BILL PURCELL
MAYOR

METROPOLITAN GOVERNMENT OF NASHVILLE AND DAVIDSON COUNTY

DEPARTMENT OF FINANCE
INTERNAL AUDIT SECTION

222 3RD AVENUE NORTH, SUITE 401
NASHVILLE, TENNESSEE 37201
Telephone: (615) 862-6110
FAX Number: (615) 862-6425

Memo

Date: September 8, 2004

Memo to: Scott Potter

From: Kim McDoniel

Regarding: Metro Water Services Cost of Service Analysis

At your request, we have conducted an analysis of the cost of certain services provided to various Metro Water Services (MWS) customers, other than residential or commercial water and wastewater customers. One of the primary objectives was to review costs associated with out-of-county water and wastewater wholesale customers. In doing this analysis, we contracted with Raftelis Financial Consultants, who worked under our direction. Their report is included. Raftelis' major conclusions are as follows:

1. For the fiscal year ending June 30, 2004, MWS's actual revenues fell approximately $10 million short of the revenues required to cover the cost of operations and debt service. It should be noted that MWS's strong overall financial position and cash reserves can cover revenue shortfalls in the short term without an increase in rates.

2. When comparing the calculated actual cost of water and wastewater wholesale services to the related revenues collected for the 2003-2004 fiscal year, the cost exceeded the revenues by $6.4 million. This means that Davidson County residential and commercial customers are subsidizing the cost of providing wholesale water and wastewater services outside of Davidson County and to other systems inside Davidson County.

3. MWS does not meter all wastewater customers' flows into the MWS system.

4. Raftelis analyzed the cost of other services where MWS was not fully recovering costs and determined that if fiscal year 2003-2004 rates had been set to fully recover those costs, additional revenues of approximately $60,000 could have been collected.

5. Based on the cost of services among different residential and commercial customer classes and between water and wastewater customers, the existing rate structure is no longer aligned to costs by customer class and by service provided. This means that certain customer classes are subsidizing the cost of other customers' services, and that water revenues are subsidizing the cost of wastewater services.

6. If wholesale rates and the rates of other services had been set to fully cover the related cost of services for the 2003-2004 fiscal year, the overall MWS revenue shortfall would have been $3.6 million instead of $10 million.

Based on the above, Internal Audit recommends the following:

- Metro should modify all wholesale contracts so that rates paid fully cover the related cost of services without Davidson County customers subsidizing the cost of providing services to out-of-county customers and customers in other systems inside Davidson County.

- All customers' wastewater flows should be metered and billed based on uniform rates that recover the full cost of services.

- Metro should establish rates to fully cover costs for the various other services included in this analysis.

- While the study confirms that due to MWS's strong financial condition there is no need for an immediate overall rate increase, to better inform policy makers about the need for future rate adjustments the upcoming performance audit will include a full rate analysis to align the rates to the cost of services by each major customer class, and it will include an analysis of MWS's costs as compared to industry standards.

We would like to express our appreciation for the assistance and support provided by the MWS staff throughout this analysis. Please let me know if you have any questions or need additional information.

Copy: Mayor Bill Purcell
Karl Dean
David Manning
Talia Lomax-O'dneal
Richard Norment
Metropolitan Council Audit Committee

Metropolitan Government of Nashville and Davidson County

Metro Water Services

Cost of Service Analysis

September 2004

RAFTELIS FINANCIAL CONSULTING, PA

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EXECUTIVE SUMMARY

In October of 2003, the Internal Audit Division of the Metropolitan Government of Nashville and Davidson County ("Metro Government") engaged Raftelis Financial Consulting ("RFC") to perform a comprehensive water and wastewater cost of service study for the Metro Water Services ("MWS"). The general objective of a cost of service study is to calculate the actual cost to provide specific utility services or functions, expressed in terms of a unit of service (e.g. per 1000 gallons, per bill, or per service visit). The scope of work included the following:

- A Cost of Service Study for Water and Wastewater User Charges;
- A Wholesale Cost of Service Analysis;
- A Development Fee Calculation;
- A Cost of Service for Miscellaneous Fees; and,
- A Survey of Comparable Utilities.

Cost of Service Study for Water and Wastewater User Charges

The cost of service analysis for water and wastewater user charges is based on a detailed cost allocation model ("Model"), developed specifically for MWS. The Model was used to accomplish the following tasks:

- Identify revenue requirements**,** which address the "full costs" required to provide for operation/maintenance, and replacement of water and wastewater system assets;
- Calculate an average unit cost of service for water and wastewater customers; and,
- Calculate the unit cost of water and wastewater service for each existing customer class.

The first result from the Model is a comparison of the average unit cost of service for water and wastewater, as calculated in the Model, with the average revenues generated per billing unit from the current water and wastewater user rates and charges. The results of these calculations are shown below:

	Water	Wastewater	Total System
Average Unit Cost of Service (per ccf)	$1.60	$4.44	$3.00
Average Revenue per Billing Unit (per ccf)	$2.27	$3.50	$2.88

In theory, the average unit cost of service and the average revenue per billing unit should be reasonably similar if current user rates and charges are adequately recovering net revenue requirements for each utility. Since the average unit cost of service for water is significantly lower than the average revenue generated from current rates, and the opposite is true for wastewater, this indicates that water rates are subsidizing sewer costs under the current rate

structure. For the total system, an average unit cost of service that is higher than the average revenue per billing unit indicates that current rates may be insufficient to support the "full cost" of operating the utilities.

(It should be noted that the average unit cost of service is not the same as a billing rate or volume charge, and can not be compared directly to existing rates and charges. The average unit cost of service combines all of the costs associated with providing service into a single measure, or average rate, based on total volume billed, whereas the actual rates consist of volume charges and minimum charges that vary by customer class and meter size, respectively. Similarly, the average revenue per billing unit is a summary measure of the total revenues expected to be generated from both volume and base charges. As a result, direct comparisons between the average unit cost of service and a particular rate or charge are not valid.)

An average cost of service for each customer class is also calculated in the Model. To determine this, a comprehensive cost of service methodology was used to allocate the net revenue requirements to each customer class. For water customers, the cost of service methodology recommended in the American Water Works Association M-1 Rate Manual was used.

A comparison of the average unit cost of service for each class, or specifically the cost differentials among the classes, provides a basis for evaluating whether the current volume rates are consistent with the cost of service analysis. In the following chart, the calculated unit cost of service for each class is shown, along with the unit cost differential (ratio of unit costs compared to the residential class). Also shown are, and the calculated differentials based on the current volume rates for each class.

Customer Class	Water- Calculated Average Unit Cost of Service - (Volume)	Ratio of Calculated Average Unit Costs	Ratio of Current Volume Rates	Recovery of Costs
Residential	$1.32	1.00	1.00	over
Small Commercial	$1.36	1.03	1.06	over
Intermediate Commercial	$1.37	1.04	0.92	under
Large Commercial	$1.29	0.98	0.78	under

A comparison of the calculated cost of service differentials with the actual rate differential indicates that the residential and small commercial classes are subsidizing the intermediate and large commercial customers. The actual differential for the small commercial class is higher than the calculated differential, indicating over-recovery from this class. The actual differential for the intermediate and large commercial customers is lower than the calculated differential, indicating under-recovery from these classes.

Assuming that the total revenues generated by the water volume charges remained unchanged (i.e. revenue neutral), a shift to rates consistent with the cost of service analysis would result in

less revenues collected from residential and small commercial customers, and more revenues collected from intermediate and large commercial customers, as summarized in the table below.

Water	**Actual '04 Water Volume Revenues**	**Revenue Reqmts. Allocated by COS Results**	**Over/(Under) Recovery**	**Impact Per Customer (annual)**
Residential	$ 16,449,970	$ 14,684,480	$ 1,765,490	$ 13.56
Small Commercial	$ 1,366,665	$ 1,180,119	$ 186,546	$ 21.06
Intermediate Commercial	$ 18,764,421	$ 18,918,533	$ (154,112)	$ (27.40)
Large Commercial	$ 14,331,133	$ 16,129,058	$ (1,797,925)	$ (20,866)
	$ 50,912,189	$ 50,912,189	$ -	

The process for developing a cost of service analysis for wastewater costs is, typically, much more straight-forward than the methodology used for developing a water cost of service analysis. Unlike water, wastewater flow does not experience the same customer driven max day or max hour demand peaks, and as a result, there is less emphasis in identifying differences in the cost of service among wastewater customer classes. In general, it is not possible to justify significant cost differentials among customer classes for wastewater volume rates based on a cost of service analysis, and, as a result, the vast majority of wastewater rate structures are based on a uniform volume rate applied to all customers. In contrast, as shown below, the rate differentials derived from MWS's current wastewater volume rates show a significant discount for larger commercial customers, compared to residential customers, with small commercial customers paying a premium. The implication is that residential and small commercial customers are subsidizing intermediate and large commercial customers.

Customer Class	**Current Rates**	**Calculated Rate Differential**
Residential	$3.76	1.00
Small Commercial	$4.21	1.12
Intermediate Commercial	$3.43	0.91
Large Commercial	$2.59	0.69

Shifting to a uniform volume rate, assuming total revenues generated from wastewater volume rates remain unchanged, would produce the following impacts among the existing customer classes:

Wastewater	Actual '04 Wastewater Volume Revenues	Revenue Reqmts. Allocated by COS Results	Over/(Under) Recovery	Impact Per Customer (annual)
Residential	$ 23,072,777	$ 20,406,327	$ 2,666,450	$ 19.88
Small Commercial	$ 2,234,622	$ 1,731,827	$ 502,795	$ 59.51
Intermediate Commercial	$ 30,278,926	$ 28,823,700	$ 1,455,226	$ 280.75
Large Commercial	$ 17,845,684	$ 22,470,156	$ (4,624,472)	$ (56,168)
	$ 73,432,009	$ 73,432,009	$ -	

Wholesale Cost of Service Analysis

One of the objectives identified by MWS is to develop a methodology for setting wholesale rates that can be applied consistently to all wholesale customers. The recommended methodology is designed to be consistent with industry guidelines for setting wholesale or bulk customer rates. This methodology is based on the Utility Approach to rate setting. The Utility Approach is used to calculate wholesale rates since it provides a more effective methodology for compensating the utility for the risk associated with providing service to "non-owners" of the system. The Utility Approach looks at two primary cost components: an operations and maintenance ("O&M") component and a capacity component. The sum of the calculated O&M cost and capacity cost per 100 cubic feet is the cost that should be recovered from wholesale customers. This cost is summarized below:

Type of Charge	Water	Sewer
Capacity Cost per 100 cubic feet	$0.86	$1.05
Calculated O&M Cost per 100 cubic feet	$0.69	$1.04
Wholesale Cost per 100 cubic feet	$1.55	$2.09

Currently there is only one wholesale water customer. The existing water wholesale rate ($1.56/ccf) for this customer is very close to the calculated cost, indicating that it is providing for adequate and equitable cost recovery. Currently there are two types of sewer wholesale customers. One type of customer pays a trunk and treatment ("T&T") rate based on existing contractual relationships which include provisions for up-front capital contributions. For these wholesale customers, only the O&M cost component is appropriate. The other sewer wholesale customers pay a different rate because they have not made capital contributions. For these customers, both the capacity and O&M components are appropriate. The current T&T rate for sewer is $0.43/ccf which is significantly lower than the calculated O&M cost shown above. Similarly, the sewer wholesale customers that do not pay the T&T rate generally pay a rate that is significantly lower than the calculated wholesale sewer cost of $2.09/ccf. As a result, opportunities exist to generate additional revenue from sewer wholesale customers, and increase the overall equity of cost recovery between retail and wholesale customers, if the existing

contractual relationships can be amended to address a different methodology for calculating wholesale rates. The chart below provides a comparison of the revenues generated under the current wholesale rates with the potential revenues that would be generated at rates consistent with the calculated cost of service.

