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January 31, 2018

Mr. Rudolph Chow  
Director – Department of Public Works  
Abel Wolman Building  
200 North Holliday Street  
Baltimore, MD 21202

Mr. Henry Raymond  
Director of Finance  
City Hall  
100 North Holliday Street  
Baltimore, MD 21202

Dear Mr. Chow and Mr. Raymond:

Upon finalization of the financial statements for fiscal year (FY) 2016 and FY 2017, the City of Baltimore (City) determined that the Water Utility Enterprise Fund (Water Fund) failed to meet the Rate Requirements as prescribed in the 2002 Water Bond Resolution. In the event of a failure to meet the Rate Requirements, the City must employ a consulting firm to prepare a Consulting Engineer's report and recommendations with respect to rates and charges of the Water Utility and improvements or changes in the Water Utility.

The City engaged Raftelis Financial Consultants, Inc. (Raftelis) to perform this work. Raftelis is a nationally recognized financial services firm registered as a Municipal Advisor with the Municipal Securities Rulemaking Board and the Securities and Exchange Commission. As part of its scope of services, Raftelis reviewed historical operating results of the Water Fund including revenues, operating expenses and debt service, in order to project results over a planning horizon covering FY 2018 through FY 2022.

This report provides background on the Water Fund's historical performance, assumptions and analysis used to project performance over the planning horizon, and recommendations to return the Water Fund to a sound financial position. In our opinion, the accompanying financial projection is presented in conformity with industry guidelines and the underlying assumptions provide a reasonable basis for the forecast. It should be noted that there will be differences between the projections and actual events as circumstances frequently do not occur as expected. It should also be noted that Raftelis is under no obligation to update this report for events and circumstances occurring after the date of this report.

Raftelis Financial Consultants, Inc.

A blue ink signature of Jon Davis, consisting of a stylized, cursive script.

Jon Davis

Vice President

A blue ink signature of Joseph Crea, consisting of a stylized, cursive script.

Joseph Crea

Senior Manager

## Section 1: Background

In FY 2016 and FY 2017 the Baltimore City Water Utility Fund was not in compliance with subordinate and total debt coverage ratios as required in the Amended and Restated Water Project Bond Resolution (the “Bond Resolution” or the “Indenture”). Non-compliance was a result of lower than projected audited Net Revenues, which negatively impacted the debt service coverage as described below.

### 1.1 Fiscal Year 2016

Under Chapter 539 of the Laws of Maryland of 1924 (the “Metropolitan District Act”), Baltimore City (“the City”) is obligated to provide water to Baltimore County at cost. The City-County Water Agreement, among other things, established the methods by which Baltimore County’s share of the Water Utility’s costs of operation, maintenance and administration, major repairs and capital projects during construction, are determined.

Customers in Baltimore County are served through individual meters but are billed by the City at rates set by Baltimore County rather than on the basis of rates and charges established by the City. Following the end of each Fiscal Year, when the information as to the Water Utility’s actual costs for that period and Baltimore County’s share of usage is available, the City and Baltimore County officials reach agreement on costs to be paid by Baltimore County. If the revenues from billings to Baltimore County customers exceed the agreed costs, the City remits the excess to Baltimore County within 60 days. If there is a shortfall, Baltimore County must pay the difference to the City within 60 days. This true-up of cost sharing based on actual year-end financial data is known as the “Settlement Payment.”

In FY 2014 and FY 2015, the City was implementing an automated meter reading system that involved the replacement of every water meter in the City and Baltimore County service area. During this process, there were shifts in metered water consumption for the City and Baltimore County relative to historical results. These changes were the result of several factors, including: meters reading more accurately, identifying duplicate or unused meters, and minimizing customer adjustment requests. In addition to the abnormal consumption issues, Baltimore County had not increased their water rates to a level needed to support current expense projections. As key inputs to the Settlement Payment calculation, these shifts in consumption and lower-than-needed Baltimore County rates resulted in calculated Settlement Payments from Baltimore County to the City of \$4,830,225 and \$15,461,268 in FY 2014 and FY 2015, respectively. The City and Baltimore County are in negotiations on this issue. The Settlement Payments for FY 2016 of \$2,371,711 due to the City and the to-be-determined amount from FY 2017 will also be included in these negotiations. As of this date, Baltimore County has not remitted payment for any of the FY 2014 through FY 2016 Settlement Payments.

