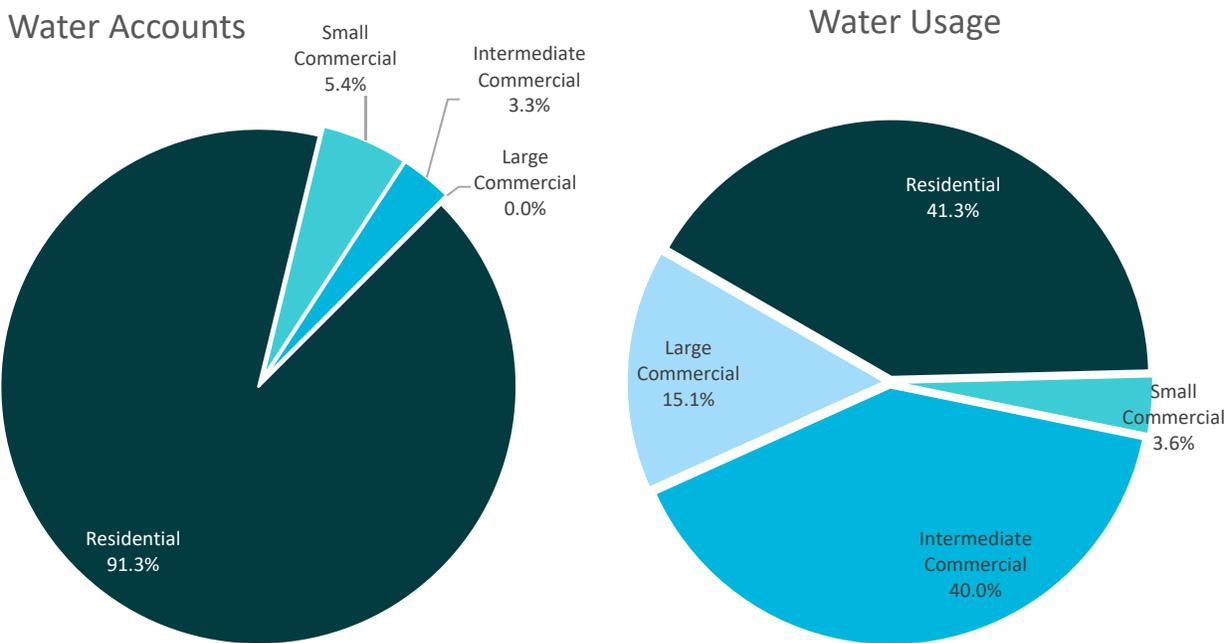
Demand for Services

MWS’s customers are divided into two general categories, residential and commercial/industrial (or non-residential). Within the commercial/industrial class, customers are further classified into three sub-classes based on anticipated and/or historical usage as shown below.

Customer Class	Anticipated and/or Historical Usage
Residential	Up to two housing units on a common meter
Small Commercial and Industrial	Up to 1,600 cubic feet per month
Intermediate Commercial and Industrial	1,600 to 200,000 cubic feet per month
Large Commercial and Industrial	Over 200,000 cubic feet per month

MWS has approximately 180,000 water accounts and 91% of these customers are residential; however, residential customers only account for 41% of total annual water usage. Figure 4 shows the size of each of the customer classes based on the number of accounts and water usage.

Figure 4. Water Accounts and Usage by Class



In order to calculate an estimate of projected user charge revenue, a customer demand forecast was developed to pair with the utility rates and charges. Customer demand includes the number of customers within each customer class, metered water sales, and billable sewer flows. Raftelis reviewed historical customer demand information from FY 2017 and FY 2018 which serves as the customer demand projection basis for the forecast period. Recent customer and usage data support a conservative assumption of growth in accounts and usage.

No growth in accounts or usage is assumed for FY 2019 and FY 2020. Customer accounts for all classes except large commercial are projected to grow at 1.0% annually for FY 2021 through FY 2024. Water usage is also projected to grow at 1.0% annually for FY 2021 through FY 2024 for all classes except large commercial. Sewer usage is billed based on actual metered water consumption for all customers unless a separate sewer flow meter has

been installed. Only a small number of large customers have metered sewer usage. Sewer usage is projected to grow at 0.5% annually for FY 2021 through FY 2024 for all classes. Table 6 and Table 7 show the projected number of customer accounts and corresponding water and sewer usage for the forecast period.

Table 6: Projected Customer Accounts

	FY 2019 <i>Estimated</i>	FY 2020 <i>Projected</i>	FY 2021 <i>Projected</i>	FY 2022 <i>Projected</i>	FY 2023 <i>Projected</i>	FY 2024 <i>Projected</i>
Water Accounts						
Residential	164,614	164,614	166,258	167,918	169,595	171,290
Small Commercial	9,780	9,780	9,874	9,969	10,065	10,163
Intermediate Commercial	5,870	5,870	5,925	5,980	6,035	6,092
Large Commercial	80	80	80	80	80	80
Total Water	180,344	180,344	182,137	183,947	185,775	187,625
% Change		0.0%	1.0%	1.0%	1.0%	1.0%
Sewer Accounts						
Residential	178,130	178,130	179,909	181,706	183,521	185,355
Small Commercial	9,677	9,677	9,771	9,865	9,961	10,058
Intermediate Commercial	5,113	5,113	5,161	5,209	5,257	5,306
Large Commercial	68	68	68	68	68	68
Total Sewer	192,988	192,988	194,909	196,848	198,807	200,787
% Change		0.0%	1.0%	1.0%	1.0%	1.0%

Table 7: Projected Customer Usage (ccf)

	FY 2019 <i>Estimated</i>	FY 2020 <i>Projected</i>	FY 2021 <i>Projected</i>	FY 2022 <i>Projected</i>	FY 2023 <i>Projected</i>	FY 2024 <i>Projected</i>
Water Usage (ccf)						
Residential	12,655,439	12,655,439	12,781,977	12,909,782	13,038,861	13,169,232
Small Commercial	1,105,442	1,105,442	1,116,483	1,127,632	1,138,893	1,150,268
Intermediate Commercial	12,281,165	12,281,165	12,403,959	12,527,982	12,653,250	12,779,766
Large Commercial	4,622,998	4,622,998	4,669,214	4,715,890	4,763,035	4,810,651
Total Water Usage	30,665,044	30,665,044	30,971,633	31,281,286	31,594,039	31,909,917
% Change		0.0%	1.0%	1.0%	1.0%	1.0%
Sewer Usage (ccf)						
Residential	10,460,037	10,460,036	10,512,335	10,564,896	10,617,719	10,670,807
Small Commercial	890,979	890,977	895,431	899,907	904,405	908,926
Intermediate Commercial	11,236,539	11,236,538	11,292,719	11,349,182	11,405,927	11,462,955
Large Commercial	2,913,700	2,913,699	2,928,267	2,942,907	2,957,620	2,972,407
Total Sewer Usage	25,501,255	25,501,250	25,628,752	25,756,892	25,885,671	26,015,095
% Change		0.0%	0.5%	0.5%	0.5%	0.5%

User Charge Revenues

Operating revenues are generated primarily from the water and sewer user rates and charges assessed to system customers. The forecasted number of customer accounts and billed usage in each customer class is multiplied by the existing rates and charges to develop a forecast of revenue under the existing rates.

Existing Rates

MWS's customers are currently charged for water and sewer service based on a rate structure with two components: a fixed monthly minimum charge and a volumetric rate based on the quantity of water used. The fixed monthly minimum charge is assessed to all customers based on their meter size with increasing charges for larger meter sizes. Customers pay varying fixed and volume charges based on their assigned class. Additionally, the fixed monthly minimum charge includes 2 ccf of usage for both water and sewer customers. Table 8 shows MWS's existing water and sewer rates.

Table 8: Existing Rates

Meter Size	Residential	Small Commercial	Intermediate Commercial	Large Commercial
Water				
Monthly Minimum (up to 2 ccf)				
5/8-Inch	\$3.13	\$3.98	\$13.85	\$597.23
3/4-Inch	10.62	11.32	19.64	603.69
1-Inch	12.77	13.63	21.51	605.80
1.5-Inch	18.77	20.03	26.71	611.60
2-Inch	25.29	26.97	32.63	618.22
3-Inch	33.38	35.61	40.84	624.04
4-Inch	54.41	58.03	64.65	650.65
6-Inch	85.42	91.12	99.81	689.96
8 & 10-Inch	133.59	142.50	155.38	755.41
Volume rate per ccf above 2	\$2.33	\$2.48	\$2.14	\$1.81
Sewer				
Monthly Minimum (up to 2 ccf)				
5/8-Inch	\$7.62	\$8.51	\$27.89	\$1,076.37
3/4-Inch	21.63	24.22	39.55	1,088.01
1-Inch	26.05	29.17	43.33	1,091.79
1.5-Inch	38.29	42.89	53.81	1,102.25
2-Inch	51.57	57.75	65.73	1,114.18
3-Inch	68.04	76.21	82.26	1,124.65
4-Inch	110.88	124.18	130.22	1,172.65
6-Inch	174.12	195.01	201.05	1,243.48
8 & 10-Inch	272.29	304.96	312.96	1,361.43
Volume rate per ccf above 2	\$4.74	\$5.30	\$4.32	\$3.26

Projected annual revenues from each customer class is presented in Table 9 based on the customer demand forecast and the existing rates. The change in revenue over the forecast period is due to the customer and usage growth assumptions.

Table 9. Projected User Charge Revenue

	FY 2019 <i>Estimated*</i>	FY 2020 <i>Projected</i>	FY 2021 <i>Projected</i>	FY 2022 <i>Projected</i>	FY 2023 <i>Projected</i>	FY 2024 <i>Projected</i>
Water Revenue						
Residential	\$ 26,511,871	\$ 26,511,871	\$ 26,776,610	\$ 27,043,969	\$ 27,313,998	\$ 27,586,879
Small Commercial	3,259,949	3,259,949	3,291,187	3,322,691	3,354,745	3,387,241
Intermediate Commercial	28,277,548	28,277,548	28,558,083	28,841,212	29,126,968	29,416,008
Large Commercial	9,023,157	9,023,157	9,106,733	9,191,141	9,276,397	9,362,504
Subtotal Water Revenue	\$ 67,072,526	\$ 67,072,526	\$ 67,732,613	\$ 68,399,013	\$ 69,072,108	\$ 69,752,632
% Change		0.0%	1.0%	1.0%	1.0%	1.0%
Sewer Revenue						
Residential	\$ 48,117,153	\$ 48,117,153	\$ 48,440,741	\$ 48,766,762	\$ 49,095,216	\$ 49,426,425
Small Commercial	5,807,349	5,807,346	5,844,636	5,882,021	5,919,949	5,958,074
Intermediate Commercial	52,217,348	52,217,346	52,495,899	52,775,652	53,056,606	53,339,559
Large Commercial	10,526,021	10,526,020	10,573,462	10,621,140	10,669,055	10,717,212
Subtotal Sewer Revenue	\$ 116,667,872	\$ 116,667,864	\$ 117,354,738	\$ 118,045,575	\$ 118,740,826	\$ 119,441,270
% Change		0.0%	0.6%	0.6%	0.6%	0.6%
Total User Charge Revenue	\$ 183,740,399	\$ 183,740,391	\$ 185,087,351	\$ 186,444,588	\$ 187,812,935	\$ 189,193,902
% Change		0.0%	0.7%	0.7%	0.7%	0.7%

*Estimated values, FY2019 was unaudited at time of report.

Miscellaneous Revenues

In addition to user charge revenues, MWS collects revenue from several other operating and non-operating sources. The most significant of these revenues are from SIR fees, wholesale customer revenues, late payment fees and other customer-related revenues, and fire protection charges. The SIR fee is based on 10% of annual sewer user charges and varies based on projected system revenue. Other miscellaneous revenue is based on the FY 2019 estimated actual results, which are projected to remain constant over the forecast period. Table 10 shows the projected miscellaneous revenues.

