Report Regarding Fire Service Charges

March 10, 2021

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Consulting Group LLC

1. Executive Summary

1.1 Background and Purpose

Since April 1, 2000, the District of Columbia Water and Sewer Authority ("DC Water" or the "Authority") has assessed a fire protection fee to the District of Columbia (the "District") based on Title 21 DCMR, Chapter 21, Section 4103 Fire Protection Service Fee. The fire protection fee is intended to recover certain costs incurred by the Authority including, but not limited to, the ability to deliver water for firefighting as well as upgrading and maintaining fire hydrants.

The fee was initially set at $217 per fire hydrant per year in 2000. A Memorandum of Understanding was executed on October 25, 2007 (the "2007 MOU") by DC Water and the District of Columbia Fire and EMS Department (FEMS). Among the purposes of the 2007 MOU were the definition of the parameters for a series of operating and capital improvements for fire protection service and the achievement of nozzle uniformity in the fire hydrants. Significant investments were made in the Water System by DC Water pursuant to the 2007 MOU.

The most recent Memorandum of Understanding was executed on May 3, 2013 by DC Water and the FEMS (the "2013 MOU") which supersedes and replaces the 2007 MOU. Among the purposes of the 2013 MOU is to memorialize the commitments of the parties with regard to the Fire Hydrant Risk Assessment, Repair, and Replacement Program.

Previous studies of the cost of fire protection services and the resulting fee to the District were prepared in calendar years 2006, 2009, 2011, 2015, and 2018. The current fire protection fee is $12,527,000 per year for fiscal years 2019 through 2021. The purpose of this cost of service study and resulting Fire Service Charges Report (the "Report") is to assess the appropriate level of cost recovery required from the District government for fire protection service and to recommend an appropriate fee for the 2022 through 2024 fiscal years.

1.2 Methodology

The approach that was taken in computing the cost of service involves a two-step process: 1) identifying and summarizing those costs that are directly assignable to the fire protection service provided to the District (e.g., the cost of replacing a hydrant), and 2) identifying those costs that should be allocated, in part, to fire protection service. The second step consists of allocating certain costs between general water service and fire protection service using a methodology that is known as base-extra capacity; i.e., a division of costs between what is required for the provision of service on an average day and the extra capacity needed to meet maximum, or peak day demand. The base-extra capacity method is an accepted cost of service approach in the water industry. Fire protection is provided to: a) the general public through public fire hydrants and the infrastructure needed to supply water of sufficient quantity and pressure to the hydrants, and b) to individual customers that receive additional fire protection through privately-owned hydrants, standpipes or sprinkler connections. Based on the estimated units of service in each category, the total fire protection costs of DC Water are assigned to the District and to private fire customers.

Except where noted, all references to years in the Report refer to the fiscal years of the Authority which begin on October 1st and end on September 30th. Actual direct costs were provided by DC Water for this Report for 2016 through 2020. Since the 2020 fiscal year ended just prior to the publication of this Report, the figures presented for 2020 are considered preliminary projections. Projections of direct costs for the current year (2021) and future years (2022 through 2024) were also provided by DC Water.

1.3 Findings

A summary of the key findings of the study is presented below.

1. In 2006 and 2007, DC Water's total annual investments in fire protection assets and services (operating and capital spending, prior to the amortization of certain capital costs) were $1.5 million and $6.4 million, respectively. The annual investments were much greater after execution of the 2007 MOU, reaching a peak of $17.0 million in total annual costs in 2008, followed by $15.7 million in investments in 2009. Following those two years with the highest level of investment (2008 and 2009), the actual average annual total spending for fire protection service for the eleven-year period of 2010 through 2020 was $7.9 million. The projected average fire protection spending for the four-year period of 2021 through 2024 is $10.4 million per year.

2. The total spending represents both direct costs and allocated costs; the allocated public fire costs are relatively small - representing about 7.8% of the long-term total direct and allocated public fire costs from 2016 through 2024. The illustration of historical (2016-20) and projected (2021-24) fire protection costs, including both direct and allocated costs, is presented in Table 1. Additional information concerning these costs, including the methodology and the assumptions used, is presented in the Report.