During the FY 2016 audit process the City increased the allowance for doubtful accounts by \$20 million to reserve for potential non-payment of the FY2014 and FY 2015 settlement of \$20,291,493. The charge reduced revenue in FY 2016 and resulted in the following coverage levels:

	<b>Indenture Requirement</b>	<b>Internal Target</b>	<b>FY 2016 CAFR Actual</b>
<b>Senior Debt Service Coverage</b>	1.15	1.40	1.36
<b>Subordinate Debt Service Coverage</b>	1.10	1.10	0.87
<b>Total Debt Service Coverage</b>	1.00	1.00	0.96

All FY 2016 bond and loan payments were made on time and in the full amount. However, FY 2016 coverage calculations, based on the City CAFR, show that the Water Fund failed to meet coverage

requirements for Subordinate Debt Service and Total Debt Service. In addition, the Water Fund failed to meet its internal target for Senior Debt Service coverage. Failure to meet these requirements is due to the independent auditor's recommendation to take a one-time charge of \$20 million against current revenue for the potential Baltimore County non-payment of FY 2014 and FY 2015 settlements.

## 1.2 Fiscal Year 2017

Prior to FY 2017, the City had an outdated utility billing and metering system. In order to effectively service customers, the City needed to improve, modernize and streamline its method of conducting business. As a result, the City invested in a state-of-the-art, Customer Information System (UMAX) and a new Advanced Metering Infrastructure System (AMI) that will provide the following benefits:

- Improved meter reading and billing accuracy
- Reduced number of estimated bills
- Enhanced customer service and operational efficiencies
- Improved information related to water loss, leaks and meter tampering
- Enhanced Information Technology platform that provides a system capable of adapting to modified business practices as needed,
- Implemented customer web portal that allows customers the opportunity to access their consumption information.

The UMAX system was activated in October 2016. Due to circumstances encountered during the implementation, FY 2017 revenues came in under the projected targets which impacted the FY 2017 debt service coverage. The reasons are as follows:

- Achieving a state of consistent billing in both timing and charges for all accounts has taken longer than planned. Through June 30, 2017, the number of accounts that were not billed since the conversion and were inconsistently billed totaled 1,006 and 4,108, respectively.
- There were unexpected challenges in the configuration of certain data and the migration of historical data from the old billing system for the City's 193,571 accounts.
- Anticipating that there would be an adjustment period for both staff and customers with the new billing system, penalties were waived beginning at the implementation date to allow for payment delays during the adjustment period. The impact was approximately \$2 million.
- The annual rate increase was delayed from July 2016 until October 2016. This delay allowed for a seamless rate implementation with the conversion; however, the result was a reduction in revenue of approximately \$2 million.
- Conversion of some remaining Baltimore City and Baltimore County meters was still in progress during FY 2017.

As of the date of this report, the number of accounts not billed has been reduced to 133 and the number of inconsistently billed accounts has been reduced to 2,275. The City has reorganized the Customer Support and Service Division (CSSD) to better address the billing issues identified above. CSSD created a specialized unit to address non-routine billing exceptions such as the "not billed" or "inconsistently billed" invoices. As of June 30, 2017, UMAX was actively billing 199,414 City water and sewer accounts. Other operational improvements include:

- Standardized methodology to resolve customer disputes and claims by establishing consistent credits for leak adjustments and customer disputes
- Retraining of all customer support staff on the UMAX system, internal policies and Standard Operating Procedures

- Penalties for delinquent bills are due to be reinstated in February 2018.

Due, in large part, to the issues discussed above, Water Fund revenue for FY 2017 was below what is needed to meet the required debt coverage ratios. The FY 2017 audited results are shown below:

	<b>Indenture Requirement</b>	<b>Internal Target</b>	<b>FY 2017 CAFR Actual</b>
<b>Senior Debt Service Coverage</b>	1.15	1.40	1.35
<b>Subordinate Debt Service Coverage</b>	1.10	1.10	0.71
<b>Total Debt Service Coverage</b>	1.00	1.00	0.90

All FY 2017 bond and loan payments were made on time and in the full amount. However, FY 2017 coverage calculations based on the audited financial data show that the Water Fund failed to meet required Indenture coverage targets for Subordinate Debt Service and Total Debt Service. While not an Indenture requirement, the City will also not meet its internal coverage target for Senior Debt.