Table 10: Projected Miscellaneous Revenues

	FY 2019 <i>Estimated*</i>	FY 2020 <i>Projected</i>	FY 2021 <i>Projected</i>	FY 2022 <i>Projected</i>	FY 2023 <i>Projected</i>	FY 2024 <i>Projected</i>
Miscellaneous Revenues						
Surcharges	\$ 15,700,000	\$ 15,766,787	\$ 15,766,786	\$ 15,835,474	\$ 15,904,558	\$ 15,974,083
Wholesale Revenues	14,085,310	14,085,310	14,085,310	14,085,310	14,085,310	14,085,310
Customer Related	4,069,500	4,069,500	4,069,500	4,069,500	4,069,500	4,069,500
Maintenance and Testing Fees	2,930,000	2,930,000	2,957,300	2,957,300	2,957,300	2,957,300
Fire Protection	995,140	995,140	995,140	995,140	995,140	995,140
Wind Turbine	899	899	899	899	899	899
Total System Revenues	\$ 37,780,849	\$ 37,847,636	\$ 37,874,935	\$ 37,943,623	\$ 38,012,706	\$ 38,082,231
% Change		0.2%	0.1%	0.2%	0.2%	0.2%

*Estimated values, FY2019 was unaudited at time of report.

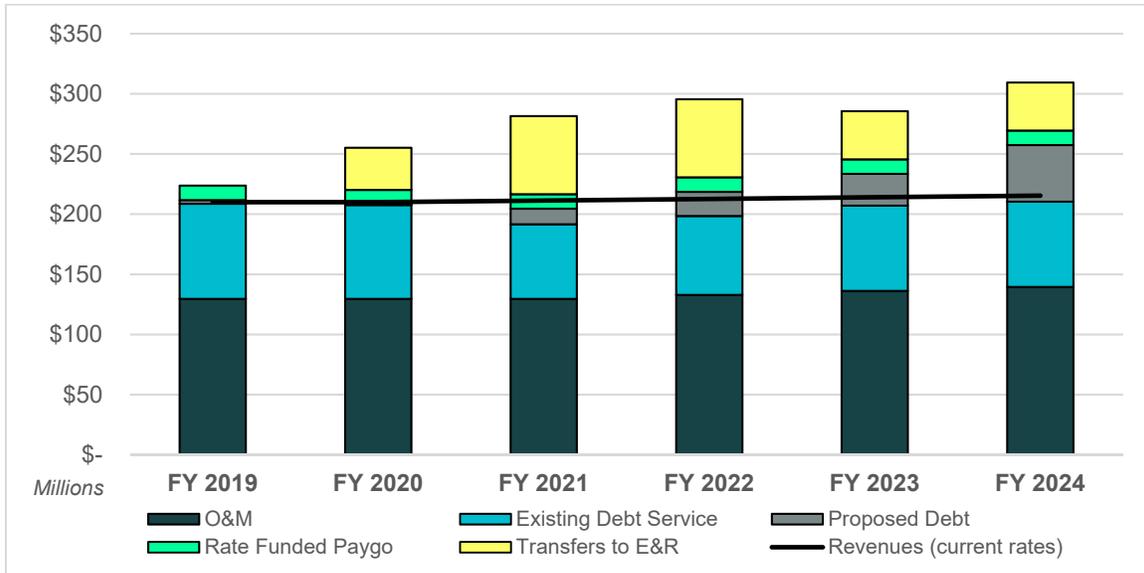
REVENUE SUFFICIENCY

As mentioned previously, the purpose of any rate study is to develop a plan that promotes revenues sufficient for funding the total costs of providing service. The MWS financial plan needs to address two critically important issues:

1. Revenue shortfalls in funding annual operating and capital expenses
2. Weakening debt service coverage ratios and cash reserve position

Figure 5 shows projected water and sewer revenue requirements, including operating expenses, debt service, and capital funding in relation to projected revenues under current rates. If FY 2019 rates are held through FY 2024, annual net revenues will be nearly \$45 million short in FY 2020 and will increase to over \$94 million in FY 2024.

Figure 5: Projected Revenue Sufficiency with No Rate Increases



While the solid line that represents annual revenue exceeds the annual O&M and existing debt service obligations, MWS will be unable to make needed capital improvements and would be at risk of defaulting on existing bond covenants without future rate increases.

MWS’s legal debt covenants that are part of the bond indentures require MWS to maintain revenue at a level sufficient to repay all obligations. These ratios reflect the ability of the utility to repay existing and proposed necessary debt, with higher values demonstrating a greater availability of net revenues being available to pay for debt service. As shown in Table 11, Prior Second Lien debt, which includes revenue bonds used in refunding commercial paper, has a legal limit of 1.20x. Subordinate debt, including subordinate lien refunding bonds, requires a lower 1.10x coverage ratio. In addition to the rate covenant ratios, MWS is also required to conduct a two-part additional bonds test based on maximum annual debt service with 1.20x and 1.10x coverage targets in order to issue new debt. In all four cases, MWS is projected to fall short of the targeted coverage levels required within the forecast period.

Table 11: Rate Covenant Ratios and Additional Bonds Test

	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
	<i>Estimated*</i>	<i>Projected</i>	<i>Projected</i>	<i>Projected</i>	<i>Projected</i>	<i>Projected</i>
Rate Covenant Ratios						
Prior Second Lien (1.20x Required)	1.67x	1.68x	1.91x	1.48x	1.18x	0.95x
Subordinate (1.10x Required)	1.21x	1.23x	1.37x	1.15x	0.96x	0.80x
Additional Bonds Test						
Part I (1.20x Required)	1.74x	1.36x	1.36x	1.10x	0.90x	0.89x
Part II (1.10x Required)	1.26x	1.08x	1.08x	0.92x	0.77x	0.76x

*Estimated values, FY2019 was unaudited at time of report

The results of the financial planning forecast indicate that rate increases are needed to fund the operational and capital requirements of MWS. The increases are primarily driven by capital needs that have immediate costs over the next few years and will continue indefinitely.

Cost of Service Analysis

The basic principle in the establishment of cost of service rates is to achieve general fairness in the recovery of costs from various classes of customers. The approach used in this Study is based on the principles endorsed by the AWWA and WEF, which allows MWS to demonstrate rates have not been set in an arbitrary manner and one class of customer is not subsidizing another to an unjustifiable extent, or in a manner that is not approved and supported by MWS. Costs have been allocated between customer classes based on their estimated usage and demand requirements and recognizing the different costs associated with serving different customer classes. The cost of service analysis is based on the base-extra capacity methodology recommended in the AWWA Manual M-1 and the WEF Manual of Practice No. 27.

IDENTIFICATION OF TEST YEAR REVENUE REQUIREMENTS

Consistent with the guidelines identified in the AWWA Manual M-1 and WEF Manual of Practice No. 27, the cost of service analysis was performed on a test year. The test year for this evaluation was FY 2020. The process was performed on a “cash-basis” which means the test year costs include anticipated expenses incurred by MWS in FY 2020. These expenses include annual operating and maintenance costs for salaries, benefits, insurance, electricity, chemicals, supplies, contractual services, debt service, cash transfers, etc. Items like depreciation, non-cash accruals and adjustments, and return on rates are not included in a cash-basis approach.

ALLOCATION TO FUNCTIONAL COST DRIVERS

The cost of service methodology necessitated that the revenue requirements be allocated into functional categories listed in the following tables. The test year revenue requirements are identified in the financial plan.

Table 12. Water Functional Cost Allocation Categories

• Source of Supply	• Pumping
• Treatment Plant	• Customer Service/Billing
• Transmission	• Meters
• Distribution	• Fire Protection
• Storage	• General & Administration

Table 13. Sewer Functional Cost Allocation Categories

• Preliminary Treatment	• Primary Treatment
• Secondary Treatment	• Sludge Thickening & Dewatering
• Digestion	• Drying
• Collection	• Conveyance
• Sludge Disposal	• Meters
• Customer Service/Billing	• General & Administration

The revenue requirements are allocated to the functional categories based on allocation factors developed by Raftelis and generally accepted industry practices and were then reviewed with staff to ensure the appropriate allocation factor was applied. For example, operating costs for the customer service center are allocated to customer service and billing; and costs for operating the treatment plants are allocated to treatment. Capital costs (debt service requirements and rate-funded capital) are allocated based on the allocation of MWS’ fixed assets, and not on the allocation of specific debt issuances. A summary of the functional cost allocation process is presented in Table 14 for water and Table 15 for sewer.

Costs that are not easily assigned to a specific functional category are included in the ‘general and admin support’ cost center. This includes costs like utilities administration, accounting, information systems, and human resources. The general and admin support costs are ultimately redistributed to the functional cost centers based on the proportion of allocable items.

Table 14. Water Functional Cost Allocation Results

Water Functional Categories	Operating	Capital	Total
Supply	\$ 3,051,310	\$ 8,332,099	\$ 11,383,409
Treatment	7,051,918	5,013,701	12,065,619
Pumping	7,511,066	841,318	8,352,384
Storage	995,501	1,020,792	2,016,293
Transmission	2,184,414	6,561,256	8,745,670
Distribution	20,133,180	10,347,053	30,480,233
Meters	2,574,385	1,863,179	4,437,564
Billing	2,343,733	106,551	2,450,284
Fire Protection	241,664	416,354	658,018
Admin Support	10,806,488	498,664	11,305,152
Total Costs by Function*	\$ 56,893,660	\$ 35,000,967	\$ 91,894,627

*Total costs differ from the projected budget because miscellaneous revenues outside of user charge revenues were allocated and subtracted from capital and operating costs.

Table 15. Sewer Functional Cost Allocation Results

Sewer Functional Categories	Operating	Capital	Total
Collection & Transmission	\$ 12,767,455	\$ 56,011,846	\$ 68,779,301
Preliminary Treatment	2,360,173	12,699,957	15,060,130
Primary Treatment	2,472,984	2,217,127	4,690,110
Secondary Treatment	9,890,117	8,713,249	18,603,366
Sludge Thickening	1,203,521	1,085,591	2,289,112
Sludge Dewatering	2,416,749	2,116,653	4,533,403
Digestion	2,205,756	1,931,859	4,137,615
Drying	2,089,343	1,829,902	3,919,245
Sludge Disposal	867,462	759,746	1,627,208
Meters	1,576,650	-	1,576,650
Billing	1,620,288	-	1,620,288
Admin Support	7,032,195	3,172,711	10,204,906
Total Costs by Function*	\$ 46,502,692	\$ 90,538,642	\$ 137,041,334

*Total costs differ from the projected budget because miscellaneous revenues outside of user charge revenues were allocated and subtracted from capital and operating costs.

ALLOCATION TO COST COMPONENT DRIVERS

The functional costs are then allocated to their cost components in accordance with how the facilities are designed. Cost components included volume-based allocations (base, max day, and peak hour) and meter-based allocations (meter repair and replacement (R&R), billing and customer service, and readiness-to-serve). The volumetric components are used to calculate commodity rates and the meter components were used to determine fixed costs to recover from each meter size.

The readiness-to-serve allocation is a percent of annual debt service costs (principal and interest) and is made to reflect the enormous investment in fixed infrastructure that has been made by MWS to provide reliable and around-the-clock service to customers. MWS has discretion in how much allocation is made to this component and that decision can help improve revenue stability; corresponding with typical industry standards, 25% of annual debt service costs are allocated to the readiness-to-serve component in this Study.

Water systems are required to be designed and built to provide service during normal as well as peak operating conditions. A customer who has continuous and steady water use places a demand on the water system that is more predictable versus an irrigation account which may run at high capacity for two hours on a given day, or it may go days/weeks/months with no usage. Therefore, it is important to recognize these differences in the assignment of costs to a customer class. System monthly peaking factors were reviewed and analyzed to develop ratios for max day and peak hour allocations. Based on historical data and staff input, the system max day and peak hour demand ratios were determined to be 1.50 and 1.73, respectively and Table 16 shows the results of the peaking factor analysis.

For functions designed to meet the max day requirements, the percentage of the systems designed to meet average day demand is 74.1%, or 1.00 divided by the max day ratio of 1.35. The remaining 25.9% was allocated to meeting max day demand. Functions designed to meet the peak hour requirements of the system were allocated 47.5% to average day demand (1.00 divided by max day ratio of 2.10), 16.7% to max day demand (the max day increment of 1.35 less 1.00 (0.35) divided by 2.10), and the final increment to meet peak hour demand is 35.8% (the peak hour increment of 2.10 less max day of 1.35 divided by 2.10).

Table 16. Water Peaking Factors Allocations

	Ratio to Average Day	Max Day	Avg:Max Day: Peak Hour	Avg:Peak Hour
Average Day	1.00	66.7%	57.8%	57.8%
Max Day	1.50	33.3%	28.9%	
Peak Hour	1.73	0.0%	13.3%	42.2%

The allocations derived from the peaking factor analysis are applied to the allocated functional costs according to the schedule shown in Table 17.