City	Contract Type	Present Rate	Calculated Cost (6)	FY 2004 Revenues	Estimated Revenues Using Calculated Cost (5)
Water Wholesale Contracts:					
City of Brentwood	Tariff	$1.56	$1.55	$965,098	$958,000
Sewer Wholesale Contracts:					
City of Belle Meade	Trunk and Treatment	$0.43	$1.04	$72,500	$175,349
City of Brentwood	Trunk and Treatment	$0.43	$1.04	$1,355,600	$3,278,660
City of Goodlettsville	Wholesale	(1)	$2.09	$936,854	$1,314,111
Hendersonville Utility District	Trunk and Treatment	$0.43	$1.04	$1,288,700	$3,116,856
City of Millersville	Trunk and Treatment	$0.43	$1.04	$79,700	$192,763
City of Mount Juliet	Wholesale	$1.13 / $1.23 (4)	$2.09	$1,058,000	$1,873,915
City of La Vergne	Trunk and Treatment	$0.43	$1.04	$510,500	$1,234,698
Old Hickory Utility District	Trunk and Treatment	$0.43	$1.04	$312,400	$755,572
City of Ridgetop	Wholesale	$1.28 (2)	$2.09	$34,600	$56,495
White House Utility District	Tariff	$2.59 (2)(3)	$2.09	$217,600	$175,592
Total Sewer				**$5,866,454**	**$12,174,011**

(1) Madison Suburban Utility District bills Goodlettsville at MWS's sewer rates and remits 41% of collected revenues to MWS.

(2) A 10% surcharge for repayment of TLDA loans is also assessed, similar to MWS retail customers.

(3) A base charge is included based on an 8" sewer meter for the large commercial class.

(4) The rate charged varies based on the amount of billed wastewater flow.

(5) These represent estimated revenues and do not consider any limitations imposed by the existing contracts.

(6) Calculated costs are based on billable flows.

Development Fee Calculation

Development fees, or capacity fees, are defined as one-time capital recovery charges assessed against new development as a way to recover a proportional share of the cost of capital facilities constructed to provide service capacity for new development. Capacity fees generally focus on recovery of a proportionate share of core system facilities, or those facilities that are required to serve all customers, existing and new. The effect of capacity fees is to shift cost away from existing residents to those new residents responsible for creating the additional costs. MWS currently assesses a $500 sewer capacity fee and no water capacity fee.

Appropriate capacity fees must comply with the Rational Nexus test established in court cases. The approach used for calculating water and sewer capacity fees that is recognized in the industry as cost-justified and meeting the requirement of the "rational nexus" standard applied by the courts is the System Buy-In approach. The System Buy-In methodology is most appropriate in cases where the existing system assets provide extra capacity to provide service to new customers, as is the case with MWS. Calculated fees are shown below:

Meter Size	Meter Capacity Conversion Factor (1)	Water Capacity Fee (2)	Sewer Capacity Fee (2)	Combined Capacity Fees
5/8"	1.00	$ 655	$ 329	$ 984
¾"	1.50	983	494	1,477
1"	2.50	1,638	823	2,461
1 ½"	5.00	3,276	1,646	4,922
2"	8.00	5,242	2,633	7,875
2 ½"	11.00	7,207	3,621	10,828
3"	17.50	11,466	5,761	17,227
4"	30.00	19,656	9,875	29,531
6"	62.50	40,950	20,574	61,524
8"	80.00	52,416	26,334	78,750
10"	145.00	95,004	47,731	142,735
12"	215.00	140,867	70,774	211,641

(1) American Water Works Association Manual of Water Supply Practices – Water Meters – Selection, Installation, Testing, and Maintenance ("AWWA Manual M6").

(2) Maximum level of fees that can be cost justified at the discretion of policy makers.

Cost of Service for Miscellaneous Fees

MWS receives revenues from fees assessed for various miscellaneous services such as turning on water service for new customers, late payment charges, disconnection of service, etc. As part of the cost of service analysis, RFC was asked to calculate the cost of service for providing each of these miscellaneous services. RFC's calculated costs are based upon information provided by

MWS staff such as labor rates, overhead percentages, material costs, transportation costs, and estimates of time required to complete a task. The calculated costs serve as a check against MWS current fees for these services.

			Survey Results		
Miscellaneous Fee	**MWS Current Fee**	**Calculated cost per order if meter set (1)**	**Range**	**# of utilities that charge for this service**	**# of survey respondents**
Turn-Ons	$25	$68	$5.00 - $49.50	8	8
Straight Lines	$0	$142			8
Broken Locks	$10	$98	$53 - $100	3	8
Investigations per customer request	$0	$73	$10 - $95	4	8
Flow Test	$0	$104	$60 - $90	2	8
Vandalism	$0	$96	$50 - $100	4	8
MXU	$0			0	8
After Hours Charge	$138	$239	$11 - 170	4	8
Reconnect for Non-Payment	$15	$16	$10 - $45	8	8
Notifies	$15	$8	$1 - $20	2	8
Duplicate Bill History Charge	$0	$3	$20 - $40	1	8
Late Payment Charge	5% of unpaid balance	$0	1.5% - 5%	6	8
Returned Check	$10	$25	$15 - $29	8	8
2nd Meter Inspection	$0	$42			8
Tap Fee/Connection			$35 - $12,000	8	8
5/8"	$250	$428	$35 - $2,000		
3/4"		$447			
1"	$350	$470			
1 1/2"		$602			
2"		$703			
3"	$450	$1,588			
4"	$1,000	$2,354			
6"	$1,500	$4,043	$35 - $12,000		
8"	$2,000	$8,774			
10"	$3,000	$12,188			

(1) If a radio meter is installed, the cost increases by approximately $152.00.

Survey

As part of the cost of service analysis, a survey was conducted to serve as a benchmarking tool for the various fees and charges assessed by MWS. RFC identified twelve utilities based on size, as measured by flows, and their geographic location relative to Nashville. Of the twelve utilities surveyed, eight responded to the questions asked of the survey. The survey was categorized into

the following three areas/sections of relevance to MWS and the cost of service analysis: miscellaneous fees, wholesale fees, and growth and development fees.

The results indicate that the fees assessed by various utilities vary both in terms of the amount of the fees and the fee structure among the respondents. These inconsistencies indicate that there may be policy objectives other than cost recovery driving the actual fees assessed to customers for some of these utilities. As a result, it is difficult to determine whether a charge is appropriate solely on the basis of the benchmarking analysis. The benchmarking analysis should be used in conjunction with the cost of service analyses and policy objectives in order to determine the most appropriate fees and charges.

Opportunities to Increase Revenues

As noted earlier, the cost of service analysis suggests that current rates may be insufficient to support the "full costs" of operating the utilities. Opportunities exist to increase revenues by moving toward rates for wholesale customers and for miscellaneous services that are more consistent with the cost of service analysis. The greatest opportunity to increase revenues is from adjusting the wholesale wastewater rates. These rates should be based on a consistent methodology applied to all wholesale customers. In addition, not all wholesale wastewater customers are billed based on metered wastewater flows. As a result, actual flows delivered to MWS for treatment are higher than billed flows, due to inflow and infiltration within the collection systems operated by those customers. All wholesale wastewater customers should be billed based on metered wastewater flows and consistent rates.

As a separate exercise, RFC was asked to evaluate the potential impact of moving to cost of service rates for wholesale customers and miscellaneous services in FY 2004. The table below summarizes the calculated shortfall from current (FY 2004) revenues from water and wastewater compared to the full cost revenue requirements, as estimated in the cost of service model. The second section shows a high level estimate of the additional revenues that could be generated by moving to rates for wholesale customers and miscellaneous fees that are more consistent with the cost of service analysis. The total shortfall based on the actual revenues is reduced by approximately 65%. Additional analyses will be required to determine the best way to address the apparent shortfall relative to "full cost" revenue requirements, including, for example, a more detailed assessment of opportunities to increase wholesale revenues, an evaluation of alternative approaches to address capital investment needs, as well as potential adjustments to the current rate structure. Note that there is no immediate need to adjust rates due to MWS's strong overall financial position, including the existence of significant cash reserves to address short-term capital needs.

	Water	Wastewater	Total System
Revenue Requirements (Full Cost)	$ 52,038,672	$ 129,374,789	$ 181,413,462
Actual Revenues Collected in '04 (1)	66,721,647	104,676,161	171,397,809
Surplus/(Shortfall)	**$ 14,682,975**	**$ (24,698,628)**	**$ (10,015,653)**
Revenue Requirements (Full Cost)	$ 52,038,672	$ 129,374,789	$ 181,413,462
Adjusted Revenues (2)	67,738,645	110,120,921	177,859,566
Surplus/(Shortfall)	**$ 15,699,972**	**$ (19,253,868)**	**$ (3,553,896)**
% Reduction in Total Shortfall			**-65%**

(1) Actual revenues for FY 2004 are approximately $3.5 million lower than the budgeted revenues used to develop the cost of service analysis. This difference is mainly due to lower water sales than projected in the budget estimates, which can be caused by a number of factors, including changing weather patterns. Actual revenues were used in this analysis to provide more updated information on the magnitude of the potential revenue shortfall for FY 2004, relative to the "full cost" revenue requirements developed for the cost of service analysis.

(2) Estimated FY 2004 revenues if wholesale rates and miscellanous fees, only, had been adjusted to reflect cost of service. These adjustments do not address the apparent subsidy from water to wastewater based on current retail rates and charges.

I. INTRODUCTION AND STUDY OBJECTIVES

A. INTRODUCTION

In October of 2003, the Internal Audit Division of the Metropolitan Government of Nashville and Davidson County ("Metro Government") engaged Raftelis Financial Consulting ("RFC") to perform a comprehensive water and wastewater cost of service study for the Metro Water Services ("MWS"). The last cost of service analysis performed for MWS was in 1992. Since that time, a number of changes have occurred within MWS that are likely to have produced changes in the cost of service relationships that existed when the prior study was completed. For example, MWS has completed a significant "re-engineering" of its operating structure in order to increase operating efficiencies and reduce the overall cost of operation. On the other hand, new costs have been added to address capital needs, as well as the implementation of the transfer of the Stormwater Division from Public Works to MWS and a new LOCAP ("local overhead cost allocation plan") allocation recovered from MWS. Significant additional capital needs have been identified over the next five to ten years. These and other cost drivers have resulted in increased concern about the effectiveness of the existing rates and charges in addressing the revenue needs of MWS. The first step in evaluating opportunities to improve the effectiveness and equity of revenue recovery is to complete a cost of service study.

B. OBJECTIVES OF STUDY

The general objective of a cost of service study is to calculate the actual cost to provide specific utility services or functions, expressed in terms of a unit of service (e.g. per 1000 gallons, per bill, or per service visit). The scope of work developed for MWS focuses on calculating unit costs of service for five areas: retail water and wastewater user rates and charges, wholesale customer charges, development (capacity) fees, and miscellaneous fees related to customer service activities or other specific services. RFC was also asked to conduct a survey of other "comparable" utilities to provide a broader basis for evaluating MWS's current fees and charges for utility services. The specific objectives for each study area are described below:

- ***Cost of Service Study for Water and Wastewater User Charges:*** The average unit cost of service was calculated for the various existing classes of water and wastewater customers. This information is useful in evaluating the effectiveness of the current water and sewer rate structure in recovering costs and/or addressing other pricing objectives of MWS or Metro Government. This analysis provides useful information for any future rate adjustments or rate structure changes.
- ***Wholesale Cost of Service Analysis:*** Appropriate wholesale or bulk water and wastewater costs were determined for utility service based on accepted cost of service principles and industry standard approaches.

- ***Development Fee Calculation:*** Cost justified Capacity Fees were developed for water and wastewater service, based on industry standard approaches and accepted methodologies.
- ***Cost of Service for Miscellaneous Fees:*** The cost of providing miscellaneous services related to customer service functions and other activities were calculated based on an analysis of the specific activities, personnel and equipment required to perform each service. This information is useful for evaluating opportunities for adjusting service fees to ensure adequate recovery of the full cost of providing specific services.
- ***Survey:*** A survey of various miscellaneous fees and charges (excluding user rates and charges) imposed by a representative group of comparable utilities was conducted to compare with MWS's current and calculated rates.

II. COST OF SERVICE STUDY FOR WATER AND WASTEWATER USER RATES AND CHARGES

A. CURRENT RATE STRUCTURE

The majority of revenues generated by MWS are derived from retail user rates and charges for water and wastewater services. For both water and wastewater, the rate structure includes both volumetric rates and fixed charges that vary by class of customers. One of the key objectives of a cost of service study is to calculate the difference in the actual cost of service for each customer class. This information can then be used to determine if the existing rate structure reasonably reflects these differences in the actual cost of service.