### 1.3 Changes to Water Rates and Rate Structure

The implementation of the UMAX system presented the City with an opportunity to make enhancements to its water rate structure that would eliminate minimum charges and provide transparency to customer bills. Prior to the UMAX system, the City billed quarterly for water service and the rate structure provided an allowance of 1,000 cubic feet of water (10 hundred cubic feet, or Ccf, approximately 7,480 gallons) for a customer with a 5/8" meter. Additional water used in excess of the minimum allowance was billed per unit (Ccf) according to a declining block structure that lowered the unit rate for large users.

Upon implementation of the UMAX and AMI systems, the City switched to monthly billing which results in smaller, and more regular utility bills to customers. A new water rate structure was also implemented that includes three, easy-to-understand components:

1. A fixed Account Management fee that is the same for every bill created,
2. A fixed Infrastructure Charge that varies by meter size, and
3. A uniform variable rate that is the same for all customers regardless of meter size, customer class, or usage volumes. This is assessed to every unit of consumption per billing period.

The City implemented the rate structure and rates in accordance with the recommendations provided by Staff and consulting engineers. The new rates and rate structure were developed to be revenue neutral to the previously existing rate structure with the goal of providing a seamless transition for the City. The new water rates were implemented in October 2016 and subsequently increased on July 1, 2017 according to an approved rate increase schedule. However, the unanticipated challenges described in Section 1.2 resulted in customer billings and revenues that did not meet projections. The rates currently in place are further scheduled to increase according to an approved 9.9% across-the-board rate increase on July 1, 2018. The water rates that are currently approved by the City Board of Estimates are presented in the following table:

Monthly Water Rates and Charges

<b>Fixed Charge Components</b>			
	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2019</b>
	<i>Effective: 11-Oct-16</i>	<i>1-Jul-17</i>	<i>1-Jul-18</i>
<b>Account Management Fee</b> <i>(per bill)</i>	\$ 1.63	\$ 1.79	\$ 1.96
<b>Infrastructure Charge</b>			
<u>Meter Size</u>			
5/8"	\$ 8.15	\$ 8.96	\$ 9.84
3/4"	\$ 14.67	\$ 16.12	\$ 17.72
1"	\$ 32.60	\$ 35.83	\$ 39.37
1-1/2"	\$ 57.05	\$ 62.70	\$ 68.91
2"	\$ 130.40	\$ 143.31	\$ 157.50
3"	\$ 228.20	\$ 250.79	\$ 275.62
4"	\$ 521.60	\$ 573.24	\$ 629.99
6"	\$ 937.25	\$ 1,030.04	\$ 1,132.01
8"	\$ 1,467.00	\$ 1,612.23	\$ 1,771.84
10"	\$ 2,078.25	\$ 2,284.00	\$ 2,510.11
12"	\$ 3,708.25	\$ 4,075.37	\$ 4,478.83
<b>Variable Rate Component</b>			
<b>Volumetric Rate</b> <i>(all units, per Ccf)</i>	\$ 2.26	\$ 2.48	\$ 2.73

## Section 2: Updated Financial Forecast

The City maintains a financial planning model for the Water Fund that forecasts the overall financial performance of the utility based on anticipated revenue, operating cost needs, capital investments, debt repayment, and compliance with financial policies. This model is updated annually to reflect the most recent information available and provide information to support the management of the Water Fund. The financial planning model was reviewed, verified, and updated throughout the development of this Consulting Engineer's Report.

### 2.1 Operating Expenses

A primary driver of the Water Fund's financial plan is the cost associated with operating the water systems to provide safe and reliable service to its customers. Historical operating costs have increased approximately 3.9% per year between FY 2013 and FY 2017 (excluding depreciation and debt service costs). Annual operating costs are summarized in the table below:

\$ Millions	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017
Salaries and Wages	\$ 37.1	\$ 39.5	\$ 38.2	\$ 36.9	\$ 35.3
Other Personnel Costs	\$ 16.3	\$ 17.2	\$ 17.7	\$ 19.0	\$ 19.5
Contractual Services	\$ 37.6	\$ 46.6	\$ 43.3	\$ 43.7	\$ 53.0
Materials and Supplies	\$ 9.0	\$ 10.1	\$ 12.0	\$ 12.3	\$ 8.6
Minor Equipment	\$ 0.8	\$ 0.7	\$ 0.7	\$ 0.8	\$ 1.1
<b>Total Operating Expenses</b>	<b>\$ 100.8</b>	<b>\$ 113.9</b>	<b>\$ 111.9</b>	<b>\$ 112.8</b>	<b>\$ 117.5</b>

The adopted FY 2018 operating cost budget is \$124.6 million. In response to the revenue shortfalls in FY 2016 and FY 2017, the City is making reductions in operating expenses that are projected to reduce the FY 2018 actual operating costs by about 9%, or \$11.2 million. This targets a total operating expense of approximately \$113.4 million which is consistent with FY 2014 through FY 2016 average operating expense spending.