3. In 2019 and 2020, the District paid in full the fire protection service bill of DC Water of $12,527,000. The payment of $12,527,000 is expected again in 2021.

4. In aggregate, District payments for fire protection service during the period of 2006 through 2021 were less than DC Water's aggregate costs for fire protection services; the Authority's costs reflected both operating expenses as well as capital investments. Prior Reports highlighted the shortfall in payments and alternative methods by which the District could become current in paying the cost of service. DC Water elected to utilize the amortization of certain capital costs in lieu of requesting cash reimbursement for all costs; this approach enables the District to pay for certain capital costs over the long-term, as DC Water does. This Report calculates the total costs incurred by DC Water and compares it to the payments received to date from the District, both with and without the amortization of certain capital costs. For purposes of calculating an annual fire protection fee, we amortize certain capital costs. The selection of a specific billing option represents a policy decision for DC Water.

5. The calculated annual fire protection fee, assuming amortization of certain capital costs as referenced above, is $11,535,000 each year for 2022 through 2024, including the

effects of the reconciliation of historical costs and District payments using this methodology.

1.4 Cost Recovery Options

The figures presented in Table 1 on the following page reflect the cost of fire protection service be recovered on a current basis with no capitalization of costs. Section 4 of the Report illustrates the proposed Base Case whereby bond proceeds would be used to pay for certain capital costs, with the remaining capital costs being paid for on a pay-as-you-go basis.

Table 1 - Direct and Allocated Fire Costs: Without Capitalization of Certain Costs
(All amounts in $)

	Cost Category	2016	2017	2018	2019	2020	2021	2022	2023	2024
				Historical				Projected		
	Direct Fire Costs									
1	Full time assigned personnel costs	928,964	1,014,998	1,034,526	1,289,095	1,206,274	1,242,463	1,279,736	1,318,129	1,357,672
2	Hydrant Parts	67,608	67,154	85,926	52,551	41,571	54,127	55,751	57,423	59,146
3	Material & Equipment (Fire Hydrant Program)	160,256	511,096	660,368	500,460	416,168	515,474	530,938	546,866	563,272
4	Hydrant Installation and Restoration	200,886	956,607	914,512	768,017	1,098,077	1,131,020	1,164,950	1,199,899	1,235,896
5	Personnel loaned from other departments (documented via WO)	1,054,792	1,847,677	1,640,246	1,847,942	2,042,592	2,103,870	2,166,986	2,231,996	2,298,956
6	DDOT Open Space Permits	435,591	377,858	496,714	371,249	329,148	339,023	349,193	359,669	370,459
7	Paid to Fire Department for Inspection Services (NTE)	0	0	0	0	0	0	0	0	0
8	Fire Protection Cost of Service Study			42,727			42,946			42,946
9	Burden applied to DC Water personnel costs	1,059,019	1,157,098	1,282,813	1,598,478	1,495,780	1,279,736	1,318,129	1,357,672	1,398,403
10	Burden applies to Personnel loaned (Hourly Rate, Salary Rate & OH)	1,202,463	2,106,352	2,033,905	2,291,448	2,532,815	2,166,986	2,231,996	2,298,956	2,367,924
11	Burden applied to Parts	32,452	32,234	53,274	32,581	25,774	25,981	26,760	27,563	28,390
12	Burden applied to Material & Equipment	76,923	245,326	409,428	310,285	258,024	247,427	254,850	262,496	270,371
13	Subtotal Direct Costs	5,218,955	8,316,402	8,654,439	9,062,108	9,446,224	9,149,053	9,379,291	9,660,669	9,993,436
	Allocated Fire Costs									
14	Fire Share of Water Base Costs @ 0.5%	530,766	513,113	550,519	574,719	638,030	771,519	794,664	818,504	843,059
15	Fire Share of Peak Costs @ 1.64% for 2016, decreasing to 1.58% by 2019	282,220	247,738	276,977	272,756	292,908	347,636	358,066	368,808	379,872
16	Subtotal	812,986	760,850	827,495	847,475	930,938	1,119,155	1,152,730	1,187,312	1,222,931
17	Allocated Public Fire Costs	612,362	573,596	629,493	643,459	700,197	841,763	867,016	893,026	919,817
18	**Total Direct and Allocated Public Fire Costs**	**5,831,317**	**8,889,998**	**9,283,931**	**9,705,567**	**10,146,422**	**9,990,817**	**10,246,307**	**10,553,696**	**10,913,253**
19	**District Payment**	**10,796,000**	**10,796,000**	**10,796,000**	**12,527,000**	**12,527,000**	**12,527,000**			
20	**Annual Difference**	**4,964,683**	**1,906,002**	**1,512,069**	**2,821,433**	**2,380,578**	**2,536,183**			
21	**2006-21 Cumulative Difference (Payments vs. Costs)**	**-27,386,887**	**-25,480,885**	**-23,968,816**	**-21,147,383**	**-18,766,805**	**-16,230,622**			
22	**Recovery of 2006-21 Difference + Current (2022-24)**							**16,466,000**	**16,466,000**	**16,466,000**