Currently, MWS retail customers are segregated into four customer classes, defined as follows:

- Residential – Up to two housing units on a common meter;
- Small commercial – Up to 1,600 cubic feet per month;
- Intermediate commercial – 1,600 to 200,000 cubic feet per month; or
- Large commercial/Industrial - Over 200,000 cubic feet per month

The water and wastewater rate structures include a separate minimum (fixed) charge that includes the first 200 cubic feet (approximately 1,500 gallons) of usage. The minimum charge varies by meter size and by customer class. For usage above 200 cubic feet per month, a volume rate is applied per hundred cubic feet ("ccf") of water used, with a separate volumetric rate for each customer class, for both water and wastewater. Sewer, or wastewater usage, is based on metered water consumption. However, the MWS has a summer water use policy that affects the calculation of sewer bills during the summer months. Title 15 of the Metropolitan Code of Laws states that customers can not be charged for sewer based on water consumption that is not returned to the sewer system. In order to recognize the use of water for irrigation in the summer, the residential sewer charge for the billing period between April 1 and November 31 is based upon the average water consumption during the months of January, February and March, plus 30%.

It should be noted that the MWS assesses an additional 10% surcharge to the calculated sewer bill to cover debt service associated with Tennessee Local Development Agency loans ("TLDA") loans. The TLDA loans and the revenues from the 10% assessment are excluded from this analysis, since they do not show up in the MWS budget and there is no specific debt service payment associated with these loans.

B. COST OF SERVICE ANALYSIS

The cost of service analysis is based on a detailed cost allocation model ("Model"), developed specifically for MWS. The Model was used to calculate average unit costs of service for water and wastewater customers. For water customers, we have used the cost of service methodology recommended in the American Water Works Association M-1 Rate Manual. For wastewater costs, a more general cost allocation approach was used to calculate an average unit cost or average cost per unit of billable wastewater flows. The M-1 Rate Manual specifies that a Test Year be established using revenue requirements, or the total cost of operating the system in that year. Revenue requirements include operating costs, indirect and overhead costs, debt service costs, and other cash needs associated with ongoing capital investment (i.e. cash funded capital outlays and contributions to reserves). The MWS's fiscal year 2004 budget and 2004 CIP were used to identify revenue requirements to be recovered from water and wastewater user charges. (In most cases, the Test Year is based on the most recent year of actual costs and expenditures available for a utility. However, for MWS, the 2004 fiscal year represented the first year that the full impact of the transfer of Stormwater costs and the adjusted LOCAP allocation were reflected in the MWS cost structure. As a result, the FY 2004 budgeted costs are expected to be more consistent with the future level of revenue requirements than prior year information.)

Revenue Requirements

Revenue requirements include all costs incurred by the MWS such as operating and maintenance costs ("O&M") and capital costs, plus other recurring cash needs for capital expenditures. The MWS's 2004 budget, which totals $82.88 million was entered into the Model and used as the Test Year for O&M costs. The budget was adjusted to also include the allocated overhead amount, LOCAP, of $4.0 million, for services provided by Metro Government. Since the MWS prepares a combined water and wastewater budget, the budget was allocated between water and wastewater using various allocation factors either provided by MWS staff, based on water and wastewater operating system statistics, or using a composite allocation.

Capital costs include debt service costs and rate funded capital improvement projects. The MWS's existing and proposed debt service obligations includes revenue bonds and state revolving fund loans. (Debt service on TLDA loans was excluded since this is paid with revenues generated from the 10% surcharge applied to the sewer bill). The annual debt service cost for MWS was allocated between water and wastewater based on fixed asset information. Approximately 23% of all fixed assets are water system assets, compared to 77% of wastewater fixed assets. These percentages were used to allocate the debt service payments for revenue bonds and state revolving fund ("SRF") loans between water and wastewater.

The MWS's expenditures for capital improvement projects for both water and wastewater for FY 2004 are estimated to be $65.0 million which is to be funded with a combination of revenues from user rates and reserves in the extension and replacement ("E&R") Fund. It was assumed that $42.3 million of this would be funded directly through rates, since this amount was budgeted in the MWS's FY 2004 budget as a transfer to the E&R Fund. MWS' surplus from rates, after

direct expenses have been deducted, contributes directly to the E&R Fund to fund capital improvement projects. The remaining $22.7 million is assumed to be funded with existing reserves from the E&R Fund. The amount to be funded through rates, $42.3 million, was used as an estimate of the annual capital needs funded through rates for the Test Year. In order to allocate between water and wastewater, each project listed in the CIP was identified as either a water or wastewater project, and if a project cost pertained to both systems, the allocation based on fixed assets was applied. The resulting allocation of CIP project costs are $7.9 million (18.6%) for water projects and $34.5 million (81.4%) for wastewater projects.

As shown in the exhibit below, total revenue requirements for FY 2004 are 2% higher than they were in FY 2003 due to the addition of LOCAP and the inclusion of additional stormwater costs. The LOCAP amount was not included in the original FY 2004 budget, but was subsequently identified as an expense to be incurred in FY 2004.

Exhibit 1

Comparison of Revenue Requirements

	FY 2003	FY 2004	Difference
Revenue Requirements			
Operating Budget	$ 71,280,048	$ 78,903,800	11%
LOCAP		$ 3,973,085	
Debt Service			
Revenue Bonds	$ 49,295,490	$ 48,810,637	-1%
SFR Loans	$ 7,945,425	$ 7,063,532	-11%
CIP (Transfer to E&R Fund)	$ 49,997,660	$ 42,330,900	-15%
Transfer to Operating Reserve	$ 151,202	$ 331,508	119%
Total Revenue Requirements	$ 178,669,825	$ 181,413,462	**2%**

The total revenue requirements were then reduced by various revenue offsets, or revenues from charges and fees other than water and wastewater user charges to calculate net revenue requirements for each utility. The MWS provided projected offsets for FY 2004 which include revenues from such items as late payments fees, service initiation fees, private fire protection charges, investment earnings, extra strength surcharges, etc. In addition, revenues generated from water and wastewater wholesale charges were also treated as offsets. The offsets were identified as other charges collected on behalf of either the water or wastewater utility, and any offset that was not attributable to one specific utility was allocated based on the composite budget allocation. Net revenue requirements represent the amount to be recovered from retail user rates and charges, for each utility.

The calculation of net revenue requirements provides information necessary to determine of the water and wastewater utilities are independently self-sufficient. By comparing the calculated amount of net revenue requirement for water and wastewater, with the actual revenues generated from current rates and charges (as of FY 2004) for water and wastewater, it is apparent that the water utility is currently subsidizing the wastewater utility. As shown in Exhibit 2, actual water

revenues are adequate to cover the net revenue requirements for the water utility. However, actual sewer revenues are inadequate for recovering the sewer utility's net revenue requirements. Interest income and other income are allocated based on the proportion of total budget attributed to each utility and a change in this allocation could reduce the apparent level of the subsidy. The apparent shortfall in total revenues is mostly due to the difference in cash transfers to the E&R Fund. For the cost of service study, we have assumed a level of cash transfers sufficient to address the full cost of operating the utility, including adequate funding for significant, multi-year capital improvement expenditures, as identified in the current CIP. In practice, actual transfers to the E&R Fund are based on cash generated from rates after all other direct expenses have been covered for the year, which is less than the amount needed to fully address the capital needs identified in the CIP. In other words, without an increase in the level of rate funded contributions to the E&R Fund, the projected funds available in the existing E&R Fund will not be sufficient to address the current (five-year) CIP.

Exhibit 2

Calculation of Net Revenue Surplus/(Deficit) per Utility

	Water	Wastewater	Total System
FY 2004 Budget Projections:			
Revenue Requirements			
O&M Expenses	$ 30,971,215	$ 51,905,670	$ 82,876,885
Debt Service	13,074,556	42,799,614	55,874,169
CIP	7,869,017	34,461,883	42,330,900
Transfers	123,885	207,623	331,508
Total Revenue Requirements	**$ 52,038,672**	**$ 129,374,789**	**$ 181,413,462**
Less Revenue Offsets:			
Wholesale Rates	(3,676,196)	(5,499,649)	(9,175,845)
Interest Income	(4,328,921)	(7,254,979)	(11,583,900)
Other Income	(2,062,338)	(3,492,580)	(5,554,918)
Total Revenue Offsets	**$ (10,067,455)**	**$ (16,247,208)**	**$ (26,314,662)**
Net Revenue Requirements	**$ 41,971,218**	**$ 113,127,581**	**$ 155,098,799**
Budgeted Revenue (1)	$ 59,363,213	$ 89,194,427	$ 148,557,640
Surplus/(Shortfall)	**$ 17,391,995**	**$ (23,933,154)**	**$ (6,541,159)**
Projected FY 2004 Billable Flow (ccf)	26,158,123	25,458,426	51,616,549
Average Unit Cost of Service (per ccf)	$1.60	$4.44	$3.00
Average Revenue per Billing Unit (per ccf)	$2.27	$3.50	$2.88

(1) From volume rates and minimum charges.

The average unit cost of service is not the same as a billing rate or volume charge, and can not be compared directly to existing rates and charges. For example, the current rate structure includes both a minimum and volume charges that are different for each customer class. In addition the base charges vary by meter size. In comparison, the average unit cost of service rolls all of the costs associated with providing service to each class into a single measure, or average rate, based on total volume billed to each customer class. As a result, direct comparisons between the average unit cost of service and a particular rate or charge are not valid. However, the proportional, or percentage differences, between the average cost of service between various customer classes, can be compared to the proportional relationships among existing rates to evaluate whether those rates are consistent with actual cost of service among and between customer classes, as discussed in more detail in the following sections.

Methodology for Calculating the Water Unit Cost of Service by Customer Class

Once the net revenue requirements are allocated between each utility, an average unit cost is calculated using the cost allocation process used for establishing cost of service-based rates. The basic methodology used to conduct a water cost of service analysis involves the allocation of revenue requirements to each customer class using a two step process. The first step involves allocating the costs to functional areas of operations and the second step involves the allocation of these costs to each class based on the patterns of demand and usage demonstrated by each class. The resulting average unit cost of service for each class provides information on the level of rate differentials that can be cost justified among the various customer classes.

Once the net water revenue requirements were identified, the next step in the cost of service methodology is to allocate the Test Year revenue requirements for water into the following functional categories:

- Treatment,
- Transmission,
- Distribution,
- Storage,
- Customer Service/Billing,
- Meters, and
- Administration/General.

The water Test Year revenue requirements were allocated to the functional categories listed above based on allocation factors developed by Staff, composite allocations, or fixed asset information. The majority of the operating budget was allocated based on input from MWS staff related to specific system operating characteristics and/or data generated from the billing system. Debt service and CIP revenue requirements were allocated based on fixed asset information. In addition, RFC and MWS staff reviewed each revenue requirement line item for the Test Year to ensure that the appropriate allocation percentage was applied. Exhibit 3 below shows the results of this allocation.

Exhibit 3

Functionalization of Revenue Requirements

Functional Categories	Allocation	
Treatment Plant	$	12,684,789
Transmission	$	5,269,049
Distribution	$	19,511,412
Storage	$	1,502,577
Customer Service & Billing	$	2,203,457
Meter	$	799,933
Total	**$**	**41,971,217**

Once the costs were allocated to functional categories, system peaking factors were used to allocate these costs to base capacity, max day, and max hour categories. Peaking factors are a measure of the variability of water usage over time. Demand levels change with the season (max day demand) and during the day (max hour demand). Water systems must be designed and constructed to meet maximum demand levels in order to maintain the integrity of the system and provide uninterrupted service. Different functional components of the system are designed to meet different peak demands. For example, the treatment plants are designed to base demand and meet maximum day demand levels, whereas the transmission and distribution components must be sized to meet maximum hourly fluctuations, in addition to base demand and max day demand. System storage is primarily designed to meet max day and max hour requirements. The max day factor is simply the ratio of maximum day usage, measured as maximum day water production at the treatment plants, divided by average daily production for the year. Daily peaking information, based on plant-wide production numbers, was obtained from the MWS's engineering staff. The estimated max day system peaking factor is 1.4 and the estimated max hour system peaking factor is 1.71. These system peaking factors were then used to determine the allocation between base, max day, and max hour. Exhibit 4 below shows the results of this allocation.