The operating cost reductions are comprised of several major items:

1. Not filling vacant positions and eliminating vacancies that are no longer needed,
2. Lowering contract service spending carried over from the UMAX implementation, and
3. Reducing overtime related to efficiencies realized through implementation of advanced metering.

As of December 31, 2017, the operating costs for FY 2018, excluding debt service and encumbrances are approximately \$42.4 million and are on pace to meet the \$113.4 million target. The reduced operating costs in FY 2018 have been used as the basis for the financial plan and subsequent year's operating costs. Future operating costs are projected in the financial plan to increase by a blended rate of approximately 3.4% per year.

### 2.2 Capital Expenditures

The other major cost driver for the financial plan is the requirement for outstanding system indebtedness and continued system reinvestment. The existing debt is a mixture of revenue bonds and state revolving fund (SRF) loans. In addition to existing debt service requirements, the City's infrastructure requires continual investments to replace aging assets and improve service reliability and delivery. The most recent capital improvements plan (CIP) forecasts total water utility needs of \$700 million to be performed by FY 2024. Major projects that are part of this investment include: large water main rehabilitation and upgrades at the water treatment plants.

These investments have been sequenced to defer the some costs until FY 2020 or later to provide time for the Water Fund’s revenue to stabilize and ensure all financial metrics are met. The revised CIP prioritizes efficient system operation and regulatory-driven projects and ensures that all permits continue to be in full compliance.

- The current sequence and level of the CIP provides the City with approximately \$235 million in capital project spending reductions during the forecast period from FY 2018 through FY2022.
- These capital deferrals reduce the amount of future borrowing needs which lowers annual debt service requirements. The current forecast has total debt service in FY 2019 that is \$6.9 million less than the amount previously forecasted; in FY 2020, the total annual debt service is \$11.7 million less.
- Despite these savings, the City will be completing all projects that prioritize the efficient operation of the system and regulatory requirements.

The Water Fund plans to fund these capital projects with a mixture of additional long-term debt and rate-funded capital (pay-as-you-go capital, or “Pay-Go”). Some of the debt-funded projects in FY 2018 will be funded with existing proceeds from the City’s Series 2017 revenue bond issue. Estimated capital expenditures for FY 2018 are reasonable and consistent with expenditures FY 2017 totaling \$103.8 million. Total projected capital spending by year is shown below along with the proposed mix of funding sources.

<i>\$ Millions</i>	<b>FY 2018</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>
<b>Capital Spending</b>	<b>\$ 86.5</b>	<b>\$ 94.4</b>	<b>\$ 118.2</b>	<b>\$121.5</b>	<b>\$ 133.2</b>
Pay-Go	\$ 5.0	\$ 5.0	\$ 10.0	\$ 15.0	\$ 15.0
Debt-Funded	\$ 81.5	\$ 89.4	\$ 108.2	\$ 106.5	\$ 118.4

Debt-funded projects will be funded with a mixture of bond proceeds on hand, SRF loan proceeds, and future bond issue proceeds. Future bond issues are forecast with 30-year terms, 4.5% interest rate, an interest-only payment in the first year, and senior lien indenture. The City will continue to work with its financial advisor to determine the optimal structure of all future borrowings.

### 2.3 Revenue

Water Fund revenue is divided into four major categories, each described in further detail below and their historical levels from FY 2013 through FY 17 shown in the table below:

- Baltimore City revenue is generated by rates and charges to City retail customers and other City agencies;
- Baltimore County revenue is a product of cost sharing in the operations of the Water System;
- Other jurisdiction revenue is generated from rates and charges to Anne Arundel, Carroll, Harford, and Howard Counties; and
- Other miscellaneous revenue