Notes

(A.) Direct fire protection costs are provided by DC Water for FY 2016 - FY 2024.

(B.) Allocated fire costs are anticipated to grow in proportion to the forecasted budgetwhich assumed 3.0% annual rate of increase in expenses for FY 2022 - FY 2024.

(C.) Public fire allocation percentages are provided in section 5.3 of the Appendix. It is assumed that the FY 2021 - FY 2024 public fire hydrant percentage stays the same as FY 2020.

(D.) Projected 2021 - 2024 total direct and allocated public fire costs are shown as an annual expense without consideration of using bond proceeds for capital costs.

(E.) Total public fire cost for FY 2017 reflect actual FY 2017 operating expenses which are slightly lower than the preliminary figures used in the prior report.

1.5 Impacts of COVID-19

The fire protection work performed and actual costs incurred during 2020 reflect DC Water's experience during approximately six months of the COVID-19 outbreak. DC Water has advised that due to COVID-19: a) there has been some impact to date on fire hydrant replacement and maintenance, and b) the actual and anticipated effects on performance and operating and capital spending remain uncertain through the pandemic. The projections presented in this Report do not assume potential operating expense or capital cost adjustments due to impacts from COVID-19.

1.6 A Note of Thanks

The Amawalk Consulting Group team wishes to express its appreciation to representatives of DC Water who provided information to assist us in the preparation of this Report.

2. Background

2.1 Purpose

The District of Columbia Water and Sewer Authority ("DC Water" or the "Authority") has assessed a fire protection fee to the District of Columbia (the "District") since April 1, 2000. This fee is intended to recover costs incurred by DC Water for fire protection service provided by the Water System of DC Water. The purpose of this cost of service study is to assess the appropriate level of cost recovery required from the District government for this service.

This study Report presents actual operating and financial data for five (5) fiscal years (2016 through 2020) to illustrate the historical cost of service versus the payments received from the District for such service. It is noted that the 2020 costs are preliminary and may be subject to change. As noted in the 2018 Report[1], the 2017 costs provided at the time were preliminary. The final 2017 costs used in this Report are slightly lower than what was used in the 2018 Report. The anticipated costs for the current year (2021) and three (3) upcoming years (2022 through 2024) are presented herein. The presentation incorporates direct costs for fire protection services as well as the allocation of certain costs. The vast majority of costs are direct; allocated public fire costs represent about 7.8% of the total long-term (2016 through 2024) costs of fire protection service. The results of the cost of service calculations will be compared with the revenues produced under historical and current charges and will identify adjustments, where necessary, to provide sufficient revenues to recover the cost for this service.

Since the start of the years of peak investments in fire protection, annual charges to the District were typically less than the cost of service[2]. The intent has been to recoup the accumulated differential over time so that all costs incurred are fully reimbursed by District payments. A reconciliation of DC Water costs of service and District payments has been prepared by Amawalk beginning with 2006. Beginning in 2014 if no capitalization is used, and in 2015 if capitalization is used, District payments have exceeded the current year cost of service, enabling the application of the additional amounts received to reduce the outstanding balance. The ending balance shown in 2016 in Table 1 and in Table 9 reflects the outstanding balance owed by the District from 2015 offset by the net receipts in 2016.