Exhibit 4

Categorization of Revenue Requirements

Functional Category	BASE	MAX DAY	MAX HOUR	Customer Service/Meters
Treatment Plant	$ 9,060,563	$ 3,624,225	$ -	$ -
Transmission	$ 3,763,606	$ 1,505,443	$ -	$ -
Distribution	$ 11,423,543	$ 4,569,417	$ 3,518,451	$ -
Storage	$ -	$ 879,729	$ 622,848	$ -
Customer Service/Billing	$ -	$ -	$ -	$ 2,203,457
Meter	$ -	$ -	$ -	$ 799,933
TOTAL	**$ 24,247,713**	**$ 10,578,814**	**$ 4,141,299**	**$ 3,003,390**

Total Base, Max Day, Max Hour	**$ 38,967,826**
Total including Customer Service/Meters	**$ 41,971,217**

Certain functional categories such as customer service/billing costs, and meter costs are not allocated to the base, max day or max hour categories. Instead these costs are separated and are assumed to be recovered directly from the monthly minimum charge. As a general practice, the monthly base or minimum charge is typically set to recover specific categories of cost required to service customer accounts, and other similar functions, that are not directly related to the delivery and use of water or wastewater. These types of costs do not vary with consumption, are basically fixed, and are, therefore, appropriately recovered through a fixed charge. Since MWS already has a minimum charge in place for both water and sewer, the customer service, billing and meter costs were excluded from the cost of service allocation to the volumetric rate component of the rate structure.

The next step includes further allocating the base, max day, and max hour costs to each customer class to determine the revenue requirements to be recovered by the volume charge for each customer class. It is not unusual for cities to lack peaking factor information for each customer class, particularly estimates of max hour factors, since acquiring this information requires the installation of special meters for prolonged periods to measure the usage patterns of different customer classes. In the absence of measured capacity factors, it was necessary to develop capacity factors based on existing billing system data and plant production data. RFC developed estimates of these factors using procedures outlined in the AWWA M1 Rate Manual. In particular, the process involved using customer class monthly peaking data (from billing information) and certain adjustments typical of the existing customer classes to develop appropriate factors.

Base capacity costs are allocated to each customer class based upon the percentage of total billable flow attributable to each class. In order to allocate max day and max hour costs, the proportion of total usage is adjusted, or scaled, using the specific max day and max hour peaking factors developed for each class. As a result, classes demonstrating larger peak day and peak hour factors are allocated a proportionally larger share of the max day and max hour costs.

Exhibit 5 provides a summary of the peaking factors developed for each customer class and the resulting allocation factors applied to each category of costs. Exhibit 6 shows the results of applying these factors to calculate the total cost allocated to each customer class.

Exhibit 5

Allocation Factors for Customer Classes

Customer Class	Annual Usage (100 cf)	% of Usage (Allocation of Base Costs)	Max Day Peaking Factor	Max Day Allocation Factors	Max Hour Peaking Factor	Max Hour Allocation Factors
Residential	10,286,964	35.1%	1.90	30.0%	3.15	44.9%
Small Commercial	820,119	2.8%	2.10	2.9%	3.15	3.0%
Intermediate Commercial	10,841,949	37.0%	2.20	42.1%	3.10	34.1%
Large Commercial	7,343,328	25.1%	2.05	25.0%	2.75	18.0%
	29,292,361	100.0%				

Exhibit 6

Allocation of Costs by Customer Classes

Cost Category	Cost	Residential	Small Commercial	Intermediate Commercial	Large Commercial
BASE	$ 24,247,713	$ 8,515,372	$ 678,880	$ 8,974,779	$ 6,078,681
MAX DAY	$ 10,578,814	$ 3,171,554	$ 309,038	$ 4,456,880	$ 2,641,342
MAX HOUR	$ 4,141,299	$ 1,860,784	$ 124,613	$ 1,412,045	$ 743,857
Total	**$ 38,967,826**	**$ 13,547,710**	**$ 1,112,532**	**$ 14,843,705**	**$ 9,463,880**
% of Total Allocated to Customer Class	**100.0%**	**34.8%**	**2.9%**	**38.1%**	**24.3%**

Average Water Unit Cost of Service

The costs allocated to each class are then divided by total consumption to determine an average unit cost of service for volume costs for each customer class. FY 2003 actual billable consumption was obtained from MWS staff. Historical water usage for each customer class and in total was reviewed for FY 2001 through FY 2003. Total consumption over this three-year period fell approximately 3% in FY 2002 and 0.6% in FY 2003. Residential consumption decreased by an average of 2.8% per year while consumption for the commercial classes decreased significantly in 2002 but had modest increases in 2003. As a result, it was determined that consumption should not be escalated in order to project FY 2004 consumption. Therefore, FY 2003 consumption was used to determine the water volume unit cost.

Exhibit 7

Calculated Average Unit Cost Per Customer Class for Water

Customer Class	Water- Calculated Average Unit Cost of Service - (Volume)
Residential	$1.32
Small Commercial	$1.36
Intermediate Commercial	$1.37
Large Commercial	$1.29

As noted previously, the average unit cost of service is not the same as an actual volumetric rate used to calculate monthly bills. However, the ratio of these average unit costs of service among the customer classes identifies the level of the rate differential that can be cost justified based on this analysis. The calculated unit cost differential is compared to the existing volume rate differentials, where the differential is measured as the ratio of each rate (calculated and actual) to the respective residential rate. As shown in Exhibit 8, it appears that the residential and small commercial classes are subsidizing the intermediate and large commercial customers. The actual differential for the small commercial class is higher than the calculated differential, indicating over-recovery from this class. The actual differential for the intermediate and large commercial customers is lower than the calculated differential, indicating under-recovery from these classes. In addition, since the actual differentials for the intermediate and large commercial are significantly lower than the calculated differential, this implies that both the residential and small commercial are subsidizing the other two classes (i.e. are over-recovering their share of revenues).

Exhibit 8

Calculated Differentials and Average Unit Cost

Customer Class	Ratio of Calculated Average Unit Costs	Ratio of Current Volume Rates	Recovery of costs
Residential	1.00	1.00	over
Small Commercial	1.03	1.06	over
Intermediate Commercial	1.04	0.92	under
Large Commercial	0.98	0.78	under

Although it is not clear how these rate differentials were originally established, the existence of this apparent inequity among customer classes in not unusual if these relationships and rate differentials are not reviewed and adjusted periodically, which is the case for MWS. The information generated by the cost of service analysis can be used to ensure that future rate adjustments are designed to provide more equitable cost recovery.

To determine the amount of the over or under-recover of costs for each customer class, actual revenues generated from each customer class for FY 2004 were used in conjunction with the resulting ratios from the cost of service analysis. Assuming that the total revenues generated by the water volume charges remained unchanged (i.e. revenue neutral), a shift to rates consistent with the cost of service analysis would result in less revenues collected from residential and small commercial customers, and more revenues collected from intermediate and large commercial customers, as summarized in the exhibit below.

Exhibit 9

Estimated Over and Under-Recovery of Water Revenues

Water	**Actual '04 Water Volume Revenues**	**Revenue Reqmts. Allocated by COS Results**	**Over/(Under) Recovery**	**Impact Per Customer (annual)**
Residential	$ 16,449,970	$ 14,684,480	$ 1,765,490	$ 13.56
Small Commercial	$ 1,366,665	$ 1,180,119	$ 186,546	$ 21.06
Intermediate Commercial	$ 18,764,421	$ 18,918,533	$ (154,112)	$ (27.40)
Large Commercial	$ 14,331,133	$ 16,129,058	$ (1,797,925)	$ (20,866)
	$ 50,912,189	$ 50,912,189	$ -	

Methodology for Wastewater Unit Cost of Service

The process for developing a cost of service analysis for wastewater costs is, typically, much more straight-forward than the methodology used for developing a water cost of service analysis. In general, wastewater systems are not sized and designed around the necessity of meeting peak day and peak hour demands caused by customer usage patterns. Wastewater systems are designed around average flow requirements, and peak flows driven by wet weather or storm events, rather than by customer demands. As a result, there is less emphasis in identifying differences in the cost of service among customer classes. Instead, emphasis is placed on segregating costs between general functional categories for treatment and disposal, collection system, and customer service related costs.

For treatment and disposal costs, as long as the wastewater is of normal strength or concentration, these costs are the same for all customers. For those customers that do have high strength wastewater, the high strength surcharges are intended to capture the incremental costs associated with treating this wastewater, such that the average or normal customer is not impacted by these incremental costs.

For collection system costs, a key issue is identifying costs associated with wet weather events. For the Department, these costs are attributable to a number of factors, including inflow and infiltration ("I&I") issues, combined sewer systems, and the fact that stormwater is operated as a component of the wastewater utility. Costs associated with addressing I&I problems and treating additional water entering the collection system as a result of I&I are a function of a number of factors that affect the whole system. As a result, these costs are generally recovered on a pro-rata basis from all customers through the volume charge. Similarly, costs associated with combined sewer systems, although attributable to certain areas or locations where these systems exist, are not impacted by customer classification, or any class specific customer attributes, and again, are typically recovered through the volume rate. As an alternative, it is possible to develop rates or surcharges that are applied to specific areas or zones of a system where combined sewer systems exist, to recover a portion of the costs associated with correcting this problem. However, the costs of implementing and administering this type of rate structure can be significant. In addition, as combined sewer systems are eliminated, all customers benefit, since this results in additional capacity available to serve all customers and accommodate growth.

For stormwater costs, the current situation for the Department is that these costs are allocated to wastewater operations, and the assumption is that these costs are to be recovered from wastewater user rates and charges. The cost allocation model is built around this assumption. Again, there is no reasonable cost basis for allocating these costs differently to different customer classes, as long as these costs are recovered primarily from wastewater user rates and charges.

For the reasons discussed above, the most common rate structure used for wastewater is a uniform volume rate or charge that is the same for all customers and that is designed to recover all costs associated with the normal operation and maintenance of the collection system and treatment plants. Customer service related costs are typically recovered from a base or minimum charge, rather than a volume charge. Not all utilities have a uniform volume charge for wastewater. Differences in volume rates are typically based on specific operational cost differences due to location (for example, inside-city and outside-city customers) or based upon specific treatment plants serving one drainage basin versus another, rather than customer classes based on usage levels. Rate differentials may also be implemented based on broader policy objectives, such as encouraging economic development. In any event, differences in cost of service among general customer classes served throughout a system (no geographic separation of

customer classes) typically do not provide a reasonable basis for developing separate rates for broad classes of customers. As a result, the main objectives for our analysis are to provide information as to the relative costs associated with the main functional categories of wastewater operations, and to assess whether current rates and charges for wastewater service are recovering the total revenue requirements for wastewater operations.

The wastewater revenue requirements and offsets were allocated to functional categories using allocation percentages provided by MWS staff or composite allocation factors. The functional categories are as follows:

- Treatment,
- Disposal,
- Collection,
- Customer Service/Billing/Meter Reading,
- Admin & General, and
- Stormwater.

Similar to the methodology used for allocating the water revenue requirements, the wastewater revenue requirements were allocated to functional categories based on information provided by MWS staff, system characteristics, or composite allocation factors. Based on the functional allocation, as shown in exhibit 11, it was determined that approximately $8.7 million in operating and maintenance costs are attributable to stormwater. These costs were separated out so that an average unit cost could be calculated including and excluding stormwater costs. The objective for this exercise was to provide information about the impact of stormwater costs on the total costs for operation of MWS and on the wastewater unit cost of service. Exhibit 10 shows the results of the allocation to functional categories.

Exhibit 10

Allocated Wastewater Net Revenue Requirements

Functional Category	Cost
Treatment, Disposal, & Collection	$ 100,460,396
Customer Service/Billing	$ 3,433,474
Meters & Maintenance	$ 570,143
Stormwater	$ 8,663,575
TOTAL	**$ 113,127,589**

Wastewater flow does not experience the same customer driven max day or max hour peaks as water, as a result, wastewater unit costs are usually the same regardless of customer class. Therefore, a unit cost was not calculated per customer class. Instead an average unit cost was calculated for the entire system. Consistent with the water cost of service analysis, costs for billing, customer service and meters were excluded since these costs are assumed to be recovered from the minimum charge. The wastewater volume revenue rate requirements were divided by wastewater flows to determine an average unit cost as shown below. Similar to the trends in water flow, wastewater flows has not increased significantly over the past two years (if wholesale flows are excluded). Wastewater flows decreased in FY 2002 by approximately 1.2% and slightly increased (0.6%) in FY 2003. Therefore projected wastewater flows for FY 2004 were assumed to remain level, at FY 2003 levels.

As shown below in Exhibit 11, the calculated unit cost (when customer service/billing and meter maintenance costs are excluded) is $4.29.