<i>\$ 1,000’s</i>	<b>FY 2013</b>	<b>FY 2014</b>	<b>FY 2015</b>	<b>FY 2016</b>	<b>FY 2017</b>
City Retail	\$ 78,883	\$ 83,823	\$ 87,132	\$ 96,735	\$ 89,886
Baltimore Co.	49,011	53,260	57,453	33,865	59,242
Ann Arundel Co.	1,308	1,190	1,135	2,692	-1,803
Carroll Co.	482	552	577	670	677
Harford Co.	275	186	265	182	156
Howard Co.	13,871	14,965	16,094	18,289	16,554
<b>Total Water Sales</b>	<b>\$ 138,056</b>	<b>\$ 148,525</b>	<b>\$ 155,119</b>	<b>\$ 135,193</b>	<b>\$ 161,568</b>



**2.3.1 Baltimore City**

City revenues are generated through assessment of water rates and charges to residential, non-residential, and City agencies in accordance with the approved rates shown in Section 1.3. Revenue in FY 2017 did not meet expectations due to the implementation issues described in Section 1.2. The City has been able to work through the majority of the start-up issues experienced with UMAX and customer billing continues to return to normal conditions.

Revenue from City retail sales is presented in the table below. This table shows the actual revenue for FY 2016 and FY 2017, year-to-date for FY 2018 (through December 2017), and projected year-end FY 2018.

\$ 1,000's	FY 2016	FY 2017	FY 2018 YTD	FY 2018 Est.
City Retail Sales	\$ 96,735	\$ 89,886	\$ 51,392	\$ 100,500

Monthly revenue reported in the City’s general ledger indicate that retail revenue shows signs of stabilizing since the implementation of UMAX. This monthly revenue is the basis for the \$95.0 million forecast in FY 2018. Continued improvements in billing practices may improve performance, but this has not been assumed in these revenue forecasts. The City is also investigating issues identified with linkages between UMAX and the City accounting systems to ensure that billed revenue is being recognized in financial statements.

Based on the corrective actions the City has implemented to address many of the FY 2017 billing system issues, the financial plan forecasts a return to normal billing operations in FY 2019 and through FY 2022. The FY 2019 revenue projection includes allowances for the approved 9.9% across-the-board rate increase along with an underlying reduction in water sales of 1%. The reduction in water sales is consistent with per capita water consumption trends seen throughout the service area, and water industry at large. Future revenues projections over the remainder of the forecast period include continued rate increases of 9.9% per year that have, as yet, not been considered by the Board of Estimates.

\$ 1,000's	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
City Retail Sales	\$ 100,500	\$ 109,054	\$ 118,336	\$ 128,750	\$ 140,082

**2.3.2 Baltimore County**

Under the City-County Water Agreement, Baltimore County is responsible for a portion of the annual operating and capital costs as outlined in the Water Agreement and Cost Allocation Model that was the result of arbitration between the two jurisdictions in 1992. Baltimore County typically funds its portion of capital investment upfront and the majority of costs assigned to the County relate to the annual operation and maintenance of the water system. Annual operating costs are split between the City and Baltimore County (as well as other jurisdictions to whom the City provides wholesale water service) commensurate with each jurisdiction’s use of facilities and assets. The City anticipates that with resolution of the UMAX and AMI installation issues, the cost allocation results (Settlement Payments) should proceed consistently with historical levels and mitigate future disruptions on Baltimore County payments.

As indicated in Section 1.1, the City and County are working to resolve the Settlement Payments for FY 2014 and FY 2015 which led to the recommendation from the independent auditor to make the \$20 million adjustment to FY 2016 revenues. Based on the cost sharing agreement, the estimated revenue (cost share) from Baltimore County since FY 2016 is presented in the following table.



\$ 1,000's	FY 2016	FY 2017	FY 2018 YTD	FY 2018 Est.
Baltimore Co. Revenue	\$ 53,865	\$ 59,242	\$ 30,648	\$ 59,534
Adjustments	-\$ 20,000	\$ 0	\$ 0	\$ 0
<b>Total Water Sales</b>	<b>\$ 33,865</b>	<b>\$ 59,242</b>	<b>\$ 30,648</b>	<b>\$ 59,534</b>

With the resolution of the AMI and UMAX implementation issues, the City anticipates a return to normal operations related to County revenue and cost sharing agreements. Additionally, Baltimore County has increased their water rates to generate higher revenue and minimize future Settlement Payments. The forecast revenue for FY 2018 through FY 2022 is presented in the following table and is consistent with this expectation. Recovery of the \$20 million in past due balance is not factored in these projections.