Fire protection service differs from other services offered by water utilities because it is primarily a standby service that is required to be available when the need exists; i.e., as demanded. The development and maintenance of the supply, treatment, pumping, storage and distribution capacity for fire protection service requires: a) capital investments in facilities that are designed larger than would otherwise be required to be able to accommodate fire demand, and b) annual operation and maintenance ("O&M") expenses to ensure that the assets are appropriately maintained and provide service as needed. Fire protection is provided to both the general public (through public fire hydrants and the infrastructure needed to supply water of sufficient quantity and pressure to the hydrants) and to individual customers that receive

[1] Report Regarding Fire Service Charges, DC Water, prepared by the Amawalk Consulting Group, dated February 13, 2018.

[2] Without capitalization of certain costs, payments received were less than the cost of service in 2008 through 2013, except in 2011.

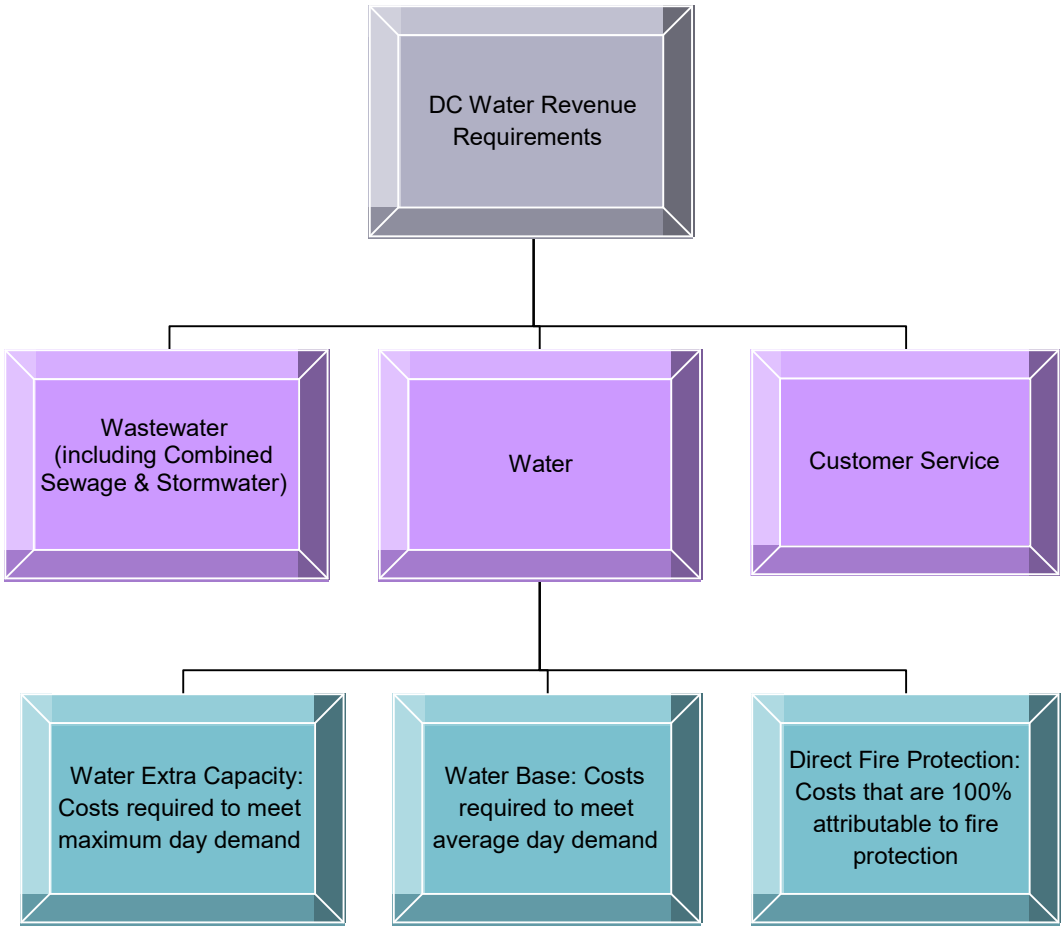
additional fire protection through privately-owned hydrants, standpipes or sprinkler connections. The private fire connections provide a direct service and benefit to individual properties that is separate from the services provided to the general public.