Exhibit 11

Calculated Average Unit Cost for Wastewater

	Volume Revenue Requirements
Net Revenue Requirements	**$ 109,123,971**
Total Consumption	**25,458,426**
Calculated Wastewater Average Unit Cost (per ccf)	**$ 4.29**

The costs associated with the transmission and treatment of wastewater are not significantly impacted by demand patterns or other factors that vary by customer class. As shown below in Exhibit 12, the rate differentials derived from the current wastewater volume rates show a significant discount for large commercial customers, compared to residential customers, with small commercial customers paying a premium. The implication is that residential and small commercial customers are subsidizing intermediate and large commercial customers. Any future rate adjustments should include consideration of an objective to reduce the current rate differentials and move toward a uniform wastewater volume rate for all customers.

Exhibit 12

Calculated Rate Differential - Wastewater

Customer Class	Current Rates	Calculated Rate Differential
Residential	$3.76	1.00
Small Commercial	$4.21	1.12
Intermediate Commercial	$3.43	0.91
Large Commercial	$2.59	0.69

Exhibit 13 shows the impacts among the existing customer classes assuming a shift to a uniform volume rate, and assuming total revenues generated from wastewater volume rates remain unchanged.

Exhibit 13

Estimated Over and Under-Recovery of Wastewater Revenues

Wastewater	Actual '04 Wastewater Volume Revenues	Revenue Reqmts. Allocated by COS Results	Over/(Under) Recovery	Impact Per Customer (annual)
Residential	$ 23,072,777	$ 20,406,327	$ 2,666,450	$ (19.88)
Small Commercial	$ 2,234,622	$ 1,731,827	$ 502,795	$ (59.51)
Intermediate Commercial	$ 30,278,926	$ 28,823,700	$ 1,455,226	$ (280.75)
Large Commercial	$ 17,845,684	$ 22,470,156	$ (4,624,472)	$ 56,168
	$ 73,432,009	$ 73,432,009	$ -	

III. WHOLESALE COST OF SERVICE ANALYSIS

A. BACKGROUND

Metro Water Services ("MWS") currently provides service to one water wholesale customer and ten sewer wholesale customers. The water customer's present rate structure is based on the intermediate commercial customer class, which is composed of a base charge and a volume rate. The ten sewer customers are charged based upon a variety of wholesale rates and rate structures. Six of the ten sewer wholesale customers are trunk and treatment wholesale customers, who are participating entities in the Nashville 201 Facilities Plan. These customers' current wholesale rate is based on a contract methodology that was put into place March 2, 1978. The rate for the trunk and treatment customers is updated annually, based upon allocation factors established in the original contract, to reflect increases in O&M costs and certain capital costs, as well as a debt service component. Of the four remaining sewer wholesale customers, both the City of Mount Juliet and the City of Ridgetop have rates that are pre-set in their individual contracts, and are adjusted annually based on the change in the Consumer Price Index ("CPI"). The City of Goodlettsville has a sewer wholesale rate based on a percentage of MWS' rates. The White House Utility District's wholesale rate is based on the large commercial customer class rate, which is composed of a base charge and a volume rate. Exhibit 14 outlines MWS's list of wholesale customers and the details of the various contracts.

A large disparity exists between the sewer wholesale contracts, and the need to examine this disparity has become apparent as MWS has continued to grow and add wholesale customers. Conversely, as MWS has continued to acquire other water utilities as opposed to maintaining wholesale relationships with them, the number of wholesale water customers has decreased. As a result of the changing nature of MWS's relationships with its wholesale customers, the need to calculate a cost of service based rate to serve these wholesale customers has become imperative.

Exhibit 14

Wholesale Contracts

Water					
City	**Contract Type**	**Contract Expiration**	**Time Required to End Contract**	**Annual Revenues**	**Present Rate Structure**
Brentwood	Tariff	March 20, 2021	Written Notice to be effective in 4 years	$965,098	Intermediate Commercial Customer
Wastewater					
City	**Contract Type**	**Contract Expiration**	**Time Required to End Contract**	**Annual Revenues**	**Present Rate Structure**
Bell Meade	Trunk and Treatment	Open	60 Day Written Notice to be effective in 1 year	$72,500	T&T Rate
Brentwood	Tariff	12/31/2000, month to month	Written Notice to be effective in 4 years	$1,355,600	T&T Rate
Goodlettsville	Wholesale	June 7, 2007	Written notice if violating Metro's Industrial Waste Code	$936,854	41% Metro's Sewer Rates
Hendersonville	Trunk and Treatment	Open	60 Day Written Notice to be effective in 3 years	$1,288,700	T&T Rate
Millersville	Trunk and Treatment	Open	60 Day Written Notice to be effective in 1 year	$79,700	T&T Rate
Mount Juliet	Wholesale	June 22, 2029	Not addressed	$1,058,000	Rate based on CPI
LaVergne	Trunk and Treatment	Open	60 Day Written Notice to be effective in 1 year	$510,500	T&T Rate
Old Hickory	Trunk and Treatment	Open	90 Day Written Notice to be effective in 3 years	$312,400	T&T Rate
Ridgetop	Wholesale	September 30,2031	Not addressed	$34,600	Rate based on CPI
White House	Tariff	October 1,2016	Mutual Written Consent of Parties	$217,600	Tariff

B. DEVELOPMENT OF WATER AND WASTEWATER WHOLESALE RATES

One of the objectives for this study is to develop a methodology for setting wholesale rates that can be applied consistently to all wholesale customers. The recommended methodology is designed to be consistent with industry guidelines for setting wholesale or bulk customer rates. This methodology is based on the Utility Approach to rate setting. The Utility Approach is typically used to calculate utility rates by private sector service providers (i.e. investor-owned utilities) regulated by public service commissions or similar agencies. However, the Utility Approach is also used by government-owned utilities to determine outside-city rate differentials and to calculate wholesale rates since it provides a more effective methodology for compensating the utility for the risk associated with providing service to "non-owners" of the system. The Utility Approach looks at two primary cost components:

1. An operation and maintenance component ("O&M") which includes an allocated share of direct costs for operation O&M of the assets used to provide water/sewer service to wholesale customers;
2. A capacity component which includes a rate of return applied to an allocated portion of the investment in assets used to serve wholesale customers, and an allocated portion of the depreciation expenses associated with these assets.

The above mentioned components are allocated to the wholesale customers based on their pro rata share of usage, as determined from an analysis of historical flows. Each of these components is discussed in more detail below.

O&M Component

To determine the O&M component of the water and sewer wholesale rates, budgeted FY 2004 O&M costs, including general, administrative and overhead costs, but exclusive of debt service costs, capital outlay, and CIP projects, were allocated between water and sewer. O&M costs for water and sewer, separately, were then allocated between three categories of costs:

1. Joint costs – Includes costs for the operation of facilities that provide benefit to both wholesale and retail customers. Typically this would include costs associated with the operation of all core system assets including water source of supply, treatment, and major transmission lines and wastewater treatment, major collection lines, and pump stations.
2. Retail costs – Includes costs for the operation of system components that generally do not benefit wholesale customers. This would include costs associated with local service water distribution lines and water storage tanks (reservoirs) used to pressurize local distribution systems (unless wholesale customers also take advantage of these tanks), and also costs associated with local service sewer collection lines.
3. Account costs – Includes costs associated with customer service, billing and collection, meter reading and other costs required to service individual accounts. The per bill

amounts of these costs were determined to be negligible and not considered in calculating wholesale rates.

The sum of the allocated "joint" costs was divided by total projected billable flows, including both wholesale and retail billable flows, to calculate a unit rate for O&M costs attributable to both wholesale and retail service. The projected O&M costs are summarized below in Exhibit 15:

Exhibit 15

Wholesale Cost Calculation –O&M Component

Type of Costs	Water	Sewer
Total O&M Joint Costs	$20,628,328	$37,580,668
Total Billable Flows (100 cubic feet)	29,804,317	36,288,133
O&M Cost per 100 cubic feet	**$0.69**	**$1.04**

Capacity Component

The capacity component of the wholesale rate incorporates both the return on assets calculation and the recovery of an allocated portion of depreciation expense. The return on assets component is intended to compensate MWS for risk incurred to reserve a portion of its total system capacity for wholesale customers, or "non-owners" of the system. The portion of the depreciation expense is designed to reimburse MWS for the use of the assets by the wholesale customers.

Return on Assets

The return on assets is calculated by multiplying a rate of return factor times the value of the assets used to serve wholesale customers. The asset value in our analysis is based on the original cost less depreciation ("OCLD"), or net book value ("NBV"). MWS provided a detailed list of both the water and sewer system assets and the annual depreciation expense associated with the assets. This information was used to determine the NBV of those assets which are used to provide service to wholesale customers.

Whereas the OCLD approach provides the most appropriate measure for the value of the existing assets, it is also important to address the value of on-going capital investments, particularly those expenditures already made, but not yet booked to fixed assets, as measured primarily by Construction Work In Progress ("CWIP"). CWIP was provided by MWS to be included in the allocation of assets to the wholesale customers since this represents a significant investment in utility assets. Contributed Capital was deducted from the assets and CWIP, since it would not be appropriate to earn a return on assets not paid for by MWS. The objective is to develop an estimate of the total value of the assets that are used to provide service to wholesale customers,

that were contributed by, or paid for by MWS, and ultimately by MWS's retail customers, who are the "owners" of the system.

Once the value of the assets is identified using the OCLD approach, the next step is to allocate those assets between those that benefit both wholesale and retail customers and those that benefit only retail customers. For water, the water treatment plant assets, the reservoir and pump station assets, and the transmission main assets provide benefit in delivering service to the wholesale customer. Since the one wholesale water customer is fully integrated into the retail distribution system and relies on MWS to pressurize its system, it is appropriate to include cost for reservoirs (tanks) in with those assets providing benefit in delivering service to the wholesale customer. All other water assets (such as the distribution lines) were not included since these assets do not provide direct benefit in delivering service to the wholesale customer. The total OCLD value of water core assets associated with water production, storage and transmission is approximately $119.2 million including CWIP. Contributed Capital is $6 million. The allocated costs ($113.2 million) are then multiplied by the proportion of the wholesale customers' flows versus total system flows. For FY 2003, that proportion was 2.0%, resulting in approximately $2.3 million in OCLD value attributable to the wholesale customer.

For wastewater, the wastewater treatment plant assets, sludge management and odor control, pump station assets, and sewer trunk lines and large force mains benefit wholesale and retail customers, while all other wastewater assets do not provide benefit in delivering service to wholesale customers. The total OCLD value of sewer core assets associated with sewer treatment and transmission is $414.4 million including CWIP. Contributed Capital is $113.7 million. The allocated costs ($300.7 million) are then multiplied by the wholesale customers' proportion of sewer flows as compared to the system. For FY 2003, this percentage was 25.9%, resulting in approximately $77.9 million in OCLD value for wholesale customers.

The next critical factor is to determine a rate of return to apply to these asset values. The rate of return is set equal to the weighted average cost of capital ("WACC"). The WACC considers both the cost of debt and the cost of equity.

Exhibit 16 shows the calculation of WACC and the resulting rate of return used to calculate the return component used in the wholesale analysis.

EXHIBIT 16 WACC - RATE OF RETURN	
COST OF DEBT CAPITAL	
MWS Weighted Average Cost of Debt (1)	5.7%
COST OF EQUITY CAPITAL	
Risk Free Rate - Long-Term U.S. Treasury Bond Yield (2)	4.80%
Equity Risk Premium (2) times Beta (3) (7.0% * 0.55)	3.85%
Small Company Risk Premium (2)	1.48%
Specific Company Risk Premium	0.00%
Total Buildup of Cost of Equity Capital	**10.13%**
DEBT STRUCTURE (4)	
Debt as Percentage of Capital	36.52%
Equity as Percentage of Capital	63.48%
WEIGHTED AVERAGE COST OF CAPITAL (WACC)	
Weighted Cost of Debt	2.09%
Weighted Cost of Equity	6.43%
Weighted Average Cost of Capital	**8.52%**

(1) MWS weighted average cost of debt based on outstanding bond issues listed in Official Statement for the MWS Series 2002 Bonds.

(2) Key Variables in Estimating the Cost of Capital, SSBI Valuation Edition 2003 Yearbook (based on 2002 data).

(3) Value Line's Sample Water Industry Report, October 31, 2003.

(4) Department of Water and Sewerage Services, The Metropolitan Government of Nashville and Davidson County Financial Statements, June 30, 2003.

Since MWS does not issue stock, there is no clear cost of equity for MWS. Therefore, the cost of equity for the water utility marketplace must serve as a proxy for the cost of equity for MWS.