\$ 1,000's	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
Baltimore Co. Cost Share	\$ 59,534	\$ 60,424	\$ 61,826	\$ 63,391	\$ 64,741

### 2.3.3 Other Jurisdictions

The City provides water service to other surrounding jurisdictions: Anne Arundel County, Carroll County, Harford County, and Howard County. The rates and charges used to assess these jurisdictions are also based on water service agreements. However, the other jurisdiction rates increase at the same rate as the City's retail customers. Revenues from these jurisdictions have experienced much less fluctuation from the AMI and UMAX implementation than the retail and Baltimore County revenue. Revenue since 2016 is presented below.

\$ 1,000's	FY 2016	FY 2017	FY 2018 YTD	FY 2018 Est.
Anne Arundel Co.	\$ 2,692	\$ (1,803)	\$ 0	\$ 0
Carroll Co.	\$ 670	\$ 676	\$ 0	\$ 507
Harford Co.	\$ 182	\$ 156	\$ 242	\$ 194
Howard Co.	\$ 18,239	\$ 16,554	\$ 14,258	\$ 18,193
<b>Total Water Sales</b>	<b>\$ 21,833</b>	<b>\$ 15,583</b>	<b>\$ 14,500</b>	<b>\$ 18,895</b>

Anne Arundel received an incorrect bill at the end of FY 2016 which accounted for their revenue of \$2.7 million (historical average is around \$1.2 million). This was reversed during FY 2017 which caused the negative value shown. Anne Arundel is shifting to an emergency connection-only with the City beginning in FY 2018 and the City's forecast does not assume future water sales to them. The estimated revenue from these other jurisdictions for FY 2018 through FY 2022 is presented below.

\$ 1,000's	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
Anne Arundel Co.	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0
Carroll Co.	\$ 507	\$ 558	\$ 613	\$ 674	\$ 741
Harford Co.	\$ 194	\$ 194	\$ 194	\$ 194	\$ 194
Howard Co.	\$ 18,193	\$ 19,994	\$ 21,974	\$ 24,149	\$ 26,540
<b>Total Water Sales</b>	<b>\$ 18,895</b>	<b>\$ 20,747</b>	<b>\$ 22,781</b>	<b>\$ 25,018</b>	<b>\$ 27,475</b>

### 2.3.4 Other Revenue

In addition to revenue from user rates and charges, the City received a portion of its annual revenue from miscellaneous charges and fees for service. These include penalties for late payment, returned check fees, sale of scrap, private fire protection service, fire hydrant rentals, and other similar items. This revenue has

historically accounted for a small percentage of total annual revenues, approximately 8% of Water Fund total revenue.

The largest contributor to this group is penalty revenue from customers that do not make on-time payments. Between FY 2012 and FY 2016, the annual average revenue from penalties was approximately \$5.5 million. As described in Section 1.2, penalties were temporarily turned off when UMAX was implemented and this contributed to the FY 2017 revenue shortfall. Penalties in UMAX are scheduled to be reactivated in February 2018 and this should continue to be a revenue source going forward.

## 2.4 Projected Operating Results

Corrective actions implemented in FY 2017 are continuing. However, some improvements in the Water Fund financial results can already be identified. The City has been able to work through the majority of start-up issues inherent in the implementation and integration of its new billing software. As a result, the City should begin to take advantage of these technological advances to bill customers more frequently and more accurately. After consideration of the corrective actions in progress and a review of current year results, Raftelis expects FY 2018 revenues to rebound to more sustainable levels and return the Water Fund to compliance with debt coverage levels as required under the Indenture.

Raftelis has conducted a critical review of the status of corrective actions as well as year-to-date revenue results through December 2017 and projected Water Fund operating results for the five-year forecast period, FY 2018 through FY 2022. Based on these projections, the Water Fund should achieve both minimum debt coverage ratios required by the bond Indenture and higher internal targets.

Effective in FY 2018, the City is no longer able to submit a property with past-due water bills to the tax sale program if this is the only delinquent charge. This has historically been a primary mechanism for DPW to ensure high collection rates for customer charges. In response to this change, the DPW has developed and implemented a water shut-off policy for past due accounts that will be used to incentivize on-time payment of customer bills. This policy is consistent to policies used by other utilities in the region and throughout the industry and should not have a material impact for projected operating results. A summary of projected operating results is shown in the table below:

**City of Baltimore Department of Public Works**  
*Water Enterprise Fund*

Summary of Projected Operating Results  
(\$000's)