2.2 Methodology

The results of the most recent study of fire protection costs and revenues for DC Water were presented in a Report dated February 2018. Similar study reports were prepared in September 2006, January 2009, November 2011, and February 2015. Costs that are directly assignable to the fire protection service (e.g., the cost of replacing a hydrant) are shown as direct costs. In addition to direct costs, certain other costs should be allocated to fire protection. The approach that was taken in the previous studies for allocating costs between general water service and fire protection service used a methodology that is known as base-extra capacity; i.e., a division of costs between what is required for the provision of service on an average day and the extra capacity needed to meet maximum, or peak day demand. The base-extra capacity method is an accepted approach in the water industry. The allocated fire protection costs are divided between public and private fire protection based on the number of equivalent connections in these two groups.

DC Water provides not only water service, but also wastewater and stormwater services to its customers. The determination of the cost of fire protection service requires that costs unrelated to water be separated and not included in the computation of fire protection service costs. It also requires that costs attributable to multiple services be appropriately allocated among the services provided. Figure 1 provides a graphical overview of the cost of service methodology.

Figure 1



All of the annual costs of the Authority are categorized according to three functions: wastewater (including sanitary sewage, combined sewerage, combined sewer overflow ("CSO") abatement and stormwater), water and customer service. As illustrated in Figure 1, water-related costs are separated into three parts. The Base Costs of Water are those required to meet average day demand. The vast majority of water costs are expected to be assigned to Base Costs. The Extra Capacity Costs should reflect the cost associated with meeting the peak day demand. Direct fire protection costs are shown separately.

A portion of the annual cost of fire protection is expense-related, such as costs related to inspection and repair of hydrants and related appurtenances. Other costs are categorized as capital improvements; e.g., the replacement of hydrants and related sections of pipe and valves together with the technical analyses supporting such replacement. Accounting policy typically dictates which costs must be categorized as an expense versus which costs can be classified as capital. DC Water's Capitalization Policy is presented in Section 5.4 of the Appendix. Annual O&M expenses are typically paid from annual revenues. As noted previously, capital improvements can be funded either on a PAYGO (pay-as-you-go, or cash-financed) basis (i.e., from annual revenues) or through the issuance of debt, the proceeds of which would pay for the capital improvements. The debt would then have to be repaid through annual principal and

interest payments (collectively referred to as "debt service"). This Report illustrates the cost of service and calculated rate with certain assumptions regarding those costs that are classified as annual operating expenses and other costs that are capital-related. The assumptions are identified herein.

DC Water also receives federal grants towards the cost certain capital projects; however, these grants do not apply to fire hydrants or related appurtenances or any other direct costs of fire protection services. Thus, such grants are not considered in this study as potential offsets to the direct cost of fire protection.

The total cost of fire protection service equals direct fire protection costs plus allocated costs.

2.3 Data and Assumptions Used in This Study

Highlights of the data and assumptions used to develop the cost of fire protection service are shown below**.**

Direct Fire Protection

- Hydrant installation and restoration costs that are directly attributable to fire protection are assigned by Authority representatives to operating expense and capital in accordance with DC Water's Capitalization Policy. The costs shown for 2016 through 2020 reflect actual results[3].

- The costs shown for 2016 through 2024 have been provided by the Authority. The projected costs for 2021, the current year, and the estimates in each year for 2022 through 2024 are less than the annual costs incurred in peak cost years of 2008 and 2009. DC Water has indicated that hydrant replacements and repairs have reached a fairly steady level in recent years. The Authority anticipates continuing to perform most of the future hydrant-related projects with in-house personnel to optimize costs.

- Direct fire protection other than hydrant installation and restoration (e.g., personnel, parts, permits) in 2016 through 2020 also reflect actual costs incurred, subject to final figures for 2020. The projected costs in each year for 2021 through 2024 were also provided by DC Water.

- The cost of preparing the fire protection cost of service study is included starting with the 2018 Report which was initiated in 2017. Budgeted costs are included for this Report (2021) and projected costs are shown for 2024.