The cost of equity is comprised of several components, including a risk-free rate of return plus various risk premiums. The risk free rate can be determined by looking at the yield on long-term U.S. treasury bonds. For this analysis, the risk free rate is assumed to be 4.80%. The beta is a measure of the volatility of the particular industry's returns as compared to the marketplace. Value Line's Sample Industry Report provides betas for publicly traded private water companies on a quarterly basis. Value Line's average beta, used for this analysis, is .55. The return on risk associated with investing in equity (referred to as the equity risk premium) is 7.0%, which can be determined by comparing the return on equity investments versus the risk free rate. An analysis is performed by Ibbotson Associates each year that calculates the equity risk premium. They also calculate the return on the risk of investing in smaller companies (referred to as the small

company risk premium). For MWS, the risk associated with size has been estimated at 1.48%. No risk has been assigned to the specific company premium.

The calculated weighted average cost of capital or rate of return is 8.52%. This rate of return is then multiplied times the OCLD value for both water and sewer, respectively, to derive a return component of approximately $196,000 for water and $6.6 million for sewer.

Depreciation Expense

The depreciation cost component is calculated by determining the annual depreciation on each category of assets. The same percentages as used in the return on assets calculation were applied to the depreciation expense for each category of assets to determine the portion of the depreciation expense associated with assets that provide benefit to wholesale customers. The wholesale customers' pro-rata share of usage based on 2003 flows (2.0% for water and 25.9% for sewer) was applied in order to derive an annual depreciation cost component (approximately $113,800 for water and $4.7 million for wastewater) applicable to wholesale customers.

The total capacity cost for 100 cubic feet of water system capacity is shown below in Exhibit 17.

Exhibit 17

Wholesale Cost Calculation –Water Capacity Component

	$195,968	Return on Assets
+	113,781	Depreciation Allocated to Wholesale Customers
=	$309,749	Annual Capacity Cost

The annual capacity cost component is then divided by the total wholesale water flows to determine the actual capacity cost per 100 cubic feet ($309,749/ 360,873 = $0.86 per 100 cubic feet). The water capacity charge is determined to be $0.86 per 100 cubic feet.

For sewer, the same exercise yields a sewer capacity cost of $0.99 per 100 cubic feet. The annual capacity cost component divided by total wholesale sewer flows: $9,868,011 / 9,995,326 = $0.99 per 100 cubic feet, as shown below.

Exhibit 18

Wholesale Cost Calculation –Sewer Capacity Component

	$6,636,099	Return on Assets
+	$4,698,714	Depreciation Allocated to Wholesale Customers
=	$11,334,813	Annual Capacity Cost

The sum of the calculated capacity cost and calculated O&M cost per 100 cubic feet is the cost to serve wholesale customers. Exhibit 19 details the calculated wholesale costs.

Exhibit 19

Summary of Wholesale Cost Calculations

Type of Costs	Water	Sewer
Capacity Cost per 100 cubic feet	$0.86	$1.05
Calculated O&M Cost per 100 cubic feet	$0.69	$1.04
Wholesale Cost per 100 cubic feet	**$1.55**	**$2.09**

For those sewer wholesale customers (trunk and treatment customers under the 201 Facilities Plan) that have previously contributed capital upfront, their wholesale cost of service would just be the O&M component of the wastewater wholesale cost, which is calculated at $1.04. These customers have already contributed to the capacity charge portion of the wholesale cost.

C. COMPARISON OF CURRENT RATES VERSUS CALCULATED COSTS

The rate impacts of the calculated costs on the various wholesale customers are demonstrated in Exhibit 20 below. Rate impacts vary depending on the type of wholesale customer. The revenues generated from these wholesale customers in fiscal year 2004 is shown and compared to the estimated revenues that would be generated if the calculated wholesale costs were implemented. As shown, water revenues would be 0.7% lower, while sewer revenues would be approximately 108% higher.

Exhibit 20

Comparison of Present Rates versus Calculated Costs

City	Contract Type	Present Rate	Calculated Cost (6)	FY 2004 Revenues	Estimated Revenues Using Calculated Cost (5)
Water Wholesale Contracts:					
City of Brentwood	Tariff	$1.56	$1.55	$965,098	$958,000
Sewer Wholesale Contracts:					
City of Belle Meade	Trunk and Treatment	$0.43	$1.04	$72,500	$175,349
City of Brentwood	Trunk and Treatment	$0.43	$1.04	$1,355,600	$3,278,660
City of Goodlettsville	Wholesale	(1)	$2.09	$936,854	$1,314,111
Hendersonville Utility District	Trunk and Treatment	$0.43	$1.04	$1,288,700	$3,116,856
City of Millersville	Trunk and Treatment	$0.43	$1.04	$79,700	$192,763
City of Mount Juliet	Wholesale	$1.13 / $1.23 (4)	$2.09	$1,058,000	$1,873,915
City of La Vergne	Trunk and Treatment	$0.43	$1.04	$510,500	$1,234,698
Old Hickory Utility District	Trunk and Treatment	$0.43	$1.04	$312,400	$755,572
City of Ridgetop	Wholesale	$1.28 (2)	$2.09	$34,600	$56,495
White House Utility District	Tariff	$2.59 (2)(3)	$2.09	$217,600	$175,592
Total Sewer				**$5,866,454**	**$12,174,011**

(1) Madison Suburban Utility District bills Goodlettsville at MWS's sewer rates and remits 41% of collected revenues to MWS.

(2) A 10% surcharge for repayment of TLDA loans is also assessed, similar to MWS retail customers.

(3) A base charge is included based on an 8" sewer meter for the large commercial class.

(4) The rate charged varies based on the amount of billed wastewater flow.

(5) These represent estimated revenues and do not consider any limitations imposed by the existing contracts.

(6) Calculated costs are based on billable flows.

Additional information regarding MWS's wholesale rates as they compare to other comparable utilities can be found in Section VI of this report.

IV. DEVELOPMENT FEE CALCULATION

Development fees are defined as one-time capital recovery charges assessed against new development as a way to recover a proportional share of the cost of capital facilities constructed to provide service capacity for new development. Development fees are also referred to as "system development charges", "capital recovery charges", "facilities investment fees", "development impact fees", "capacity fees", etc. Development fees generally focus on recovery of a proportionate share of core system facilities, those facilities that are required to serve all customers, existing and new. These types of fees are typically used in areas experiencing high growth rates or in communities that want to manage their growth. The effect of development fees is to shift cost away from existing residents to those new residents responsible for creating the additional costs. MWS currently assesses a $500 sewer capacity fee and no water capacity fee.

Appropriate development fees must comply with the Rational Nexus test established in court cases. The Rational Nexus test requires that: 1) the need for development fees is a result of new growth; 2) the amount of the fee does not exceed the reasonable cost to provide capacity to accommodate growth; and 3) the funds collected must be adequately earmarked for the sufficient benefit of new customers required to pay the fee.

There are two approaches for calculating water and sewer development fees that are recognized in the industry as cost-justified[1] and meet the requirement of the "rational nexus" standard applied by the courts. The two approaches are the System Buy-In Approach and the Marginal Incremental Approach.

A. SYSTEM BUY-IN APPROACH

The System Buy-In Methodology is most appropriate in cases where the existing system assets provide extra capacity to provide service to new customers. This approach calculates a fee based upon the proportional cost of each user's share of existing plant capacity. The cost of the facilities is based on fixed assets records and usually includes escalation of the depreciated value of those assets to current dollars. All core assets that provide benefit to the general transmission/collection and treatment systems are included, such as water and sewer treatment plants, water reservoirs (storage tanks), major water transmission mains and sewer interceptors, and pump/lift stations. Excluded from the calculation are costs associated with local service lines that are dedicated to serving existing customers. In addition, all assets contributed by or paid for by developers, or assets that were grant funded, are excluded from the calculation since these costs were not "paid" by the existing customers. Also, outstanding principal on funds borrowed to construct the core assets is deducted in order to ensure that new customers are not

[1] See the AWWA manual M26 – Water Rates and Related Charges, Chapter 3: System Development Charges, pp.19-33.

being double charged for these costs, since this cost will be recovered from all present and future customers through retail rates which must be set to recover debt service costs.

B. MARGINAL/INCREMENTAL COST APPROACH

The second method used to calculate water and sewer capacity fees is the Marginal/Incremental Cost Methodology. This method focuses on the cost of adding additional facilities to serve new customers. It is most appropriate in a situation where existing facilities do not have available capacity to provide service to new customers, and the cost for new capacity can be tied to an approved CIP, or where additional capacity is currently being added and costs can be tied to an on-going construction program. It was determined that the Marginal/Incremental Cost Methodology was not the appropriate methodology to use for MWS's capacity fee analysis.

C. CALCULATION OF DEVELOPMENT/CAPACITY FEES

1. Water

The calculation of the water capacity fee for MWS is appropriately based on the System Buy-In Method. Although MWS is currently involved in expanding certain components of the water distribution system to address growth, most of the core system assets of MWS, particularly water treatment plants, have adequate capacity to serve new customers. The typical approach is to determine a development or capacity fee for new water customers based on the estimated investment in water treatment assets escalated to current dollars. In MWS's case, sufficiently detailed fixed asset information is not currently available to allow for escalating the values of individual assets to current dollars. Instead, the analysis is based on the replacement cost of the major system assets developed for insurance purposes. This replacement cost was then adjusted for the proportion of the assets original cost that has already been depreciated, as provided in the fixed asset records, to develop an estimate of the RCNLD value of core system assets. No replacement cost was available for water transmission lines, instead a more conservative estimate based on the original cost less depreciation was used for these assets. Construction Work in Progress (CWIP) to be completed before June 30, 2004 was also added to the escalated value of the existing fixed assets to determine the total value. The outstanding bond principal was credited against system value. This credit accounts for the fact that the payment for projects financed by bonds is collected through the monthly rates the customer will pay. These adjustments to the RCNLD value determine the total system value which the new customers are buying into. The total value is divided by the maximum capacity of the overall system (180 mgd) to determine a cost per gallon per day for the treatment and delivery of finished water. This cost per gallon per day represents an estimate of the value of the existing assets available to

serve new customers that these customers are being asked to "buy into". The cost per gallon per day for the MWS water system based on the System Buy-In Approach is $1.13.

The amount of the water capacity fee is calculated on the basis of a usage standard for a typical residential customer which is defined in terms of an equivalent dwelling unit (EDU). The number of gallons per day (GPD) of consumption for an EDU is calculated by using an estimate of the average usage per person (100 gallons per day) and multiplying it by the number of persons per household (3.5). [2] The result is then multiplied by a water loss factor (1.18) and system-wide peaking factor for customer usage (1.4) to calculate the GPD per EDU. Water facilities must be sized to meet peak periods of customer demand, including accounting for lost or non-billed water. The resulting GPD per EDU (578) is then multiplied by the cost per gallon to calculate the capacity fee for a residential customer, as shown in Exhibit 21.

Exhibit 21

Calculation of Water Capacity Fees for an Equivalent Dwelling Unit

GPD per person	100
Persons per household	3.5
Water Loss	1.18
System Peaking Factor	1.4
GPD per EDU	**578**

Cost per Gallon * GPD per EDU = $1.13 * 578 = $ 655

Costs for other customer types are based on meter capacity ratios calculated based upon the ratio of capacity provided by different meter sizes.

2. Sewer

The calculation of the sewer capacity fee for MWS is also based on the System Buy-In Method, for the same reasons, and using the same approach as described for the water capacity fee. Similar to the water capacity fee, the outstanding bond principal attributable to sewer, was credited against sewer system value. In addition, MWS also received state revolving fund loans (SRF) loans which were used to finance a variety of "core" sewer capital projects. The outstanding principal for these SRF loans was also credited against the sewer system value. These adjustments to the RCNLD value determine the total system value which the new customers are buying into. The total value is finally divided by the maximum capacity of the overall system (186.5 mgd) to determine a cost per gallon charge for buying into the system. The cost per gallon charge for the MWS sewer system based on the System Buy-In Approach is $0.98.

[2] Gallons per person (100), persons per household (3.5), and water loss factor (1.18) from MWS staff.

The amount of the sewer capacity fee is calculated on the basis of a usage standard for a typical residential customer, also defined in terms of an equivalent dwelling unit (EDU). The number of average gallons per day (GPD) of consumption for an EDU is calculated by using an estimate of the gallons of wastewater generated per person (70) and multiplying it by the number of persons per household (3.5)[3]. The result is then multiplied by the inflow and infiltration factor (1.365) to calculate the GPD per EDU. The resulting GPD per EDU (334) is then multiplied by the cost per gallon to calculate the capacity fee for a residential customer, as shown in Exhibit 22.