	<i>Fiscal Year Ending June 30</i>					
	2017 (1)	2018 (2)	2019 (2)	2020 (2)	2021 (2)	2022 (2)
<b>Revenues:</b>						
Baltimore City (3)	\$ 89,886	\$ 100,500	\$ 109,054	\$ 118,336	\$ 128,750	\$ 140,082
Baltimore County (4)	59,242	59,534	60,424	61,826	63,391	64,742
Revenue from Other Counties (5)	15,584	18,895	20,747	22,781	25,018	27,475
Transfer (to) from Rate Stabilization Fund	-	-	-	-	-	-
Other Revenue	(1,150)	1,275	3,279	4,883	4,584	4,256
Interest Revenue	-	-	-	-	-	-
Allowance for Bad Debt	-	-	(2,420)	(2,660)	(2,920)	(3,530)
<b>Total Revenue</b>	<b>\$ 163,563</b>	<b>\$ 180,204</b>	<b>\$ 191,083</b>	<b>\$ 205,166</b>	<b>\$ 218,823</b>	<b>\$ 233,024</b>
<b>Operating Expenses:</b>						
Operating and Maintenance Expenses (6)	\$ (117,547)	\$ (113,408)	\$ (117,466)	\$ (121,007)	\$ (123,987)	\$ (127,734)
Less: Additional Expenses (7)	-	(418)	(418)	(418)	(418)	(418)
<b>Net Revenues Available for Debt Service</b>	<b>\$ 46,016</b>	<b>\$ 66,378</b>	<b>\$ 73,199</b>	<b>\$ 83,741</b>	<b>\$ 94,418</b>	<b>\$ 104,872</b>
<b>Debt Service:</b>						
Senior Lien Revenue Obligations	\$ 34,054	\$ 35,139	\$ 35,149	\$ 37,831	\$ 42,839	\$ 49,626
Subordinate Lien Revenue Obligations	16,871	25,343	26,446	28,847	31,365	31,301
<b>Total Debt Service</b>	<b>\$ 50,925</b>	<b>\$ 60,482</b>	<b>\$ 61,595</b>	<b>\$ 66,677</b>	<b>\$ 74,204</b>	<b>\$ 80,927</b>
Revenue Available After Debt Service	\$ (4,909)	\$ 5,896	\$ 11,604	\$ 17,063	\$ 20,214	\$ 23,945
<b>Projected Debt Service Coverage:</b>						
Senior Lien Debt Service Coverage (>1.15x)	1.35	1.89	2.08	2.21	2.20	2.11
Senior & Subordinate Lien DS Coverage (>1.10x)	0.71	1.23	1.44	1.59	1.64	1.76
Total DS Coverage (>1.0x)	0.90	1.10	1.19	1.26	1.27	1.30

## Notes:

- (1) Audited
- (2) Projected
- (3) Projection is based on approved rate increases effective July 1, 2016, July 1, 2017, and July 1, 2018.
- (4) Projection is based on the anticipated cost to provide service under the existing City-County Water Agreement.
- (5) For Howard, Anne Arundel, and Carroll Counties, projection is based on historical usage and anticipated rate increases.
- (6) Projection is based on a reduction in the adopted operating budget of approx. \$12.4 million in 2018 and approx. \$12.8 million in 2019.
- (7) Reflect other operating costs not included in the adopted budget, primarily related to debt and treasury management.

## Section 3: Recommendations

Through the course of this assessment, Raftelis has identified several recommendations that should help assure bondholders that the City Water Fund will return to full compliance with all indenture requirements and internal coverage targets.

### 3.1 Retail Rates and Charges

The primary objective of this Study was to determine if rates and charges, set by the City, should be increased to ensure compliance with the bond indenture. As discussed in Section 1.3, water rate increases of approximately 9.9% have been adopted by the City Board of Estimates to be effective July 1, 2018 for FY 2019. The increase impacts all City water rates and charges as well as rates for other jurisdictions except Baltimore County, who shares system costs with the City. As demonstrated in the Summary of Projected Operating Results in the previous section, the Water Fund should meet its bond indenture requirements without additional rate adjustment in FY 2019.