- For the cost recovery methodology wherein the proceeds of debt are used to pay for most fire protection-related capital costs and the resulting debt service is computed, we first assume that fire protection costs are capitalized at the same ratio as DC Water's overall capital spending, i.e., some percentage of fire costs were and will continue to be funded by PAYGO. As DC Water increasingly utilizes a higher percentage of PAYGO as part of

[3] As noted previously, the 2020 results are preliminary

its overall capital management, it is prudent to make similar assumptions in capitalization of fire costs. The second step is to estimate the portion of the debt service that is attributable to fire protection capital spending. The allocation ratio in each year is calculated by comparing the cumulative fire protection capital costs up to that year and cumulative bond proceeds up to that same year. In the third step, debt service payments for fire protection are calculated by multiplying the allocation ratio to actual and projected debt service payments for DC Water. Debt issued prior to 2007 and the resulting debt service on such debt is excluded because there were no fire protection costs tracked prior to 2006. Similarly, debt service payments for bonds that were used to refund debt that was issued prior to 2007 are excluded. When the refunding applies to both pre-2007 debt and post-2007 debt, the portions of refunding principal that are pre- and post-2007 to total borrowing for that bond issue are estimated. Refunding debt is not reflected as new principal. The calculation of the allocation ratio used in this study is provided in Section 5.5 of the Appendix.

Allocation of Certain Base and Extra Capacity Costs

In order to assign a portion of the total allocated costs to fire protection, a number of assumptions were utilized:

- The maximum day allocation for water used in fire protection is calculated as follows:
  - Design basis – 2 fires for 5 hours at 3,500 gallons per minute. This is the fire design basis as reported by DC Water in 2008 in its discussions with the Insurance Services Office (ISO). Additional information regarding the ISO can be found on its website at http://www.iso.com
  - Maximum day fire use – 2.1 million gallons per day (the calculated product of the above figures).
  - This Report presents the updated Design Fire Demand factors for 2010 to 2019 (maximum day fire use divided by peak demand) which range from 1.42% to 1.71% for the allocation of fire costs – the percentage factor is increasing over time since the maximum day fire use remains constant but peak daily volumes are declining.
- This Report utilizes average day and peak day deliveries of water as reported by DC Water Department of Water Services and the Washington Aqueduct through 2019. The average day usage and peak usage includes unbilled water.
- Water used in fire operations was assumed in the prior reports to be 0.5% of average day usage and, thus, 0.5% of base water costs. The range of values used for water used in fire operations for large systems is typically in the range of 0.5 - 1.0%. This Report continues to use the value of 0.5% of average day use. The fire protection share of peak costs is calculated based on the ratio of base and peak demand.
- O&M expense is first assigned to wastewater and water expenditures, recognizing that wastewater includes sanitary sewage, and combined sewage and stormwater. The O&M expense for water, net of other water costs and non-water costs (wastewater), was assigned based on the weighted ratio of pumping facilities' staffing levels to water supply staffing levels, in the following manner:
  - 83.9% to base and 16.1% to peak in 2016;
  - 91.6% to base and 8.4% to peak in 2017;
  - 89.5% to base and 10.5% to peak in 2018;

  - 90.4% to base and 9.6% to peak in 2019; and
  - 91.4% to base and 8.6% to peak in 2020 and each year thereafter.
- Labor-related O&M expenses (i.e., salaries and wages) are assumed by DC Water to increase in 2021 and subsequent years at the average rate of 3.0% annually.
- The burden rate for DC Water direct labor is comprised of a fringe benefit factor plus an overhead factor; we add the two percentages to arrive at a total burden rate. The fringe benefit factors are listed below and reflect figures used for 2016 through 2024:
  - 66% for 2015 – 2017;
  - 62% for 2018 – 2020; and
  - 55% for 2021 – 2024.

  The fringe benefit factors applied to DC Water personnel on loan for fire protection service are the same as the factors used for full-time assigned personnel.
- The overhead factors are listed below and reflect figures for 2016 through 2024:
  - 48% for 2015 – 2017;
  - 62% for 2018 – 2020; and
  - 48% for 2021 – 2024.
- The burden rate for non-personnel expenses of DC Water is comprised of the overhead rate only.
- Debt service is first allocated to water and non-water based on actual capital drawdowns. Water debt service is then allocated between base and peak based on the ratio of base and peak demand for the past 10-years from 2010 to 2019: 64% to base and 36% to peak.