Table 17. Functional Cost Components

Function	Functional Cost Driver		
	Base	Max Day	Peak Hour
Source of Supply	✓		
Treatment	✓	✓	
Transmission	✓	✓	
Distribution	✓	✓	✓
Storage	✓		✓

Wastewater systems do not experience customer-driven peaks like the water system and as a result, the wastewater costs are allocated between the following function cost drivers: volume, meter, customer service/billing, readiness-to-serve, flow strength, and reuse.

Offsetting the costs components are other operating revenues generated by MWS, including interest income, penalties and late payment fees, laboratory fees, etc. Costs tied directly to customer billing (returned check charges, late payment fees, new account fees, reconnection charges, and administration costs) were directly applied to offset the customer service functional component. The remaining miscellaneous revenues were allocated between operating and capital components and then further allocated to the cost categories based on the weighted average of the functional costs. The results are the net operating and capital costs to be recovered from each cost component.

CUSTOMER CLASS UNITS OF SERVICE

Developing unit costs of service is essential in developing rates that are equally applicable to all classes of users. The detailed development of units of service based on projections of accounts, customer demand, and max day and peak hour capacity factors is presented in Table 18 below. Each customer class has a unique max day and peak hour ratio that is based on the most recent three years of monthly consumption information. The AWWA Manual

M-1 identifies a process to take these monthly totals and develop daily factors based on assumptions for various customer characteristics like business hours and days in operation.

Table 18. Water Units of Service Buildup

	Water Requirements		Maximum Day			Peak Hour			Equivalent Meters		
	Water Sales 2020	Average Day	Capacity Factor	Total Capacity	Extra Capacity	Capacity Factor	Total Capacity	Extra Capacity	Cost	Flow	Total Bills
	Ccf	Ccf/day		Ccf/day	Ccf/day		Ccf/day	Ccf/day	Eq. Meters	Eq. Meters	Bills
Customer Class Units of Service											
Residential	12,655,439	34,673	235%	81,402	46,729	406%	140,826	59,424	165,210	172,953	1,975,368
Small Commercial	1,105,442	3,029	209%	6,342	3,313	362%	10,972	4,630	13,655	44,618	117,360
Intermediate Commercial	12,281,165	33,648	228%	76,632	42,984	394%	132,573	55,941	26,450	116,935	70,440
Large Commercial	4,622,998	12,666	192%	24,347	11,681	333%	42,120	17,773	1,621	6,437	960
Total Units of Service	30,665,044	84,016	0%	188,723	104,707	0%	326,491	137,768	206,936	340,943	2,164,128

As previously discussed, sewer systems do not experience customer-driven peaks like the water system. The volume and account-related units are based on the number of accounts and the actual billed volumes. However, sewer treatment is driven by the strength of the flows into the plants, and these strength parameters are regulated through MWS permits. Certain types of customers (industrial facilities, restaurants, office buildings, residential homes, etc.) often share similar waste strength profiles. MWS’s existing customer classes are categorized based on metered volumes and do not necessarily represent a homogenous strength profile. As a result, the buildup of the wastewater units includes an allocation of strength parameters to each customer class based on their proportional share of total flow volumes. MWS measures the total pounds of each component annually and the total amounts that are treated are allocated to each customer class using the proportional flows.

Table 19. Sewer Units of Service Buildup

	Sewer Requirements		High Strength Components			Equivalent Meters		
	Sewer Sales 2020	Average Day	TSS (lbs.)	BOD (lbs.)	TN (lbs.)	Cost	Flow	Total Bills
Customer Class Units of Service								
Residential	10,460,036	28,658	21,177,930	36,751,156	1,694,979	178,924	190,172	2,137,560
Small Commercial	890,977	2,442	1,803,918	3,130,432	144,377	13,056	41,026	116,124
Intermediate Commercial	11,236,538	30,786	22,750,076	39,479,382	1,820,806	24,839	108,316	61,356
Large Commercial	2,913,699	7,983	5,899,226	10,237,231	472,146	1,519	5,818	816
Total Units of Service	25,501,250	69,869	51,631,149	89,598,202	4,132,308	218,338	345,332	2,315,856

UNIT COST DEVELOPMENT

Water unit costs are derived by dividing the total allocated costs for each functional component by the corresponding service requirements of the utility. For example, total meter servicing costs are divided by the total equivalent number of meters on the system to arrive at the average unit cost of servicing one meter each year. Table 20 shows the calculation of water unit costs of service based on allocated cost and demand information; Table 21 presents the sewer unit cost development.

Table 20. Water Unit Cost Development

	Base	Max Day	Max Hour	Meters	Bills	Ready-to-Serve	Fire Protection	Total
Unit Cost Development								
Total System Units	30,665,044	104,707	137,768	206,936	2,164,128	340,943	340,943	
<i>Units of Measure</i>	<i>CCF</i>	<i>CCF/Day</i>	<i>CCF/Day</i>	<i>Eq. Meters, Cost</i>	<i>Total Bills</i>	<i>Eq. Meters, Flows</i>	<i>Eq. Fire Connections</i>	
Operating Costs								
Supply	\$ 3,051,310	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,051,310
Treatment	4,702,757	2,349,161	-	-	-	-	-	7,051,918
Pumping	5,008,952	2,502,114	-	-	-	-	-	7,511,066
Storage	575,434	-	420,067	-	-	-	-	995,501
Transmission	1,262,667	630,738	291,009	-	-	-	-	2,184,414
Distribution	11,637,676	5,813,351	2,682,152	-	-	-	-	20,133,180
Meters	-	-	-	2,574,385	-	-	-	2,574,385
Billing	-	-	-	-	2,343,733	-	-	2,343,733
Fire Protection	-	-	-	-	-	241,664	-	241,664
Admin Support	6,152,455	2,648,529	795,642	603,640	549,557	56,665	-	10,806,488
Operating Costs	\$ 32,391,251	\$ 13,943,894	\$ 4,188,870	\$ 3,178,025	\$ 2,893,290	\$ 298,330	\$ -	\$ 56,893,660
Capital Costs								
Debt Service	\$ 9,118,855	\$ 2,756,855	\$ 1,082,656	\$ 751,762	\$ 42,991	\$ 5,093,046	\$ 245,255	\$ 19,091,420
Rate-Funded Capital	4,453,800	1,356,064	531,438	363,399	21,748	80,978	-	6,807,426
Transfer to E&R Fund	5,955,118	1,813,175	710,579	485,896	29,079	108,274	-	9,102,120
Capital Costs	19,527,773	5,926,094	2,324,673	1,601,057	93,818	5,282,298	245,255	35,000,967
Total Revenue Requirement	\$ 51,919,024	\$ 19,869,988	\$ 6,513,543	\$ 4,779,082	\$ 2,987,108	\$ 5,580,627	\$ 245,255	\$ 91,894,627
Total Unit Cost (\$/Unit)	\$1.693	\$189.767	\$47.279	\$23.094	\$1.380	\$16.368	\$0.719	

Table 21. Sewer Unit Cost Development

	Volume	TSS	BOD	TN	Meters	Bills	Ready to Serve	Total
Unit Cost Development								
Total System Units	25,501,250	51,631,149	89,598,202	4,132,308	218,338	2,315,856	345,332	
<i>Units of Measure</i>	<i>CCF</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Eq. Meters, Cost</i>	<i>Total Bills</i>	<i>Eq. Meters, Flows</i>	
Operating Costs								
Collection & Transmission	\$ 12,767,455	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	12,767,455
Preliminary Treatment	291,151	1,032,586	927,105	109,330	-	-	-	2,360,173
Primary Treatment	305,067	1,081,941	971,419	114,556	-	-	-	2,472,984
Secondary Treatment	1,220,044	4,326,970	3,884,961	458,141	-	-	-	9,890,117
Sludge Thickening	148,466	526,546	472,758	55,751	-	-	-	1,203,521
Sludge Dewatering	298,130	1,057,339	949,329	111,951	-	-	-	2,416,749
Digestion	272,102	965,028	866,448	102,177	-	-	-	2,205,756
Drying	257,741	914,097	820,720	96,785	-	-	-	2,089,343
Sludge Disposal	107,010	379,518	340,750	40,184	-	-	-	867,462
Meters	-	-	-	-	1,576,650	-	-	1,576,650
Billing	-	-	-	-	-	1,620,288	-	1,620,288
Admin Support	2,791,314	1,832,236	1,645,069	193,998	280,901	288,676	-	7,032,195
Operating Costs	\$ 18,458,481	\$ 12,116,262	\$ 10,878,560	\$ 1,282,873	\$ 1,857,552	\$ 1,908,963	\$ -	\$ 46,502,692
Capital Costs								
Debt Service	\$ 36,825,959	\$ -	\$ -	\$ -	\$ 125,595	\$ 129,071	\$ 22,367,564	\$ 59,448,189
Rate-Funded Capital	4,660,052	-	-	-	7,268	7,470	517,784	5,192,574
Transfer to E&R Fund	25,824,374	-	-	-	36,251	37,255	-	25,897,880
Capital Costs	67,310,384	-	-	-	169,115	173,795	22,885,348	90,538,642
Revenue Requirement	\$ 85,768,866	\$ 12,116,262	\$ 10,878,560	\$ 1,282,873	\$ 2,026,667	\$ 2,082,759	\$ 22,885,348	\$ 137,041,334
Unit Costs	\$3.363	\$0.235	\$0.121	\$0.310	\$9.282	\$0.899	\$66.271	

COST OF SERVICE COMPARISON

The unit costs are used to determine the costs that should be recovered from each customer class, which is then compared to revenues under the existing rates to identify potential variances. The comparison assumes that the existing FY 2019 rates are adjusted by 24.6% across the board to recover the revenue requirements identified in the FY 2020 test year.

At the highest level, the revenue from water charges in 2020 are approximately \$8.3 million (10.0%) lower than the allocated costs of service. Conversely, sewer revenues are approximately \$8.3 million (5.7%) above their allocated cost of service. These results are not uncommon when reviewing utility costs of service.

A comparison of the total allocated costs of service to recover from each customer class with the projected revenues under the existing rates is shown in Table 22 and Table 23 for the water and sewer systems, respectively. When considering the water system and based on the allocations used in the cost of service analysis, the residential customer class is under-recovering relative to its cost of service. As a result, under the current rates, non-residential customer classes are over recovering their costs of service.

Table 22. Water Cost of Service Comparison with Revenues under Current Rate Structure

	Total Cost of Service	Revenue Under Existing Rate Structure	Percent Difference
Water	FY2020	FY2020	
Residential	\$ 42,601,499	\$ 33,033,792	29.0%
Small Commercial	3,959,021	4,061,897	-2.5%
Intermediate Commercial	34,301,219	35,233,825	-2.6%
Large Commercial	11,032,888	11,242,854	-1.9%
Total: Water	\$ 91,894,627	\$ 83,572,368	10.0%

When considering the sewer system and based on the allocations used in the cost of service analysis, the residential customer class is slightly under-recovering relative to its cost of service. As a result, under the estimated rates, non-residential customer classes are over-recovering relative to their costs of service.

Table 23. Sewer Cost of Service Comparison with Revenues under Current Rate Structure

	Total Cost of Service	Revenue Under Existing Rate Structure	Percent Difference
Sewer	FY2020	FY2020	
Residential	\$61,324,630	\$ 59,953,972	2.3%
Small Commercial	6,789,338	7,235,953	-6.2%
Intermediate Commercial	55,953,357	65,062,813	-14.0%
Large Commercial	12,974,009	13,115,420	-1.1%
Total: Sewer	\$ 137,041,334	\$ 145,368,159	-5.7%

It is often suggested that utilities perform a comprehensive cost of service analysis every 5 to 7 years and use the results to realign their rates for equitable revenue recovery. MWS's historical rate increases have been applied evenly to all charge types and customer classes without the awareness of comprehensive cost of service drivers. The cost of service results presented herein provide MWS with the information to develop rates and charges that are more closely aligned with cost of service principles and will support the financial planning needs of the system.

Alternative Rate Structures

The cost of service results, particularly the unit costs, provide the building blocks for customer rates that promote the equitable recovery of revenue. The rate structure design and rate setting process is highly dependent on the goals and objectives identified by each water and sewer utility. There are several different types of rate structures that can be implemented to serve a utility's needs and there is no one rate structure that is ideal for a utility, nor is a rate structure that serves one utility's purpose necessarily a good fit for a different utility. These objectives are commonly referred to as pricing objectives in the water and sewer industry and identifying these pricing objectives is the first step in the rate setting process.