Exhibit 22

Calculation of Sewer Capacity Fees for an Equivalent Dwelling Unit

GPD per person	70
Persons per household	3.5
Inflow and Infiltration Factor	1.365
GPD per EDU	**334**

Cost per Gallon * GPD per EDU = $0.98 * 334 = $ 329

Costs for other customer types are based on meter capacity ratios calculated based upon the ratio of capacity provided by different meter sizes.

As discussed above, the water and sewer capacity fees are calculated on a per EDU basis. These fees are appropriate for a typical or average residential customer with a 5/8" meter based on actual system usage characteristics. For non-residential customers, water and sewer capacity fees are assessed based on meter size. The use of meter sizes provides an effective and easy way to capture the impact of different levels of demand for different types of customers. Customers with larger meters are assumed to place a larger potential demand on the utility system for water and sewer services. The capacity fees for larger meters are adjusted or increased based on the capacity of flow provided by each meter size relative to a 5/8" meter. Adjusting the capacity fees by meter size also encourages larger customers to properly size their meters consistent with realistic demand expectations. Properly sized meters result in more efficient and accurate metering.

The capacity fees for each meter size are calculated based on the ratio of meter capacity for each meter size compared to a 5/8" meter. Exhibit 23 provides a summary of the recommended water and wastewater capacity fees by meter size, which represent the maximum amount that could be cost justified. Note that the current flat capacity fee of $500 for wastewater only is less than the combined capacity cost (water and wastewater).

[3] Gallons per person (70), persons per household (3.5), and inflow and infiltration factor (1.365) from MWS staff.

Exhibit 23

Calculated Water and Sewer Capacity Fees by Meter Size

Meter Size	Meter Capacity Conversion Factor (1)	Water Capacity Fee (2)	Sewer Capacity Fee (2)	Combined Capacity Fees
5/8"	1.00	$ 655	$ 329	$ 984
¾"	1.50	983	494	1,477
1"	2.50	1,638	823	2,461
1 ½"	5.00	3,276	1,646	4,922
2"	8.00	5,242	2,633	7,875
2 ½"	11.00	7,207	3,621	10,828
3"	17.50	11,466	5,761	17,227
4"	30.00	19,656	9,875	29,531
6"	62.50	40,950	20,574	61,524
8"	80.00	52,416	26,334	78,750
10"	145.00	95,004	47,731	142,735
12"	215.00	140,867	70,774	211,641

(1) American Water Works Association Manual of Water Supply Practices – Water Meters – Selection, Installation, Testing, and Maintenance ("AWWA Manual M6")

(2) Maximum level that can be cost justified at the discretion of policy makers.

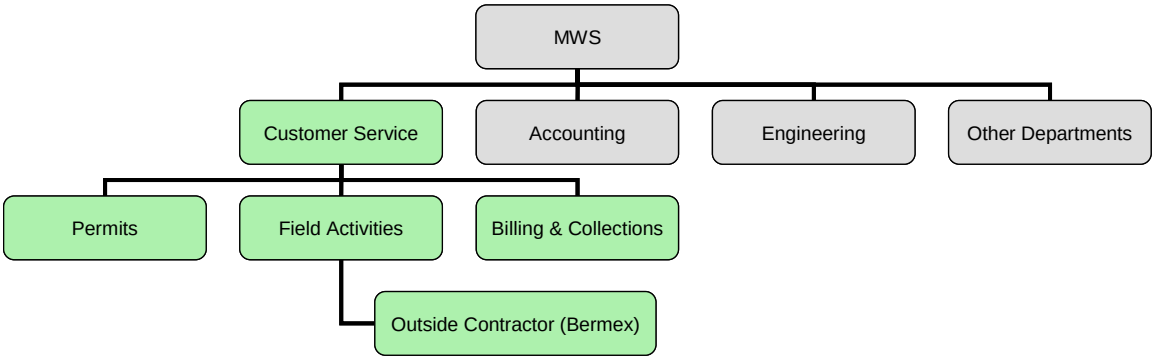
Additional information regarding MWS's capacity costs as they compare to other comparable utilities can be found in Section VII of this report.

V: MISCELLANEOUS COSTS

MWS receives revenues from fees assessed for various miscellaneous services such as turning on water service for new customers, late payment charges, disconnection of service, etc. As part of the cost of service analysis, RFC was charged with calculating the cost to provide each of these miscellaneous services. RFC's calculated costs serve as a check to MWS' current fees. In addition, a survey was conducted to compare MWS' current fees, and costs calculated by RFC, with the fees of comparable utilities (discussed in more detail in Section VII of this report). The results of the cost of service analysis for miscellaneous costs is discussed below. It should be noted that costs calculated using the cost of service methodology represent the maximum amount that could be justified for a service, but a lower fee may actually be charged due to policy issues in order to address other policy and pricing objectives. The results are segregated by the department within MWS responsible for providing the miscellaneous service, as shown below in Exhibit 24.

Exhibit 24

MWS Organizational Chart



A. SERVICES PROVIDED BY FIELD ACTIVITIES

Field activities performs several services which are as follows:

- Turn – ons: Turning on water service for new and existing customers;
- Straight lines: Removal of materials inappropriately used by water customers to tap into a line in order to bypass the meter and obtain water without paying for monthly metered water;

- Broken locks: Restoring locks which were installed on meters damaged or removed due to delinquency in water payments;
- Investigations per customer request: Determining the accuracy of meter readings that are being questioned by water customers;
- Flow test: Performing a flow test to determine if pressure is low due to the homeowner's plumbing or due to MWS' system;
- Vandalism: Replacing or restoring a meter that has been intentionally damaged;
- MXU Transceiver: Installing a radio read meter that provides automated meter reading capabilities; and,
- After hours charge: Performing any of the above services after normal operating hours.

Miscellaneous costs for services provided by field activities were calculated using a "bottom-up" approach. Personnel from field activities were interviewed to determine the amount of time spent on various activities and to discuss the tasks involved to complete each activity. A labor rate and overhead rate was provided by field activities for each activity and applied to the amount of time spent on each activity. The labor rates and overhead percentages vary based on the activities being performed and the personnel typically involved in those activities. In addition, the calculation included expenses, or an hourly expense rate, associated with travel (truck costs) and any materials and supplies typically used in conducting the activity such as coupling costs and meter costs.

Exhibit 25 below shows the current fees for miscellaneous services performed by field activities. RFC calculated costs to conduct each of these activities in order to gauge the accuracy of MWS' current fees for these services. In addition, the results of the miscellaneous fees survey are shown below for comparison purposes. As shown, the current fees are not recovering the expenses associated with each of these activities. Furthermore, the wide range of fees charged for these services as shown by the survey results indicate that fees for these services are highly variable and do not appear to be consistent with a cost of service based approach. Some of these fees may be kept artificially low due to policy issues.

Exhibit 25

Results of Miscellaneous Costs Provided by Field Activities

				Survey Results		
	Miscellaneous Fee	**MWS Current Fee**	**Calculated cost per order if meter set**	**Range**	**# of utilities that charge for this service**	**# of survey respondents**
	Turn-Ons	$25	$68	$5.00 - $49.50	8	8
	Straight Lines	$0	$142			8
	Broken Locks	$10	$98	$53 - $100	3	8
	Investigations per customer request	$0	$73	$10 - $95	4	8
	Flow Test	$0	$104	$60 - $90	2	8
	Vandalism	$0	$96	$50 - $100	4	8
	MXU	$0			0	8
(1)	After Hours Charge	$138	$239	$11 - 170	4	8

(1) On average, an employee spends 4 hours on an after hours call. Therefore, the per hour rate is $54.00. This charge is not assessed if the required work is the responsibility of MWS.

B. SERVICES PROVIDED BY BERMEX

Several activities associated with miscellaneous fees are outsourced to a company called Bermex, including reconnections for non-payments and notifies (or notification of service disconnection). MWS' customer service group will send work orders regarding these two activities to field services who then instruct Bermex to either notify a customer that their water service will be disconnected or reconnect water service after payment has been submitted by a water customer. Bermex charges MWS $13.54 for each reconnection and $5.77 for each notice. The calculated costs for these fees include the Bermex charges plus a cost for customer service activities based on an average labor rate and time associated with each activity. As shown in Exhibit 26, the current reconnection fees are comparable to those calculated in the cost of service study. It appears that the current fee to notify a customer of disconnection is closer to the calculated cost of service. It should be noted that very few utilities charge for notification of service disconnection as a separate fee.

Exhibit 26

Results of Miscellaneous Costs Provided by Bermex

			Survey Results		
Miscellaneous Fee	**MWS Current Fee**	**Calculated cost per order**	**Range**	**# of utilities that charge for this service**	**# of survey respondents**
Reconnect for Non-Payment	$15	$16	$10 - $45	8	8
Notifies	$15	$8	$1 - $20	2	8

C. SERVICES PROVIDED BY BILLING & COLLECTING AND ACCOUNTING

Several miscellaneous fees are charged for activities conducted solely by billing and collections or the accounting department. Billing and collections is responsible for producing duplicate copies of billing history upon a customer's request and for assessing a late payment charge for bills that are past due. Currently, billing and collections does not charge customers for duplicate copies of bill history. The calculated cost per order is approximately $3.50. Only one other utility in the survey assesses a fee for this service and the fee it assesses is significant ($20 to $40 depending on the amount of the bill).

MWS currently assesses a 5% penalty on any unpaid balance. Since the tracking and billing of late payment charges is mostly automated, the costs associated with handling a late payment charge are the same regardless of the amount of the bill. The only cost differential among bills is the amount of foregone interest. Since larger bills result in larger foregone interest earnings, a 5% late payment equally recovers the foregone interest. It should be noted that the majority of the utilities participating in the survey assess a 1.5% late payment charge.

Exhibit 27

Results of Miscellaneous Costs Provided by Billing & Collections and Accounting

			Survey Results		
Miscellaneous Fee	**MWS Current Fee**	**Calculated cost per order**	**Range**	**# of utilities that charge for this service**	**# of survey respondents**
Duplicate Bill History Charge	$0	$3	$20 - $40	1	8
Late Payment Charge	5% of unpaid balance	$0	1.5% - 5%	6	8
Returned Check Charge	$10	$25	$15 - $29	8	8

D. SERVICES PROVIDED BY THE PERMIT DEPARTMENT

The permits group is responsible for two miscellaneous fees – a second or more meter inspection and tap fees. Similar to the methodology for deriving the costs for the miscellaneous services performed by field activities, the cost of service for second or more meter inspections and tap fees is calculated using a "bottom up" approach. Personnel from the permits group were interviewed to determine the specific tasks or activities for second or more meter inspections and tap fees, as well as the time spent performing the tasks associated with each of these services. A labor rate and overhead rate for the permits group was applied to the time spent for each of the tasks, and materials costs were added into the charge as needed (truck costs). For tap fees, while the permits group performs the clerical work as well as the check to make sure that the work had been done correctly, the system services group performs the actual tap onto the line. A labor rate for the system services group and material costs (including the cost for the water meter) was applied in the same manner as the permits group's time in order to calculate the actual cost to perform the tap.

As shown in Exhibit 28, the calculated water tap costs are significantly higher than the current tap fees. The majority of the difference can be explained by meter costs.

Exhibit 28

Results of Miscellaneous Water Costs Provided by the Permit Department

			Survey Results		
Miscellaneous Fee	**MWS Current Fee (1)**	**Calculated cost per order if meter set**	**Range**	**# of utilities that charge for this service**	**# of survey respondents**
2nd Meter Inspection	$0	$42			8
Water Tap Fee/Connection			$35 - $12,000	8	8
5/8"	$250	$428			
3/4"		$447			
1"	$350	$470			
1 1/2"		$602			
2"		$703			
3"	$450	$1,588			
4"	$1,000	$2,354			
6"	$1,500	$4,043			
8"	$2,000	$8,774			
10"	$3,000	$12,188			

(1) The current fee schedule did not provide tap fees for 3/4", 1 1/2" or 2" taps.

Sewer tap costs for 4” and 6” taps were calculated using a similar methodology as that used to calculate water tap costs, excluding the cost for the meter. As shown below, the resulting tap costs for 4” and 6” taps is $225, which is lower than the current sewer tap fee of $500. All sewer taps greater than 6” should be charged based on actual costs (time and materials).