Customer Base for Fire Protection

- Units of service – This Report incorporates the most recent data (October 2020) provided by DC Water.

3. Calculation of the Cost of Service

3.1 2013 Memorandum of Understanding

The 2007 MOU and the 2013 MOU (collectively, the "MOU") memorialized the commitments of both parties with regard to the Fire Hydrant Risk Assessment, Repair, and Replacement Program. Key elements of the MOU that currently affect this study are summarized below.

- DC Water is required to inspect all public fire hydrants once per year in accordance with National Fire Protection Association ("NFPA") guidelines
- FEMS may inspect any public fire hydrants with advanced coordination with DC Water and shall submit a schedule of inspection to DC Water by January 1st of each year. Inspections will be conducted between March 1st and December 15th of each calendar year. DC Water will conduct inspections prior to March 1st.
- DC Water shall be responsible for identifying and installing new hydrants as part of its ongoing capital program, developing manuals and protocols for hydrant inspection and inspection data management, and ensuring that the required preventative maintenance is performed on each hydrant as required by the manufacturer.
- DC Water has committed to providing water supply personnel on scene to FEMS when requested for 2 alarm fires or greater.
- DC Water shall be responsible for the repair or replacement of all public fire hydrants on a timely basis.
- In addition to the repairs and replacements, DC Water shall be responsible for upgrading all of the remaining public fire hydrants in the District, based on the funding available for the upgrades in 2013 and each year thereafter.
- DC Water shall conduct a flow test for every public hydrant in the public water distribution system at least once every 6 years, resulting in about 1,500 hydrants being flow tested each year, as funding allows.
- In 2013 and each year thereafter, DC Water shall submit a report to FEMS on the number of repairs, upgrades, retrofits, or inspections during the prior quarter by the 45th day after the end of the second fiscal quarter. DC Water also shall submit a year-end report to FEMS containing the same information describe above for the prior Fiscal Year, as well as all costs incurred by DC Water in carrying out its responsibilities under the MOU.
- Based on the submission of an annual budget and record of auditable expenditures by FEMS, DC Water agrees to pay one-half of the personnel operating costs of FEMS that are related to fire hydrant inspections.
- An independent cost of service study on fire hydrant inspection and repair services, including capital and operating expenses shall be performed every three years.

DC Water is committed to implementing measures of the MOU. DC Water manages over 9,600 fire hydrants, and only 58 hydrants, or 0.6%, are out of service according to the Authority's Water Hydrant Dashboard.

3.2 Fire Protection Cost Calculation - Methodology

The approach that was taken in computing the cost of service involves a two-step process: 1) identifying and summarizing those costs that are directly assignable to the fire protection

services (e.g., the cost of replacing a hydrant), and 2) identifying those costs that should be allocated, in part, to fire protection services. Computing the charges attributable to the District is dependent upon determining the cost of service as well as the units of service. This part of the Report describes the components of cost and presents the resulting computations for fire protection service.

Based on our discussions with DC Water representatives and the review of data provided, we have computed the fire protection costs for 2016 through 2020 as summarized in Table 2. Information regarding direct costs and allocated costs is presented following Table 2. The breakdown of DC Water full-time personnel costs is presented in Table 2A in the Appendix. This Report also presents the projected costs for 2021 through 2024, shown in Table 7.

Table 2 – Historical Direct and Allocated Fire Costs (All amounts in $)

	Cost Category	2016	2017	2018	2019	2020
				Historical		
	Direct Fire Costs					
1	Full time assigned personnel costs	928,964	1,014,998	1,034,526	1,289,095	1,206,274
2	Hydrant Parts	67,608	67,154	85,926	52,551	41,571
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4	Hydrant Installation and Restoration	200,886	956,607	914,512	768,017	1,098,077
5	Personnel loaned from other departments (documented via WO)	1,054,792	1,847,677	1,640,246	1,847,942	2,042,592
6	DDOT Open Space Permits	435,591	377,858	496,714	371,249	329,148
7	Paid to Fire Department for Inspection Services (NTE)	0	0	0	0	0
8	Fire Protection Cost of Service Study			42,727		
9	Burden applied to DC Water personnel costs	1,059,019	1,157,098	1,282,813	1,598,478	1,495,780
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13	Subtotal Direct Costs	5,218,955	8,316,402	8,654,439	9,062,108	9,446,224
	Allocated Fire Costs					
14	Fire Share of Water Base Costs @ 0.5%	530,766	513,113	550,519	574,719	638,030
15	Fire Share of Peak Costs @ 1.64% for 2016, decreasing to 1.58% by 2019	282,220	247,738	276,977	272,756	292,908
16	Subtotal	812,986	760,850	827,495	847,475	930,938
17	Allocated Public Fire Costs	612,362	573,596	629,493	643,459	700,197
18	**Total Direct and Allocated Public Fire Costs**	**5,831,317**	**8,889,998**	**9,283,931**	**9,705,567**	**10,146,422**