There are ten pricing objectives that are commonly considered in designing a rate structure:

- | | |
|--|---|
| <ul style="list-style-type: none">• Administrative Burden• Cost of Service Based Allocations• Ease of Understanding• Economic Development• Revenue Stability | <ul style="list-style-type: none">• Affordability• Water Efficiency and Conservation• Ease of Implementation• Minimal Customer Impacts• Revenue Sufficiency |
|--|---|

It is not possible to achieve all of the objectives as many of them compete with one another, and each has trade-offs to consider. Therefore, it is necessary to identify those that are the most important to the utility. Raftelis facilitated an exercise with MWS to identify the objectives most critical to the utility during the Kick-off Workshop for this Study. The primary objective was to develop rates that are consistent with cost of service-based allocations. The other three objectives that are considered priority objectives include affordability, water efficiency and minimal customer impacts. These objectives are defined below.

- **Cost of Service Based Allocations:** The rate structure should ensure that each customer class generates revenue that is aligned with the costs of providing service to them (trade off: can result in unexpected customer impacts and rate results, such as one class of rates lowering while others increase).
- **Affordability:** The rate structure should be developed to maintain low average customer bills and provide affordable water for essential uses. (trade off: residential customers with high volume use may see larger impacts relative to lower volume users).
- **Water Efficiency & Conservation:** The rate structure should encourage efficient water use as well as assist in managing system demand (tradeoff: this could be more difficult for customers to understand and may lead to revenue instability if significant revenues are based on customer usage).
- **Minimal Customer Impacts:** The rate structure should be developed such that adverse rate impacts on each customer class are minimized (trade off: changing a rate structure to target various objectives will cause customer impacts and attempting to minimize these may limit the ability to accomplish these objectives).

Existing Rates and Rate Structure

MWS' existing rate structure has been very affordable with low fixed monthly minimum charges that includes 2 ccf of usage for both water and sewer customers. While it would be very easy to maintain this existing rate structure and implement across-the-board rate increases which would have the most uniform impacts to MWS customers, this approach would be inconsistent with the cost of service results and therefore be inequitable to each customer class.

MWS's water and sewer rate structures are similarly designed. Both the water and sewer rate structure include 1) a fixed, monthly charge that includes 2 ccf of usage, and 2) a volumetric rate assessed for usage over 200 cubic feet. Each customer class (residential, small commercial, intermediate commercial and large commercial) has its own set of fixed charges that increase by meter size, and its own volume rate, for water and sewer separately.

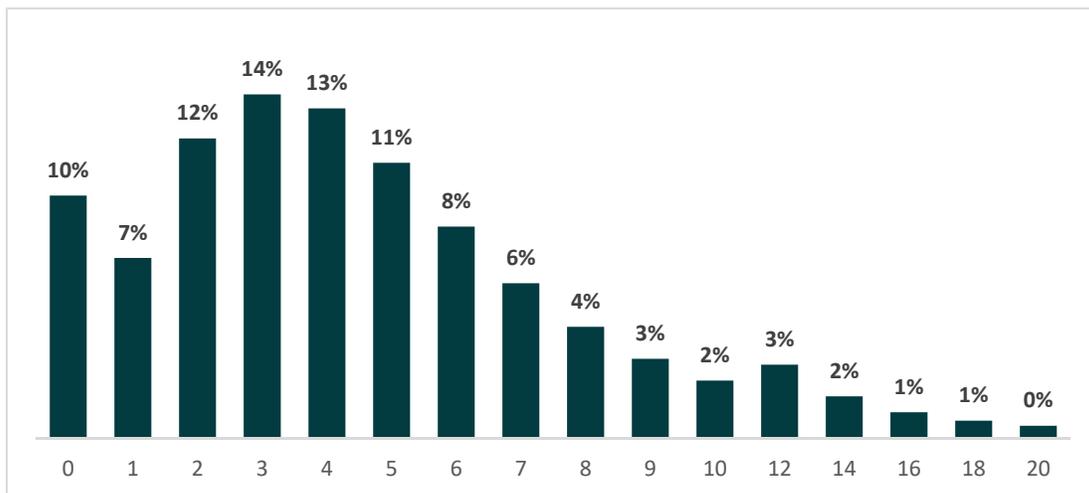
It is important to note that fixed charges increase not only by meter size, but by customer class as well with the large commercial class having significantly higher charges for each meter size. In contrast, the large commercial class is charged the lowest volumetric rate of all the customer classes for usage over 2 ccf per month. Both the intermediate and large commercial users are charged lower volumetric rates compared to the residential and small commercial customer classes. The small commercial customer class pays the highest of all the volumetric rates for water.

Sewer retail rates are structured similarly with a fixed or minimum charge that includes the first 2 ccf usage per month and that varies by meter size, with a different set of minimum charges applied to each customer class, and a volumetric rate that is different for each customer class. Sewer usage is based on 100% of metered water usage with the exception of a small number of accounts that have separate sewer meters.

There are several complexities with the existing water and sewer rate structures:

- The existing rate structure results in a significant portion of included water and sewer flows that occur below the 2 ccf minimum threshold. Billing data was reviewed to develop the bill frequency presented in Figure 6. The bill frequency graph counts how many customers are billed for usage at varying quantities of metered water; the height of the bars reflects the total number of bills generated within each group. In 2017 and 2018, water included in the minimum bill made up approximately 31.6% of metered water flows to MWS residential customers. Similarly, nearly 30% of residential bills are issued for 2 ccf or less. These included flows represent potential revenue whose cost must be recovered through the fixed charges and volume charges for all other usage. Because sewer billable usage is billed based on metered water usage, a similar percentage of residential sewer flow is also included. However, the 2 ccf allowance promotes customer affordability.
- Currently, each customer class is charged a different set of fixed charges for water and sewer by meter size. The difference in these charges cannot be explained or justified based on the usage patterns demonstrated by each class and for each meter size.
- MWS’s customer classifications are based on the amount of water and sewer usage rather than customer “type” or homogenous groups. More typical rate classifications include single-family residential, multi-family residential, commercial, industrial, government, institutional, etc. Customers within each of these typical classifications are more likely to demonstrate somewhat similar usage patterns and potentially display measurable differences when comparing classes.

Figure 6: Residential 2017 and 2018 Bill Frequency Analysis



ALTERNATIVE RATE STRUCTURES AND ADJUSTMENTS

At the Kickoff Workshop, MWS staff identified that the primary objective for the revised rate structure was to align rates with cost of service while maintaining affordable rates for residential customers with minimal impacts. In addition to these objectives, MWS was also interested in evaluating tiered rates for its residential class to further promote wise water use and conservation measures. Alternative rate structures were developed to address these pricing objectives while meeting the needed increases for revenue sufficiency identified in the financial plan. The following section discusses the alternative rate structures developed for the Study.

Basis of Rate Design

As discussed previously, MWS utility rates have two components - fixed and variable. Fixed charges provide revenue stability for utilities and bill stability for users while recovering capital and billing related costs of service. Volume rates can send price signals encouraging efficient use of water by allowing users control over their bills. Volume rates can introduce the risk of revenue instability to a utility. Finding the appropriate balance between fixed charge revenues and volume charge revenues is critical.

Base charges are made up of three components: bill charges, cost-based fixed charges, and volume-based fixed charges. Bill charges remain the same regardless of meter size. Cost-based fixed charges capture meter-related costs and are escalated by meter size based on the equivalent cost ratios between meters. Ready-to-serve and fire protection charges are recovered by the fixed charges but the escalation by meter size is based on volume equivalency factors. Table 24 shows the water and sewer fixed charges based on the cost of service results for the FY 2020 Test Year.

The calculated volumetric unit costs shown in Table 24 are uniform rates, meaning the same charge per ccf would apply regardless of usage for all residential customers. Similarly, all non-residential customers would be billed the same volume unit rate regardless of the amount of billed usage. These are determined by adding up all non-base charge related costs and dividing by the total assumed volume of billable units for water and sewer. The rates and charges in Table 24 do not include any usage in the base charge, e.g., 2 ccf.

Table 24: Water & Sewer 2020 Rates and Charges Based on Cost of Service

	Water	Wastewater
Monthly Service Charge		
5/8-Inch	\$4.73	\$7.20
3/4-Inch	\$11.25	\$31.83
1-Inch	\$14.18	\$41.19
1.5-Inch	\$24.93	\$80.18
2-Inch	\$35.20	\$112.65
3-Inch	\$56.29	\$140.25
4-Inch	\$127.90	\$397.92
6-Inch	\$159.69	\$474.39
8 & 10-Inch	\$207.80	\$607.43
Volume Rate		
Residential	\$2.62	\$4.32
Non-Residential	\$2.51	\$4.32

Rate Design Scenarios

Based on the results shown in Table 24, three rate design scenarios were developed for consideration. Each scenario began with common fixed charges for all classes but differ in the way volume charges were developed. Table 25 outlines the basic differences between rate scenarios.

Table 25: Rate Alternative Scenarios

	Scenario 1	Scenario 2	Scenario 3
Water			
Usage in base charge	0 ccf	2 ccf	2 ccf
Residential volume rate	3 Tiers	3 Tiers	3 Tiers
Non-residential volume rate	Uniform	Uniform	Uniform
Water Infrastructure Replacement Fee	0%	0%	10%
Sewer			
Usage in base charge	0 ccf	2 ccf	2 ccf
Residential volume rate	Uniform	Uniform	Uniform
Non-residential volume rate	Uniform	Uniform	Uniform
Sewer Infrastructure Replacement Fee	10%	10%	10%

Detailed descriptions are provided for each of the three rate design scenarios however the scenarios have commonalities to address the pricing objectives and challenges with the existing rate structure. The commonalities are described below:

- The recommended set of fixed charges for all customer classes (water and sewer separately) are cost justified and provide for more equitable cost recovery when compared to the existing fixed charges. The fixed charges for all scenarios include 25% of debt service for costs associated with readiness-to-serve.
- A tiered structure for the Residential class is recommended in all three scenarios to address MWS’ water efficiency/conservation pricing objective. Conservation issues have become prevalent throughout the United States with many utilities seeking to implement rate structures and policies to encourage wise water use. A conservation rate structure, such as a tiered rate structure, targets inefficient water consumption by charging a higher rate for excessive water use. The Residential class is typically the customer class with the most discretionary water usage, demonstrated by swings in both seasonal usage trends and in daily demand, which can be managed by a conservation rate structure. Non-residential customers tend to have relatively level water demands, and being profit-driven in most cases, provide an inherent incentive to use water efficiently.
- Based on the non-homogenous customer classifications and inconclusive billing data, MWS’ non-residential customers (Small, Intermediate, and Large Commercial) have been combined into one non-residential class in all three scenarios, for water and sewer.
- For sewer, all customers (Residential and Non-residential commercial classes) will be charged a uniform volumetric rate for all usage. The total sewer customer bill will continue to be assessed a 10% SIR fee, however, the money from the fee will be exclusively used to pay for capital needs associated with Clean Water Nashville as opposed to being used as an operating expense offset.

Details for each scenario are provided below and the following tables outline the rates and charges for FY 2020. Each of these scenarios has been developed to recover the FY 2020 test year revenue requirements and each is projected to generate the same amount of annual revenue.

Scenario 1

For Scenario 1, the three-tiered water rate structure is designed around the average Residential user (5.5 ccf). The first-tier cut-off is at 2 ccf so that a reduced rate can be offered to those households that use small amounts of water

and have become accustomed to a very low bill for minimal usage. This rate design helps to ease customers' transition from the current structure to removing the 2 ccf minimum from the fixed charge, which results in customers paying for all metered usage. The second-tier cutoff is set at 10 ccf, which is above the average usage. This allows the average volumetric rate for a typical 5.5 ccf user to be the same as the non-residential volumetric rate. The third-tier targets discretionary usage.

Table 26: Proposed Rates – Scenario 1

Scenario 1			
Fixed Charges		Water	Wastewater
5/8-Inch		\$4.73	\$7.20
3/4-Inch		11.25	31.83
1-Inch		14.18	41.19
1.5-Inch		24.93	80.18
2-Inch		35.20	112.65
3-Inch		56.29	140.25
4-Inch		127.90	397.92
6-Inch		159.69	474.39
8 & 10-Inch		207.80	607.43
Residential Rate	Thresholds	Water	Wastewater
Tier 1	0-2	\$1.87	\$4.32
Tier 2	2-10	2.67	4.32
Tier 3	>10	3.74	4.32
Non-Residential Rate		Water	Wastewater
All Usage		\$2.51	\$4.32

Table 27 depicts the percentage distribution of usage within each tier. As can be seen in the table, approximately 81% of the usage will be recovered in tiers 1 and 2 with 19% being recovered in tier 3.