Exhibit 29

Results of Miscellaneous Sewer Costs Provided by the Permit Department

			Survey Results		
Miscellaneous Fee	**MWS Current Fee**	**Calculated cost**	**Range**	**# of utilities that charge for this service**	**# of survey respondents**
Sewer Tap Fee/Connection					
4"	$500	$225	$310 - $1,640	7	8
6"	$500	$225			

VI. SURVEY

As part of the cost of service analysis, a survey was conducted to serve as a benchmarking tool for the various fees and charges assessed by MWS. RFC identified twelve water and wastewater utilities (ten cities) to determine the types of fees assessed by the utilities as well as the actual fees assessed. The utilities were chosen based on size, as measured by flows, and their geographic location relative to Nashville. Of the twelve utilities surveyed, eight responded to the questions asked on the survey. The list below details the utilities that responded:

- Memphis, Tennessee
- Little Rock, Arkansas (Water)
- Jacksonville, Florida
- Charlotte, North Carolina
- Birmingham, Alabama
- Dayton, Ohio
- Richmond, Virginia
- Greenville, South Carolina (Sewer)

Both the Little Rock and the Greenville systems have separate entities to operate the water and the wastewater utilities. The remainder of the cities have one entity that operate both water and wastewater.

The survey was categorized into four areas/sections of relevance to MWS and the cost of service analysis. These sections include:

- Miscellaneous fees,
- Wholesale fees,
- Growth and development fees, and
- High strength surcharges

The results of each of the four surveys are summarized below. The results can be used for MWS comparison purposes, as well as an informational tool as to the types of charges that other utilities similar to MWS may charge.

As shown, the fees assessed by various utilities range both monetarily and structurally as some fees are based on meter size. In addition, the number of utilities that assess certain fees versus those that do not varies for each fee. These inconsistencies indicate that there may be policy objectives other than cost recovery driving the actual fees assessed to the utility customers.

While comparing various water and wastewater rates and charges with other communities can provide insights regarding a utility's pricing policies, care should be taken in drawing conclusions from such a comparison. Higher rates may not necessarily mean the actual costs of providing these services are higher or that the utilities are operated and managed poorly. Many factors affect the level of costs and the pricing structure employed to recover these costs. Some of the most prevalent factors include geographic location, demand, customer constituency, level of treatment, level of grant funding, age of system, level of general fund subsidization, and rate setting methodology. As a result, it is difficult to determine whether a charge is appropriate solely on the basis of the benchmarking analysis. The benchmarking analysis should be used in conjunction with cost of service analyses in order to determine the most appropriate charges.

Miscellaneous Fees

1) FEES ($)

	Nashville (Current Fees)	Nashville (proposed Fees)	Memphis	Knoxville	Little Rock - water	Jacksonville	Charlotte	Birmingham	Dayton	Richmond	Western Carolina Regional Sewer Authority	Greenville Water System
Customer Service												
Turn-On Fee	$ 25.00	$ 25.00	$50	$20 fee and $100 security deposit	$15	$10	$32	$ 13.00	5/8" - 1" = $5; 1 1/2" = $30; 2" = $40; 3" = $80; 4" = $90; 6" = $140; 8" = $200; 10" = $225	$35		$20
Disconnect / Reconnect for Non-Payment	$ 15.00	$25	$25		Non-pay turn on =$20 Non-pay set-back =$25	$14	$45	$16 / $34	$10	$35	$300	
Returned Check	$ 10.00	$ 20.00	$20		$15 plus bank fee	$20	$29	$25	$25	$20		$20
Request Copies of Bill History	$ -	$5 for 1st page, $1 thereafer	$20 -$40			$0	$0		none	none		$0
Late Payment Charge	5%	greater of 5% of unpaid balance or minimum charge	$0	if not paid within 15 days, 5% for 1st $250 and then 1 1/2% on any excess balance (after 30 days, continue to add another 1 1/2% for each month late)		1.5% of balance	1.5% of bill balance		none	$20 and interest charge of .83%	1% per month on unpaid balance	Greater of $2 or 1.5% of bill
Notification for Termination of Service	$ 15.00	$ 25.00	none		Collection Visit = $20	$0	$1		none	none		
Meter / Reading / Maintenance Fees												
Inspection of a Second or Additional Meter	$ -	$ 25.00	none			$0	$0	$13	$5	$20		
Investigation of Meter per Customer Request	$ -	$ 25.00	$95			$40 but $85 for 1 1/2 - 2" meter	$0		varies based on meter size: 5/8 - 1" = $10; 1 1/2 - 2" =$25 ; > 3" = $50	none		$50
Broken Locks on Meters	$ 9.60	$ 45.00	$53		$75	$0	$0		if due to water theft, then $100	none		
Vandalism of Meter	$ -	$45 or $200 for electric meters	have fee but not given		Stolen meter = $50	125% X rate X estimated usage	$0		meter cost plus $100 fine	none		
Transceiver Unit Damage	$ -	$ 200.00	none			$0	$0		none	none		
After-Hours Charge	$ 137.50	$ 137.50	$11		$50	$25	$0		none	for sewer unstop work - $40 per hour (normal hours) w/ $70 minimum or $60 per hour (after hrs) w/$170 min.		

Miscellaneous Fees

	Nashville (Current Fees)	Nashville (proposed Fees)	Memphis	Knoxville	Little Rock - water	Jacksonville	Charlotte	Birmingham	Dayton	Richmond	Western Carolina Regional Sewer Authority	Greenville Water System
2) Other Misc. Fees												
Back Flow Prevention yearly inspection		$ 125.00				$35	fee varies			none		
Fire hydrant Flow test						$82				none		
Non-pay restore closed account					$35					$35		
Same day turn on	$ -	$ 40.00			$20					$35		
Meter Removal/reinstallation							$69					
Miscellaneous Fees												
Yoke removal / reinstallation							$74					
Meter lock/ unlock fee							$69					$20
Bad order plumbing								$16 or $34 for after hours				
Main turn on/ turn off							$835					
3) Does your utility impose a charge for verifying that service is off if customer is stealing water?	$ -	$ 125.00	$74				no	no	Yes, $100.			
4) Does your utility charge for a flow test?	0	If MWS fault, then no charge, but otherwise $125	$95 per customer request		Only if the meter is not at fault.		no	Not at this time	$60, $30 per fire hydrant (flow one, gauge one).	Sewer		
5) Does your utility charge for fire protection?		Volume charge of $2.14 per ccf and a minimum volume charge that varies by meter size	residential - no		No	Yes. Closed system : 4" or less = $49; 6" = $97; 8" = $200; 10" = $356 Detector Meter rates: 4" or less = $15; 6" = $20; 8" = $30; 10" = $40		$115 per year charge to fire districts and municipalities	Yes, based on pipe size: 2"= $5; 3" = $7.50; 4" =$10; 6" = $20; 8" = $37.50; 10" = $58.50; 12" = $80	0-4" = $38.22; 6" = $44.13; 8" = $70.58; 10" = $117.59		

Note: Blank spaces indicate no response

Wholesale

	Nashville	Memphis	Knoxville	Little Rock - water	Jacksonville	Charlotte	Birmingham	Dayton	Richmond	Western Carolina Regional Sewer Authority (Greenville)
1) How many wholesale customers do you have?	1 water and 10 sewer	water = zero sewer = 4		5 water customers	only 1 wastewater customer	No wholesale customers but have 3 inter-county agreements	7	none	3 water and 0 sewer	
2) Are all of your wholesale customers charged at the same rate?	no	no		Yes	yes	Yes, all charged block 2 rates	yes	NA	no	
3) How are the wholesale rates structured?	volume charge	volume charge		minimum purchase	base charge based on meter size and volume charge	volume rate	same as residential rates	NA	volume charge	
4) What are the rates being charged?	water = $1.85 / ccf and $28.19 base fee/month; T&T = $.52; 1 customer pays commercial rate, 6 pay T&T rate, and 3 pay pre-set volume rate that changes based on CPI	$.31/100 cf; 73% of base rate of $.875 per 1,000 gallons; 72% of base rate; or same as base rate	$.76 per 100 cubic feet for water and $1.34 per 1,000 gals for metered sewer or $1.53 per 1,000 gals for unmetered sewer	First 200 cubic feet = $173.46 for 6"meter for monthly min. charge and then $.704 per 100 CF thereafter	$1.74 per ccf	$1.82 /ccf (water)	same as residential rates	NA	Average rate of $.42 per ccf between 3 customers	
5) Is the rate based on a cost of service study. If so, when was the study conducted?		Yes. Study was done about 2 - 3 years ago.		Yes, 2000	Yes, 1993		yes		Yes, annually.	
6) Do you have outside-City customers?	no	Yes.		Yes	No	Yes, but regional utility	yes	Yes	Yes	
Are your wholesale customers charged the same rate as the outside-city customers?	NA	Different rates are charged except for base rate.		NO	NA		Have contracts w/ these customers.	NA	No	

Note: Information for the Greenville Water System was only obtained for miscellaneous fees.

Development Fees

	Nashville	Memphis	Knoxville	Little Rock - water	Jacksonville	Charlotte	Birmingham	Dayton	Richmond	Western Carolina Regional Sewer Authority (Greenville)
1) Does your utility have any special contract rates with individual large-volume customers?	Yes, separate lower rate for larger customers	Yes, for water & no for sewer		No	No	No	only for raw water	Have a declining block rate structure in place	no	
Connection Charge / Tap Fee										
a) Does your utility charge a connection charge or tap fee for residential water/sewer service?	Yes for water and sewer	Water - yes and Sewer - yes		yes.	Yes, both a connection charge and tap fee	Yes	Yes	Yes	Yes	NO
b) What is the amount?	$250 current but proposed charge is $400	water = $230 to $280; sewer = $1,150 plus $250 for development fee		metered connection: 5/8" = $2000; 3/4" = $2,400; 1" = $2,800; 1 1/2" = $4,200; 2" = $4,800; 3" = $7,200; 4" = $8,000 and 6" =$12,000	Conn. = $73 and Tap Fee = $427	$995 water and $1640 sewer (both assume a 3/4" meter)	$310	Varies based on typr of street sidewalks, and sod restoration we have to do	$35 for residential water and $30 for Res. Sewer	
Does it vary by meter size or some other factor				meter size	Yes, varies by meter size	Varies by meter size.	varies by meter size		only non-residential varies by meter size	
c) Is this fee based on a COS study and if so when was it completed?	COS but internally by engineering	water - COS study ; sewer - 1992 COS Study		Yes 2000	Not sure since took over system from W&S depmt.	Not really . Based on average cost per year and #.	yes	Review billed amoutn vs. actual cost every few years and adjust standards accordingly	Yes	
Fees for Line Extensions										
a) How does your utility recover costs to extend facilties?	N/A	water - developer & residential; sewer - recovers costs in certain areas		Developer covers costs	Through developer contributions	Commercial and business developers have 50/50 share policy. Residential is bond funded up to 1,000 feet	RA and DC	New areas are part of the developers cost to install. Existing areas are charged an assessment if needed.	NA	Developer contributions
b) If your utility assesses new residential customers, how is this fee determined?	N/A	water - NA		capital investment charges per acre will vary between $50 - $400 based on prior acreage charge	NA		$21 per foot	Based on total project cost divided by the linear foot of piping stallded. Customer pays a cost per foot of frontage from property line.		
c) Is this fee based on a COS study and if so when was it completed?	N/A	water - COS study		Yes, annually.	NA	50/50 policy is based on tracking cost per foot for line extension	yes	No		
Development/Impact Fees										
a) Does your utility charge capital recovey or impact fees to new residential customers to finance trunk facilties?	sewer = $500 capacity charge? And $2,000 drainage basin fee. Also, $50 capacity analysis charge for sewer only	water - no; sewer - yes in some areas outside city limits		Yes	Yes, and call them Capacity Charges	Yes	no	No	NO	Yes
b) What is the amount?	N/A	$1,000 per lot (sewer)		charge system develoment charges to expand capacity: based on service units and range from $150 to $3.750 based on meter size	WATER: Min. charge = $40 or $.10 per gal SEWER: Min = $1,025.50 or $2.93 per gal	$235 water and $775 sewer	NA	NA		residential 5/8" = $2000, 1" = $4,000; 1 1/2 " = $12,000. commercial: 5/8" = $2000, 3/4" = $4,000, 1" = $6000, 1 1/2" = $12,000, 2" = $18,000, 3" = $40,000, 4" = $80,000, 6" $240,000, 8" = $320,000
c) Is this fee based on a COS study and if so when was it completed?	N/A	calculated on estimate of total costs and # of lots			No	No	NA	NA		Yes