Financial projections over the remainder of the forecast period do include continued rate increases of 9.9% per year that have, as yet, not been considered by the Board of Estimates. In FY 2019, the City will reevaluate the financial condition of the Water Fund in light of capital and operating cost pressures, resulting from infrastructure reinvestment, regulatory compliance, and inflationary cost increases. Based on that analysis, the City will develop recommended water rate adjustments beginning in FY 2020 and these will be presented in accordance with City policy. **We recommend that the City maintain adopted rates for the remainder of FY 2018 and FY 2019, then evaluate rate increases going forward.**

### 3.2 Review and Documentation of Adjustment Policies

Historically, adjustments to Water Fund revenue have been significant. These adjustments reduce revenue in the accounting period in which they are made. Adjustments may be related to water meter misreads, trueing up estimated usage on an account, or documented leaks on the customer's side of the meter. The implementation of Automated Metering Infrastructure (AMI) and the UMAX Customer Information System affords the City much more oversight of how and when adjustments are made to customer accounts. **We recommend that the City review and update its adjustment policies based on the information and controls provided by AMI and UMAX.** The goals of this review should be: 1) to maximize technology to provide accurate and timely billing to reduce adjustments; and 2) to identify necessary adjustments earlier, thus keeping them from distorting results in subsequent accounting periods.

### 3.3 Review and Documentation of Billing Exceptions Management

Metered water usage data flows from the AMI system into the UMAX system to create monthly customer bills. Both systems have requirements and tolerances that must be satisfied before the bill can be sent to the customer. Billing exceptions are created when information does not flow properly from AMI to UMAX, when the customer account is set up incorrectly in UMAX, or when metered use falls outside of acceptable tolerances, prompting a re-read. At best, these exceptions create a delay in billing until manual intervention is taken to remediate the underlying issue. If remediation does not occur prior to the next month's billing, a second exception may be generated. The City has been working diligently to identify exception types and develop remediation procedures. **We recommend that these processes be documented and Customer Care staff trained on exception management in order to minimize new exceptions generated and reduce backlog.**

### 3.4 Reinstate Penalties

Penalties and interest begin to accrue when customer payments are not remitted on a timely basis. In preparation for the UMAX startup in October 2016, the City temporarily discontinued the imposition of

account penalties and interest. In FY 2016, penalties accounted for approximately \$5.5 million of revenue for the Water Fund. In addition, accrual of penalties incentivizes customers to make full and timely payment on their accounts. **Once UMAX startup issues are resolved, we recommend that penalties be reinstated on a prospective basis.**

### 3.5 Bolster Internal Reporting Capabilities

Reliability of internal reporting was a major concern that led the City to implement automated metering and UMAX. Consistent and reliable reporting is imperative to the efficient management of utility systems. Timeliness and accuracy of customer billing, consistent application of adjustment policies, and revenue realization are all core requirements a utility must be able to confirm with comprehensive internal reporting. The implementation of new systems does not always allow the time and resources needed to replicate and enhance internal reporting capabilities. Reporting challenges have been further complicated by the fact that Baltimore County customers are still being billed through the legacy billing system. **We recommend that the City undertake a thorough review of its reporting requirements, then establish and document reporting procedures to fulfill those requirements.**

### 3.6 Improve Rate Stabilization Fund Levels

The Rate Stabilization Fund (RSF) is part of the Water Utility Fund. It is defined in the 2002 Water Bond Resolution. In effect, the RSF is used to defer revenue in one year for use in a subsequent year to fund operating expenses or debt service payments. As such, transfers from the RSF boost revenue, and therefore debt service coverage, in the fiscal year in which they occur. At present, there are no policies or practices regarding the minimum or maximum fund balance levels to be retained in the RSF. **We recommend that the City develop targets for RSF balances and work to build balances to those levels as soon as is practical. In addition, we recommend that the City review accounting procedures for the RSF in order for transfers to be completed, as needed, prior to close of the fiscal year, to minimize the occurrence of insufficient coverage.**

### 3.7 Improve Timeliness and Review Procedures for Pre-Final CAFR

Due to issues outside of the Water and Wastewater Enterprise Funds, City audited financial statements were delayed for FY 2014, FY 2015, and FY 2016. Failure to produce final, or even accurate pre-final, audited statements, make it difficult for the Water Fund to assess its financial position and make realistic projections of performance. The FY 2017 CAFR was completed on time by December 31, 2017. **We recommend that the City make every effort to complete its CAFR in a timely manner. In the instance non-enterprise fund issues are delaying the overall City CAFR, we recommend that the Enterprise Funds are provided with accurate, pre-final financial statements that include all closing entries. Finally, we recommend that pre-final financial statements be circulated and reviewed by City Finance and DPW to ensure agreement on all accounting decisions and to trigger needed RSF transfers.**