Table 27: Residential Usage by Tier – Scenario 1

Tier	Thresholds	Flow (%)
Tier 1	0-2 CCF	31.57%
Tier 2	2-10 CCF	49.78%
Tier 3	>10 CCF	18.65%

As mentioned previously, and as shown in Table 27, usage below 2 ccf is approximately 31% of all residential usage and is currently included in the minimum allowance. MWS does not currently generate revenue on this usage. Charging for this usage allows MWS to lower the volume rates for the remaining usage because all metered usage generates revenue. Under this scenario, low volume users (e.g., those using 2 ccf or less per month) will see larger impacts relative to other residential customers. In addition, without the minimum allowance, the fixed charge becomes a true fixed charge that is set to recover those costs that are typically recovered through fixed charges.

While Residential customers are billed using a three-tier structure, non-residential classes share a uniform rate for all billed flow. Similar to Residential customers, no usage is included in the fixed charge for non-residential customers.

Sewer service would be charged using a uniform rate for all usage and all classes. When compared to the existing rate structure, removing the 2 ccf minimum allowance creates more billable sewer usage and results in a lower volume rate.

Scenario 2

Scenario 2 maintains the current 2 ccf minimum allowance in the base charge. Residential customers would be billed with three inclining block rate tiers for all usage above 2 ccf with revised tier cutoffs as compared to Scenario 1. Maintaining the 2 ccf minimum allowance in the fixed charge protects the low-volume residential users by shifting cost recovery to higher-volume residential tiers. For lower-volume residential customers, this scenario represents the scenario with the smallest impact on future bills. This scenario was created to address both the *affordability* and *minimal impacts* pricing objectives.

Table 28: Proposed Rates – Scenario 2

Scenario 2			
Fixed Charges		Water	Wastewater
5/8-Inch		\$4.73	\$7.20
3/4-Inch		11.25	31.83
1-Inch		14.18	41.19
1.5-Inch		24.93	80.18
2-Inch		35.20	112.65
3-Inch		56.29	140.25
4-Inch		127.90	397.92
6-Inch		159.69	474.39
8 & 10-Inch		207.80	607.43
Residential Rate	Thresholds	Water	Wastewater
Base Usage	0-2	\$-	\$-
Tier 1	2-6	3.26	5.16
Tier 2	6-10	3.91	5.16
Tier 3	>10	4.89	5.16
Non-Residential Rate		Water	Wastewater
All Usage		\$2.56	\$5.16

Table 30 depicts the revised tier cutoffs. As can be seen in the table, tier 2 from Scenario 1 has been divided into two separate tiers; tier 1 (2-6) and tier 2 (6-10). Approximately 31.57% of the usage will be captured in the fixed charge as part of the minimum allowance.

Table 29: Residential Usage by Tier – Scenario 2

Tier	Thresholds	Flow (%)
Included Water	0-2 CCF	31.57%
Tier 1	2-6 CCF	37.34%
Tier 2	6-10 CCF	12.44%
Tier 3	>10 CCF	18.65%

Non-residential classes would be charged with a uniform rate for usage over 2 ccf. The volume rates must increase slightly over those in Scenario 1 to recover the revenues associated with the included 2 ccf minimum allowance.

Sewer service would be charged with a uniform rate for all usage above the 2 ccf minimum and also shows an increase based on fewer units of flow being charged.

Scenario 3

Scenario 3 is a modification of Scenario 2. The rate structure is essentially the same, however, Scenario 3 reflects the implementation of a 10% Water Infrastructure Replacement (WIR) fee. Like the existing SIR fee that is intended to be used in the future to fund Clean Water Nashville projects, the WIR fee revenues would be specifically used to fund water system capital costs. Sixty-five percent of the utility’s water mains and lines are over forty years old. The WIR fee will provide additional cash funding of water capital needs and will be a dedicated funding source to replace rapidly aging infrastructure with a goal of eventually replacing 1% of assets annually. The full benefit of the WIR fee on water rates is not expected to be apparent in the near term, but as these revenues slowly reduce the use of Commercial Paper and other debt, capital financing costs are expected to fall. This reduction in debt issuance is also projected to help with meeting future coverage requirements.

As with Scenario 2, the Scenario 3 base charges include a minimum allowance for water or sewer service. Residential customers would be billed using three inclining block rate tiers and no charge for usage of 2 ccf and below. Non-residential classes would be charged with a uniform rate for usage over 2 ccf. Sewer service would be charged with a uniform rate for all usage.

Table 30: Proposed Rates – Scenario 3

Scenario 3			
Fixed Charges		Water	Wastewater
5/8-Inch		\$4.72	\$7.20
3/4-Inch		11.22	31.83
1-Inch		14.15	41.19
1.5-Inch		24.86	80.18
2-Inch		35.10	112.65
3-Inch		56.10	140.25
4-Inch		127.52	397.92
6-Inch		159.20	474.39
8 & 10-Inch		207.15	607.43
Residential Rate	Thresholds	Water	Wastewater
Base Usage	0-2	\$-	\$-
Tier 1	2-6	3.24	5.16
Tier 2	6-10	3.89	5.16
Tier 3	>10	4.86	5.16
Non-Residential Rate		Water	Wastewater
All Usage		\$2.55	\$5.16

Scenario Summary

Each of the above scenarios addresses common issues while also offering specific advantages and limitations. All of the scenarios, with the revised fixed charges in conjunction with the need to recover greater revenues, result in changes for all customer bills that are significant in many cases. Residential customers with 5/8-inch meters will see fixed monthly charges increase by less than \$1.20 per month for water and sewer service. Large Commercial customers are projected to see significant savings in the fixed portion of their bills while Small and Intermediate Commercial customers, particularly those with large meters, will see increased fixed costs. When considering overall bill impacts, billed volume has a significant role in determining the overall impact for customers. In all scenarios, the simplification of volume rates, in conjunction with need to recover greater revenues, results in volume rates increasing for all customers.

Overall, each scenario addresses the objectives laid out by MWS at the onset of the study, with some scenarios achieving various objectives better than others. For instance, each scenario adheres to the principles of cost-of-service rates. Despite affordability being a consideration in each scenario, Scenarios 2 and 3 better address affordability for residential customers with very little water usage by maintaining the minimum allowance. However, Scenario 1 offers lower unit rates because the first 2 ccf of usage is billed for all customers, creating more affordable bills for typical and larger water users. The table below summarizes how each scenario addresses the various objectives of the study.

Table 31: Rate Alternative Scenarios

	Scenario 1	Scenario 2	Scenario 3
COS-based	✓	✓	✓
Affordability to Disadvantaged Customers	-	+	+
Water Efficiency & Conservation/Tiered Rates	+	+	+
Minimal Residential Impacts	-	+	+
SIR Fee	✓	✓	✓
WIR Fee			✓

Customer Impacts

The impact on customers is a significant concern and time was taken to understand the effects the various rate scenarios may have on customers. When a rate structure undergoes major changes, these changes will have varying impacts to different customers. In addition to the proposed changes for the rate structure, MWS is also facing the need for considerable rate increases for FY 2020 and future years. Changing the rate structure in a year when large rate increases are needed magnifies the discrepancies between customer impacts making the objective of *minimal impacts* very difficult to achieve.

The customer bill analysis focused on the effect on customers in various classes and at varying usage levels within each class. The sample customers included small, medium, and large users from the residential, small commercial, intermediate commercial and large commercial classes. The impact from the proposed rate structure adjustment at various levels of usage and customer classes is illustrated in Table 32. The calculated bills include taxes and fees where applicable.

Table 32: Customer Impacts

	Current Rates	Scenario 1	Scenario 2	Scenario 3
Residential, 5/8-Inch Meter				
2 ccf	\$11.80	\$26.66	\$13.08	\$13.59
6 ccf	42.84	57.32	50.02	51.94
10 ccf	73.88	87.97	89.82	93.41
Small Commercial, 5/8-Inch Meter				
5 ccf	\$39.33	\$50.52	\$38.50	\$39.85
16 ccf	133.26	132.90	131.73	136.16
20 ccf	167.42	162.86	165.62	171.19
Small Commercial, 1-Inch Meter				
5 ccf	\$72.60	\$98.25	\$86.23	\$88.61
16 ccf	166.53	180.63	179.45	184.92
20 ccf	200.69	210.58	213.35	219.94
Intermediate Commercial, 2-Inch Meter				
20 ccf	\$235.57	\$312.14	\$314.91	\$323.78
50 ccf	448.27	536.80	569.15	586.45
100 ccf	802.77	911.24	992.88	1,024.23
Intermediate Commercial, 3-Inch Meter				
20 ccf	\$262.72	\$365.54	\$368.31	\$379.39
50 ccf	475.42	590.20	622.54	642.06
100 ccf	829.92	964.63	1,046.27	1,079.84
Large Commercial, 6-Inch Meter				
500 ccf	\$4,892.19	\$4,440.64	\$4,916.63	\$5,073.79
1500 ccf	10,455.62	11,929.34	13,391.21	13,829.38
2500 ccf	16,019.04	19,418.05	21,865.79	22,584.97

Note: projected bills include all applicable taxes and fees

Additional customer impacts are provided in Appendix A.

Recommendations

The results of the Study indicate that MWS is in need of significant rate adjustments in the current fiscal year (FY 2020) and future years to meet required operating and capital needs as discussed in the Financial Plan section of this report. In addition, the existing rate structure is atypical and does not equitably recover costs from existing customer classes as demonstrated in the Cost of Service section. A rate structure change is needed to address cost of service.

Based on the results of the Study, three recommendations are proposed.

1. A rate structure change that incorporates the needed rate increases for FY 2020. The Alternative Rate Structures section details three rate scenarios from which Scenario 3 is recommended.
2. Future rate increases for the fiscal years 2021-2024 of the forecast period. The Financial Plan details increasing operating and capital requirements that cannot be addressed in a one-year rate adjustment, it must be addressed over multiple years.
3. Small annual rate increases based on the CPI-U for each year beyond the forecast period as the Clean Water Nashville needs and other regulatory needs will continue into the future beyond the forecast period presented in this report.

The recommendations and the impacts of the recommendations are discussed in detail below.

PROPOSED WATER AND SEWER RATE STRUCTURE AND RATES

Based on thorough discussions revolving around the three rate design scenarios presented, MWS staff and Raftelis recommend the rates and charges shown in Scenario 3. Similar to Scenario 2, Scenario 3 maintains the existing 2 ccf allowance in the fixed charge for both water and sewer, however, Scenario 3 has the addition of the 10% WIR fee that dedicates additional cash funding for water capital needs, similar to the SIR fee.

Table 33: Recommended Rates and Charges, FY 2020

Scenario 3			
Fixed Charges		Water	Wastewater
5/8-Inch		\$4.72	\$7.20
3/4-Inch		11.22	31.86
1-Inch		14.15	41.22
1.5-Inch		24.86	80.24
2-Inch		35.10	112.73
3-Inch		56.10	140.34
4-Inch		127.52	398.21
6-Inch		159.20	474.72
8 & 10-Inch		207.15	607.87
Residential Rate	Thresholds	Water	Wastewater
Tier 1	0-2	\$-	\$-
Tier 2	2-6	3.24	5.16
Tier 3	6-10	3.89	5.16
Tier 4	>10	4.86	5.16
Non-Residential Rate		Water	Wastewater
All Usage		\$2.55	\$5.16

As previously discussed in the Cost of Service section of this report, water and sewer rates were performed on a cash-basis which means the test year costs include anticipated expenses to be incurred by MWS in FY 2020. These anticipated expenses were developed as part of the financial plan discussed previously and include annual operating and maintenance costs for salaries, benefits, insurance, electricity, chemicals, supplies, contractual

services, debt service, and cash transfers necessary to meet debt service coverage and fund balance requirements. If none of the recommended rate scenarios are implemented and the current rate structure were to remain intact, an across-the-board rate increase of 36.5% for water and 18.0% for sewer would be necessary in 2020, with additional increases in following years to continue to meet financial targets as shown in the following section.

FUTURE RATE INCREASES

As part of the Financial Plan, capital and operating cash needs requirements were projected for future years (FY 2021 through FY 2024) and were segregated between water and sewer for each year of the forecast period to eliminate any future subsidies between the two utilities. Table 34 shows the projected rate increases for the five-year forecast period.

Table 34: Future Rate Increases

	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Water						
Fixed Charges	0.0%	Scenario 3	8.0%	6.0%	2.0%	2.0%
Volume Charges	0.0%		8.0%	6.0%	2.0%	2.0%
Wastewater		COS				
Fixed Charges	0.0%	Alignment	13.0%	4.0%	2.0%	2.0%
Volume Charges	0.0%		13.0%	4.0%	2.0%	2.0%

Future rate increase amounts consider projected operating costs, growth in accounts, estimated changes in per capita customer usage of water and wastewater service, and capital expenses, including projected debt service. The addition of the WIR fee to Scenario 3 has resulted in changes from the Financial Plan discussed in the Financial Plan section of this report. The WIR fee increases the cash available for water capital projects, reducing the need for debt proceeds and reducing the rate revenue requirements slightly for 2020. Because the portion of the CIP that is cash funded increases in this scenario, the need for commercial paper is reduced, resulting in lower financing costs and ultimately lower debt service when commercial paper is eventually converted to long term debt. While the projected savings in 2020 is marginal, annual savings are anticipated and will be compounded annually, resulting in an improving financial position for MWS related to fund balances and debt coverage over time.

Indexed Increases

Beginning in 2025, small, regular rate increases based on the Consumer Price Index for All Urban Consumers (CPI-U) are proposed annually and in perpetuity to maintain the coverage and E&R fund balance requirements MWS must meet. These indexed increases are intended to follow general inflation rates that impact operating expenses incurred by MWS and are based on a five-year average of Consumer Price Index (CPI) and guided by common cost increases seen by Raftelis across the water and sewer industries. While operating costs are projected to increase by 2.5% annually beginning in FY 2022, these indexed increases are anticipated to be sufficient due to projected growth in accounts and water usage in future years. Rates for the study period of 2020 through 2024 are presented in Table 35 and Table 36.

Table 35: Proposed Rates – Water, Scenario 3

	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Fixed Charges					
5/8-Inch	\$4.72	\$5.09	\$5.40	\$5.51	\$5.62
3/4-Inch	11.22	12.12	12.85	13.11	13.37
1-Inch	14.15	15.28	16.19	16.52	16.85
1.5-Inch	24.86	26.85	28.46	29.03	29.61
2-Inch	35.10	37.91	40.18	40.98	41.80
3-Inch	56.10	60.58	64.22	65.50	66.81
4-Inch	127.52	137.72	145.99	148.90	151.88
6-Inch	159.20	171.93	182.25	185.90	189.61
8 & 10-Inch	207.15	223.72	237.14	241.89	246.72
Residential Rate					
Tier 1 (0-2 ccf)	\$-	\$-	\$-	\$-	\$-
Tier 2 (2-6 ccf)	3.24	3.50	3.71	3.79	3.86
Tier 3 (6-10 ccf)	3.89	4.20	4.46	4.54	4.63
Tier 4 (>10 ccf)	4.86	5.25	5.57	5.68	5.79
Non-Residential Rate					
All Usage	\$2.55	\$2.75	\$2.92	\$2.98	\$3.04

Table 36: Proposed Rates – Sewer, Scenario 3

	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Fixed Charges					
5/8-Inch	\$7.20	\$8.14	\$8.46	\$8.63	\$8.80
3/4-Inch	31.86	36.00	37.44	38.19	38.95
1-Inch	41.22	46.58	48.44	49.41	50.40
1.5-Inch	80.24	90.67	94.30	96.18	98.11
2-Inch	112.73	127.38	132.48	135.13	137.83
3-Inch	140.34	158.59	164.93	168.23	171.59
4-Inch	398.21	449.98	467.97	477.33	486.88
6-Inch	474.72	536.44	557.89	569.05	580.43
8 & 10-Inch	607.87	686.89	714.36	728.65	743.22
Residential Rate					
All Usage	\$5.16	\$5.85	\$6.08	\$6.20	\$6.33
Non-Residential Rate					
All Usage	\$5.16	\$5.85	\$6.08	\$6.20	\$6.33

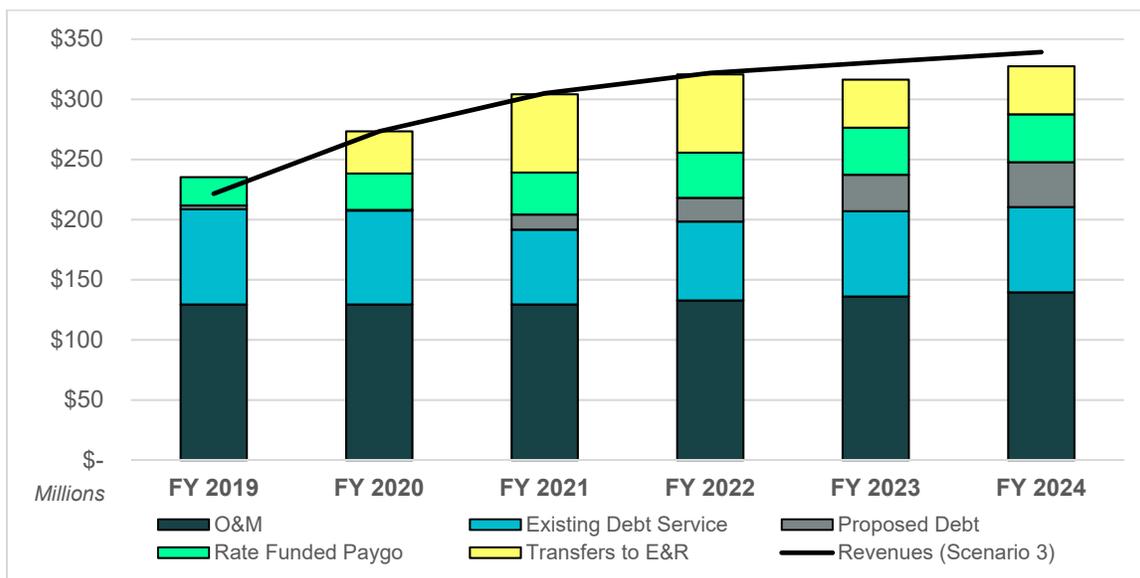
IMPACTS OF RECOMMENDATIONS

The proposed water and sewer rate structure and rates will allow MWS to meet the revenue requirements as presented in the Financial Plan. The following sections discuss the financial results resulting from the proposed recommendations.

Revenue Sufficiency

The rates presented in Table 35 and Table 36 are anticipated to generate sufficient revenue to cover operating and capital expenses and meet fund balance and coverage requirements in future years based on the assumptions used to develop the financial model. As shown in Figure 7, the solid line that represents the revenues exceeds the annual O&M and debt service obligations and provides for cash funding of needed capital improvements which is necessary to meet annual debt service coverage requirements.

Figure 7: Projected Revenue Sufficiency Under Scenario 3



These assumptions should be reviewed periodically to ensure they are appropriate and updated as needed to update the resulting projections.

Extension and Replacement Fund Balance

The rates shown in Table 35 and Table 36 are projected to generate sufficient revenues to meet the revenue requirements associated with providing on-going water and sewer service, as well as meeting the policy-driven objectives, including debt coverage requirements. The revenues, expenses, and projected year-end balances are shown in Table 37 below. Note the projected ending balance for each year is anticipated to be equal to at least 365 days of operating expenses or better with the exception of FY 2021.³ Additionally, the rate covenant ratios and additional bond test results are projected to improve significantly over those shown in Table 11 as a result of the proposed rate increases.

³ Fitch rating agency’s median target for AA credit rating is 572 days of O&M or operating expenses. MWS internal policy is 365 days of operating expenses.

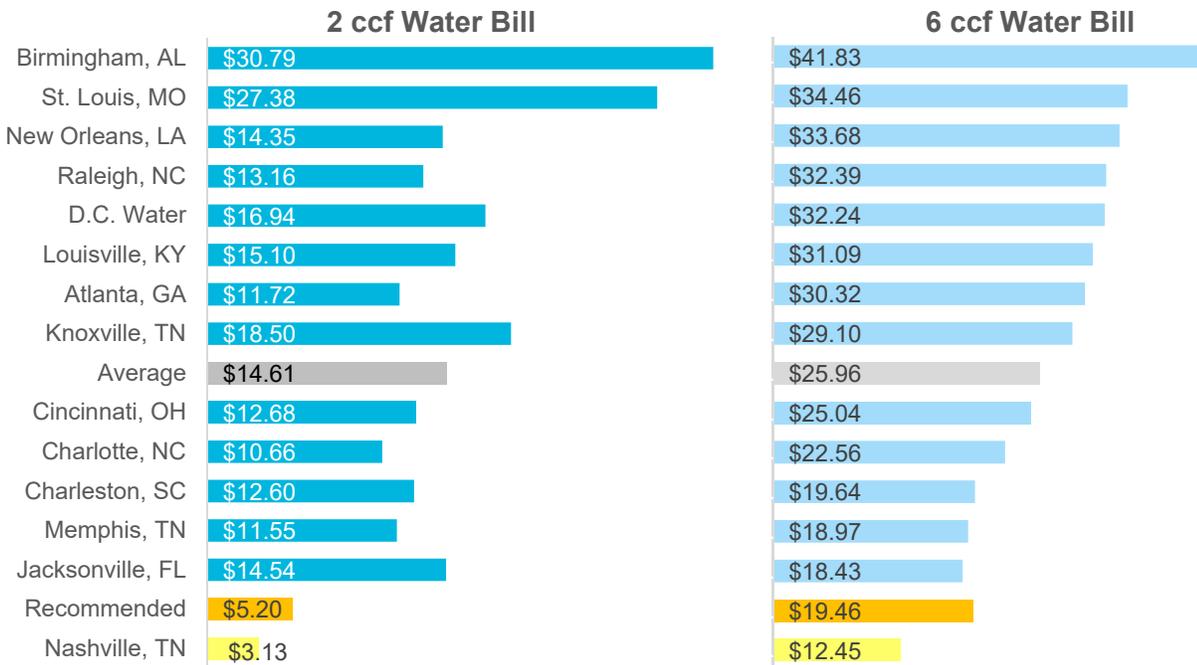
Table 37: Projected E&R Fund Balance and Coverage Results⁴

	FY 2020 <i>Projected</i>	FY 2021 <i>Projected</i>	FY 2022 <i>Projected</i>	FY 2023 <i>Projected</i>	FY 2024 <i>Projected</i>
Beginning Balance	\$95,140,537	\$130,140,537	\$120,979,346	\$137,266,090	\$141,725,085
Revenues					
Water	\$91,442,350	\$99,737,450	\$106,770,203	\$109,985,893	\$113,299,276
Wastewater	137,393,002	156,162,533	163,358,888	167,600,789	171,954,704
Miscellaneous Revenues	26,180,849	26,208,149	26,208,149	26,208,149	26,208,149
WIR Revenues	18,374,040	22,883,535	25,589,998	27,012,909	27,758,668
Expenses					
Operating Expenses	\$129,577,200	\$129,577,200	\$132,816,630	\$136,137,046	\$139,540,472
Capital Expenses	143,813,041	174,575,658	187,823,865	180,211,698	187,926,117
Net Revenues	\$0	\$838,809	\$1,286,744	\$14,458,995	\$11,754,209
E&R Activity	\$35,000,000	-\$10,000,000	\$15,000,000	-\$10,000,000	-\$10,000,000
Ending Balance	\$130,140,537	\$120,979,346	\$137,266,090	\$141,725,085	\$143,479,294
<i>Days of O&M Expenses:</i>	367	341	377	380	375
Rate Covenant Ratios					
Prior Second Lien (1.20x Required)	2.58x	3.52x	3.00x	2.50x	2.31x
Subordinate (1.10x Required)	1.89x	2.53x	2.32x	2.04x	1.92x
Additional Bonds Test					
Part 1 (1.20x Required)	1.36x	2.10x	2.04x	2.19x	1.88x
Part 2 (1.10x Required)	1.08x	1.67x	1.69x	1.82x	1.61x

Comparison with Peer Utilities

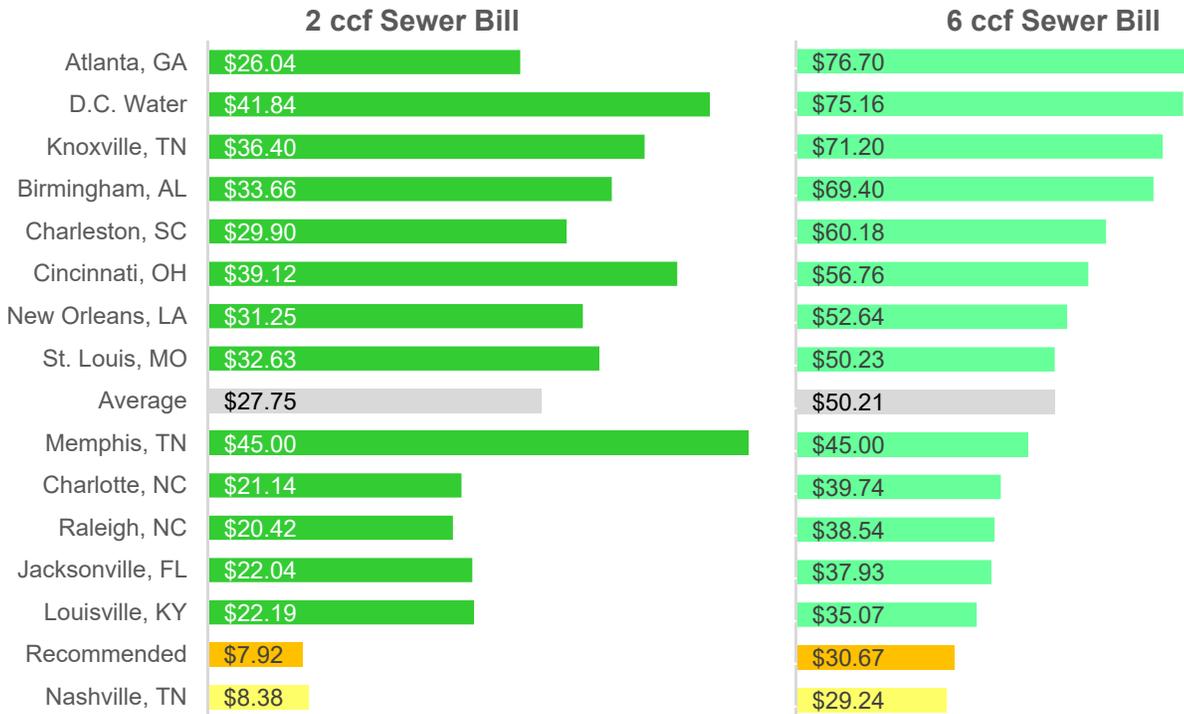
The previous comparison with peer utilities is provided below with the proposed water and sewer rates (Scenario 3). The comparisons provide additional context for the rates. As can be seen in the comparison, MWS' bills are still considerably less than the peer utilities' charges even with the needed rate adjustments.

Figure 8: Water Rate Comparison for 2 ccf and 6 ccf



⁴ Additional bonds test coverage is calculated on the net revenues in any 12 months of the prior 24 months. To be conservative in these projections, the prior fiscal years net revenues were used for the calculations. Net revenues for FY 2019 were used for FY 2020 calculations. If rate adjustments are put into place in FY 2020 and done prior to the issuance of the refunding bonds, increased revenues from the rate adjustment can be used in the calculation which should allow MWS to meet additional bonds test.

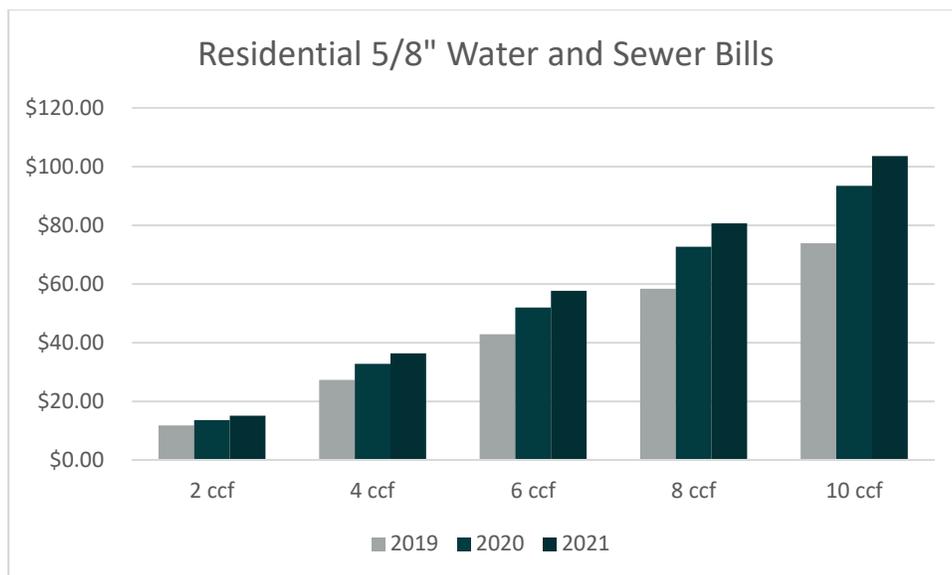
Figure 9: Sewer Rate Comparison for 2 ccf and 6 ccf



Note: Bills do not include taxes, Nashville, TN and Recommended bills include WIR or SIR surcharges

Figure 10 shows projected residential class water and sewer service bills at commonly billed volumes for 2019, 2020, and 2021. The bills for 2019 are based on the current rates, while the 2020 projected bills are based on the recommended (Scenario 3) rates. Projected bills for 2021 are based on the recommended rates for 2020 but include the rate increases listed in Table 24.

Figure 10: Residential 5/8-Inch Water and Sewer Bill



APPENDIX A:

**SELECT SCHEDULES FROM
COST OF SERVICE MODEL**

See Revised

Table A-1: Sample Water and Sewer Bills – Residential Customers

Residential – 5/8-Inch Meter		
CCF	Current Rates	Recommended Scenario
0	\$11.80	\$13.59
1	11.80	13.59
2	11.80	13.59
3	19.56	23.17
4	27.32	32.76
5	35.08	42.35
6	42.84	51.94
7	50.60	62.31
8	58.36	72.68
9	66.12	83.04
10	73.88	93.41
11	81.64	104.95
12	89.40	116.49
13	97.16	128.02
14	104.92	139.56
15	112.68	151.10
16	120.43	162.63
17	128.19	174.17
18	135.95	185.71
19	143.71	197.24
20	151.47	208.78
25	190.27	266.47
30	229.07	324.15
35	267.87	381.84
40	306.66	439.52
45	345.46	497.21
50	384.26	554.89
60	461.85	670.26
70	539.45	785.63
80	617.04	901.01
90	694.64	1,016.38
100	772.23	1,131.75
125	966.22	1,420.17
150	1,160.21	1,708.60
175	1,354.20	1,997.03
200	1,548.19	2,285.45
250	1,936.16	2,862.30

Note: projected bills include all applicable taxes and fees

Table A-2: Sample Water and Sewer Bills – Small Commercial Customers

Small Commercial - 3-Inch Meter		
CCF	Current Rates	Recommended Scenario
0	\$122.73	\$221.79
1	122.73	221.79
2	122.73	221.79
3	131.27	230.55
4	139.81	239.30
5	148.35	248.06
6	156.89	256.81
7	165.43	265.57
8	173.97	274.33
9	182.51	283.08
10	191.05	291.84
100	959.60	1,079.84
400	3,521.42	3,706.52
500	4,375.36	4,582.07
1500	12,914.76	13,337.66
2500	21,454.16	22,093.25
2600	22,308.10	22,968.81
2700	23,162.04	23,844.37
2800	24,015.98	24,719.93
2900	24,869.92	25,595.49
3000	25,723.86	26,471.05
3100	26,577.80	27,346.60
3200	27,431.74	28,222.16
3300	28,285.68	29,097.72
3400	29,139.62	29,973.28
3500	29,993.56	30,848.84
3600	30,847.50	31,724.40
3700	31,701.44	32,599.96
3800	32,555.38	33,475.52
3900	33,409.32	34,351.08
4000	34,263.26	35,226.63
4100	35,117.20	36,102.19
4200	35,971.14	36,977.75
4300	36,825.08	37,853.31
4400	37,679.02	38,728.87
4500	38,532.96	39,604.43
5000	42,802.66	43,982.22

Note: projected bills include all applicable taxes and fees

Table A-3: Sample Water and Sewer Bills – Intermediate Commercial Customers

Intermediate Commercial - 6-Inch Meter		
CCF	Current Rates	Recommended Scenario
0	\$330.20	\$713.51
1	330.20	713.51
2	330.20	713.51
3	337.29	722.27
4	344.38	731.02
5	351.47	739.78
6	358.56	748.53
7	365.65	757.29
8	372.74	766.05
9	379.83	774.80
10	386.92	783.56
100	1,025.01	1,571.56
400	3,152.00	4,198.24
500	3,860.99	5,073.79
1500	10,950.94	13,829.38
2500	18,040.89	22,584.97
2600	18,749.89	23,460.53
2700	19,458.88	24,336.09
2800	20,167.88	25,211.65
2900	20,876.87	26,087.21
3000	21,585.87	26,962.77
3100	22,294.86	27,838.32
3200	23,003.86	28,713.88
3300	23,712.85	29,589.44
3400	24,421.85	30,465.00
3500	25,130.84	31,340.56
3600	25,839.84	32,216.12
3700	26,548.83	33,091.68
3800	27,257.83	33,967.24
3900	27,966.82	34,842.80
4000	28,675.82	35,718.35
4100	29,384.81	36,593.91
4200	30,093.81	37,469.47
4300	30,802.80	38,345.03
4400	31,511.80	39,220.59
4500	32,220.79	40,096.15
5000	35,765.77	44,473.94

Note: projected bills include all applicable taxes and fees

Table A-4: Sample Water and Sewer Bills – Large Commercial Customers

Large Commercial - 6-Inch Meter		
CCF	Current Rates	Recommended Scenario
0	\$2,121.61	\$713.51
1	2,121.61	713.51
2	2,121.61	713.51
3	2,127.17	722.27
4	2,132.74	731.02
5	2,138.30	739.78
6	2,143.86	748.53
7	2,149.43	757.29
8	2,154.99	766.05
9	2,160.55	774.80
10	2,166.12	783.56
100	2,666.82	1,571.56
400	4,335.85	4,198.24
500	4,892.19	5,073.79
1500	10,455.62	13,829.38
2500	16,019.04	22,584.97
2600	16,575.39	23,460.53
2700	17,131.73	24,336.09
2800	17,688.07	25,211.65
2900	18,244.41	26,087.21
3000	18,800.76	26,962.77
3100	19,357.10	27,838.32
3200	19,913.44	28,713.88
3300	20,469.78	29,589.44
3400	21,026.13	30,465.00
3500	21,582.47	31,340.56
3600	22,138.81	32,216.12
3700	22,695.15	33,091.68
3800	23,251.50	33,967.24
3900	23,807.84	34,842.80
4000	24,364.18	35,718.35
4100	24,920.52	36,593.91
4200	25,476.87	37,469.47
4300	26,033.21	38,345.03
4400	26,589.55	39,220.59
4500	27,145.89	40,096.15
5000	29,927.61	44,473.94

Note: projected bills include all applicable taxes and fees

Table A-5: Total Water and Sewer Bills, Residential Class – 5/8-Inch Meter

CCF	Current Rates		Recommended Rates			
	2019	2020	2021	2022	2023	2024
Residential - 5/8" Meter						
2	\$11.80	\$13.59	\$15.08	\$15.81	\$16.12	\$16.45
4	27.32	32.76	36.36	38.11	38.87	39.65
6	42.84	51.94	57.64	60.41	61.62	62.85
8	58.36	72.68	80.61	84.49	86.18	87.90
10	73.88	93.41	103.57	108.58	110.75	112.96

Table A-6: Customer Accounts

	FY 2019 <i>Estimated</i>	FY 2020 <i>Projected</i>	FY 2021 <i>Projected</i>	FY 2022 <i>Projected</i>	FY 2023 <i>Projected</i>	FY 2024 <i>Projected</i>
Water Accounts						
Residential	164,614	164,614	166,258	167,918	169,595	171,290
Small Commercial	9,780	9,780	9,874	9,969	10,065	10,163
Intermediate Commercial	5,870	5,870	5,925	5,980	6,035	6,092
Large Commercial	80	80	80	80	80	80
Total Water	180,344	180,344	182,137	183,947	185,775	187,625
% Change		0.0%	1.0%	1.0%	1.0%	1.0%
Sewer Accounts						
Residential	178,130	178,130	179,909	181,706	183,521	185,355
Small Commercial	9,677	9,677	9,771	9,865	9,961	10,058
Intermediate Commercial	5,113	5,113	5,161	5,209	5,257	5,306
Large Commercial	68	68	68	68	68	68
Total Sewer	192,988	192,988	194,909	196,848	198,807	200,787
% Change		0.0%	1.0%	1.0%	1.0%	1.0%

Table A-7: Customer Usage

	FY 2019 <i>Estimated</i>	FY 2020 <i>Projected</i>	FY 2021 <i>Projected</i>	FY 2022 <i>Projected</i>	FY 2023 <i>Projected</i>	FY 2024 <i>Projected</i>
Water Usage (ccf)						
Residential	12,655,439	12,655,439	12,781,977	12,909,782	13,038,861	13,169,232
Small Commercial	1,105,442	1,105,442	1,116,483	1,127,632	1,138,893	1,150,268
Intermediate Commercial	12,281,165	12,281,165	12,403,959	12,527,982	12,653,250	12,779,766
Large Commercial	4,622,998	4,622,998	4,669,214	4,715,890	4,763,035	4,810,651
Total Water Usage	30,665,044	30,665,044	30,971,633	31,281,286	31,594,039	31,909,917
% Change		0.0%	1.0%	1.0%	1.0%	1.0%
Sewer Usage (ccf)						
Residential	10,460,037	10,460,036	10,512,335	10,564,896	10,617,719	10,670,807
Small Commercial	890,979	890,977	895,431	899,907	904,405	908,926
Intermediate Commercial	11,236,539	11,236,538	11,292,719	11,349,182	11,405,927	11,462,955
Large Commercial	2,913,700	2,913,699	2,928,267	2,942,907	2,957,620	2,972,407
Total Sewer Usage	25,501,255	25,501,250	25,628,752	25,756,892	25,885,671	26,015,095
% Change		0.0%	0.5%	0.5%	0.5%	0.5%

Table A-8: Operating Expenses

	2019	2020	2021	2022	2023	2024
Administration	\$ 11,272,600	\$ 11,272,600	\$ 11,272,600	\$ 11,554,415	\$ 11,843,275	\$ 12,139,357
Human Resources	1,106,100	1,106,100	1,106,100	1,133,753	1,162,096	1,191,149
Stores	336,300	336,300	336,300	344,708	353,325	362,158
Accounting	3,038,000	3,038,000	3,038,000	3,113,950	3,191,799	3,271,594
Information Services	4,361,000	4,361,000	4,361,000	4,470,025	4,581,776	4,696,320
Customer Service	9,121,100	9,121,100	9,121,100	9,349,128	9,582,856	9,822,427
Engineering	1,556,600	1,556,600	1,556,600	1,595,515	1,635,403	1,676,288
System Services	29,007,200	29,007,200	29,007,200	29,732,380	30,475,690	31,237,582
Operations	69,778,300	69,778,300	69,778,300	71,522,758	73,310,826	75,143,597
Total MWS Operating Budget	\$ 129,577,200	\$ 129,577,200	\$ 129,577,200	\$ 132,816,630	\$ 136,137,046	\$ 139,540,472
<i>Percent Change</i>		0.00%	0.00%	2.50%	2.50%	2.50%

Table A-9: Capital Program Budget

	FY 2019 Projected*	FY 2020 Projected	FY 2021 Projected	FY 2022 Projected	FY 2023 Projected	FY 2024 Projected	FY19-FY24 Total
Original Capital Budget							
General Construction	\$ 69,720,000	\$ 95,295,000	\$ 57,970,000	\$ 83,370,000	\$ 87,875,000	\$ 63,561,440	\$ 457,791,440
Engineering	19,550,000	39,750,000	65,450,000	49,800,000	33,300,000	27,055,000	234,905,000
Clean Water Nashville	45,195,155	60,466,125	247,125,340	176,407,390	114,082,250	167,465,443	810,741,703
Other	18,800,000	19,000,000	24,000,000	24,900,000	30,500,000	22,350,000	139,550,000
Original Capital Budget	\$ 153,265,155	\$ 214,511,125	\$ 394,545,340	\$ 334,477,390	\$ 265,757,250	\$ 280,431,883	\$ 1,642,988,143
Adjusted Capital Budget							
Water-related Projects	\$ 30,936,893	\$ 51,055,698	\$ 56,204,212	\$ 57,057,791	\$ 62,403,165	\$ 54,797,000	\$ 312,454,759
Sewer-related Projects	31,063,107	38,944,302	33,795,788	32,942,209	37,596,835	45,203,000	219,545,241
Clean Water Nashville	45,195,155	60,466,125	247,125,340	176,407,390	114,082,250	167,465,443	810,741,703
Adjusted Capital Budget	\$ 107,195,155	\$ 150,466,125	\$ 337,125,340	\$ 266,407,390	\$ 214,082,250	\$ 267,465,443	\$ 1,342,741,703

*Projected values, audited 2019 financials not available at time of report

Table A-10: Capital Program Funding Plan

	FY 2019 Projected	FY 2020 Projected	FY 2021 Projected	FY 2022 Projected	FY 2023 Projected	FY 2024 Projected	FY19-FY24 Total
General CIP Project Funding							
Rate Funded PayGo	\$ 12,000,000	\$ 12,000,000	\$ 12,000,000	\$ 12,000,000	\$ 12,000,000	\$ 12,000,000	\$ 72,000,000
Commercial Paper	50,000,000	78,000,000	78,000,000	78,000,000	88,000,000	88,000,000	460,000,000
Clean Water Nashville Funding							
SIR Funded PayGo	11,600,000	11,666,787	13,737,541	15,614,248	16,333,783	16,757,912	85,710,271
E&R Fund PayGo	-	-	75,000,000	50,000,000	50,000,000	50,000,000	225,000,000
Commercial Paper	33,595,155	48,799,338	158,387,799	110,793,142	47,748,467	100,707,531	500,031,432
Total Capital Budget	\$ 107,195,155	\$ 150,466,125	\$ 337,125,340	\$ 266,407,390	\$ 214,082,250	\$ 267,465,443	\$ 1,342,741,703

Table A-11: Projected Capital Costs

	FY 2019 Estimated*	FY 2020 Projected	FY 2021 Projected	FY 2022 Projected	FY 2023 Projected	FY 2024 Projected
Existing Debt Service	\$ 79,024,583	\$ 78,008,692	\$ 62,048,555	\$ 65,603,405	\$ 70,887,655	\$ 70,886,080
Proposed Revenue Bonds	-	-	8,804,633	17,609,265	26,413,898	35,218,530
Commercial Paper Interest	3,128,927	530,917	4,076,734	2,408,632	4,444,859	2,775,471
Total Debt Service	\$ 82,153,510	\$ 78,539,610	\$ 74,929,922	\$ 85,621,301	\$ 101,746,411	\$ 108,880,082
<i>% Change</i>		-4.4%	-4.6%	14.3%	18.8%	7.0%

*Projected values, audited 2019 financials not available at time of report

Table A-12: Miscellaneous Revenues

	FY 2019 <i>Estimated*</i>	FY 2020 <i>Projected</i>	FY 2021 <i>Projected</i>	FY 2022 <i>Projected</i>	FY 2023 <i>Projected</i>	FY 2024 <i>Projected</i>
Miscellaneous Revenues						
WIR and SIR Fees	\$ 15,700,000	\$ 22,474,040	\$ 26,983,535	\$ 29,689,998	\$ 31,112,909	\$ 31,858,668
Wholesale Revenues	14,085,310	14,085,310	14,085,310	14,085,310	14,085,310	14,085,310
Customer Related	4,069,500	4,069,500	4,069,500	4,069,500	4,069,500	4,069,500
Maintenance and Testing Fees	2,930,000	2,930,000	2,930,000	2,930,000	2,930,000	2,930,000
Fire Protection	995,140	995,140	995,140	995,140	995,140	995,140
Wind Turbine	899	899	899	899	899	899
Total System Revenues	\$ 37,780,849	\$ 44,554,889	\$ 49,064,384	\$ 51,770,847	\$ 53,193,758	\$ 53,939,517
% Change		17.9%	10.1%	5.5%	2.7%	1.4%

*Estimated values, FY2019 was unaudited at time of report.

Table A-13: Rate Revenues by Service and Class

	FY 2019 <i>Estimated*</i>	FY 2020 <i>Projected</i>	FY 2021 <i>Projected</i>	FY 2022 <i>Projected</i>	FY 2023 <i>Projected</i>	FY 2024 <i>Projected</i>
Water Revenue						
Residential	\$ 26,511,871	\$ 42,400,031	\$ 46,249,400	\$ 49,513,984	\$ 51,008,670	\$ 52,548,689
Small Commercial	3,259,949	3,533,405	3,852,070	4,124,666	4,244,106	4,370,345
Intermediate Commercial	28,277,548	33,583,090	36,628,932	39,210,952	40,390,796	41,606,592
Large Commercial	9,023,157	11,925,824	13,007,049	13,923,601	14,342,321	14,773,650
Subtotal Water Revenue	\$ 67,072,526	\$ 91,442,350	\$ 99,737,450	\$ 106,770,203	\$ 109,985,893	\$ 113,299,276
% Change		36.3%	9.1%	7.1%	3.0%	3.0%
Sewer Revenue						
Residential	\$ 48,117,153	\$ 50,468,599	\$ 57,405,012	\$ 60,094,565	\$ 61,700,569	\$ 63,350,344
Small Commercial	5,807,349	6,596,718	7,503,489	7,854,903	8,065,103	8,280,789
Intermediate Commercial	52,217,348	64,867,870	73,699,358	77,063,634	79,031,258	81,050,188
Large Commercial	10,526,021	15,459,815	17,554,674	18,345,786	18,803,858	19,273,383
Subtotal Sewer Revenue	\$ 116,667,872	\$ 137,393,002	\$ 156,162,533	\$ 163,358,888	\$ 167,600,789	\$ 171,954,704
% Change		17.8%	13.7%	4.6%	2.6%	2.6%
Total User Charge Revenue	\$ 183,740,399	\$ 228,835,352	\$ 255,899,983	\$ 270,129,091	\$ 277,586,681	\$ 285,253,980
% Change		24.5%	11.8%	5.6%	2.8%	2.8%

*Estimated values, FY2019 was unaudited at time of report.

Table A-14: Summary of Projected Cashflows

	2019	2020	2021	2022	2023	2024
	<i>Estimated*</i>	<i>Projected</i>	<i>Projected</i>	<i>Projected</i>	<i>Projected</i>	<i>Projected</i>
System Revenues						
Water Revenues	\$ 67,072,526	\$ 91,442,350	\$ 99,737,450	\$ 106,770,203	\$ 109,985,893	\$ 113,299,276
Sewer Revenues	116,667,872	137,393,002	156,162,533	163,358,888	167,600,789	171,954,704
Subtotal: User Revenues	183,740,399	228,835,352	255,899,983	270,129,091	277,586,681	285,253,980
WIR and SIR Revenues	0	18,374,040	22,883,535	25,589,998	27,012,909	27,758,668
Miscellaneous Revenues	37,780,849	26,180,849	26,180,849	26,180,849	26,180,849	26,180,849
Total System Revenues	\$ 221,521,247	\$ 273,390,241	\$ 304,964,367	\$ 321,899,938	\$ 330,780,439	\$ 339,193,497
Revenue Requirements						
Operating Expenses	\$ 129,577,200	\$ 129,577,200	\$ 129,577,200	\$ 132,816,630	\$ 136,137,046	\$ 139,540,472
<u>Debt Service</u>						
Existing Debt	79,024,583	78,008,692	62,048,555	65,603,405	70,887,655	70,886,080
Proposed Debt	<u>3,128,927</u>	<u>430,309</u>	<u>12,643,568</u>	<u>19,630,462</u>	<u>30,311,134</u>	<u>37,281,369</u>
Subtotal: Debt Service	82,153,510	78,439,001	74,692,123	85,233,866	101,198,789	108,167,448
<u>Other Expenditures</u>						
Cash Funded Capital	12,000,000	12,000,000	12,000,000	12,000,000	12,000,000	12,000,000
WIR and SIR Funded Capital	0	18,374,040	22,883,535	25,589,998	27,012,909	27,758,668
Transfers to R&E	0	<u>35,000,000</u>	<u>65,000,000</u>	<u>65,000,000</u>	<u>40,000,000</u>	<u>40,000,000</u>
Total Revenue Requirements	\$ 223,730,710	\$ 273,390,241	\$ 304,152,858	\$ 320,640,495	\$ 316,348,744	\$ 327,466,588
System Surplus/(Deficit)	(2,209,463)	-	811,509	1,259,444	14,431,695	11,726,909

*Estimated values, FY2019 was unaudited at time of report.