Following the execution of the 2007 MOU, direct fire costs increased significantly over the level of investments in the prior years. The peak level of total direct and allocated public fire costs was $17.0 million in 2008, followed by $15.7 million in investments in 2009. For 2010 through 2020, the pace of annual investments has ranged from $5.8 million to $10.1 million, with an average annual cost of $7.9 million per year. The results shown in Table 2 reflect the trend towards fewer replacements, a stable level of maintenance and repairs, and no further reliance on contractors to support fire protection, instead using DC Water personnel exclusively to perform the work.

Direct Costs –Direct costs have been presented using the following categories:

- Full-time assigned personnel (line 1) – DC Water personnel who are assigned full-time to hydrant and hydrant-related work.
- Hydrant parts and paint (repairs and retrofit) (line 2) – Maintenance-related expenses for hydrants and related appurtenances.
- Material & Equipment (Fire Hydrant Program) (line 3) – Maintenance-related expenses

for hydrants and related appurtenances.

- Hydrant installation and restoration (line 4) – Costs incurred by DC Water for hydrant and hydrant-related work; these costs are assumed to be eligible to be capitalized.
- Personnel loaned from other departments (documented via Work Orders) (line 5) – DC Water personnel who are not typically assigned full-time to hydrant and hydrant-related work but provide assistance, as needed.
- Permits (line 6) – DC Water has to pay for permits issued by the District for construction-related activities associated with hydrants, valves and water mains.
- Amounts paid to FEMS for inspection services (line 7) – The MOU indicates that FEMS would provide inspection services and DC Water would reimburse a portion of its costs for such services.
- Consulting fees for the fire protection cost of service study (line 8) – costs incurred by DC Water for the report prepared every three years.
- Burden rate applied to personnel (lines 9 and 10) - for fringe benefits and overhead expenses for DC Water personnel costs. The burden rates applied to DC Water personnel on loan for fire protection service are the same as the factors used for full-time assigned personnel.
- Burden for overhead expenses that is applied to DC Water non-personnel costs (lines 11 and 12) – The same burden rates (overhead only) are applied to costs for parts and material and equipment.

Other Costs of Fire Protection Services – In addition to the direct costs of fire protection, it is appropriate to allocate a portion of the base cost of water service and a portion of the peak cost of water service to fire protection services. The assignment of a share of these costs to fire protection requires consideration of the following factors:

1. The range of base day costs attributable to fire for large water systems such as the DC Water system is considered to be between 0.5% and 1.0%, with the largest systems being at the low end of the range and other systems being towards the high end of the range. As a result, we propose to continue using the 0.5% factor that was used in the prior studies including the 2018 Report. In calculating the share of base costs attributable to fire protection, direct fire costs will be excluded to prevent the double-counting of costs.

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2. In allocating peak day costs to fire protection, a "Design Fire Demand" of 2 simultaneous fires for 5 hours was used, each requiring 3,500 gallons per minute. The flow attributable to design fire flows – or 2.1 MGD – divided by the maximum, or peak, day flows represents the fire share of maximum day costs. This Report adjusts the calculated percentage in each year for 2017 through 2020 to reflect the average peak daily usage during those years. It is noted that simultaneously with declining average daily demand, the recent trend is towards lower average peak daily demand as well.

3. Total O&M expenses are assigned to water service and wastewater service. Operations and maintenance expenses for water service will then be allocated to base usage and peak usage on the basis of staffing levels. We computed the maximum day or peak share of these costs using the ratio of pumping staffing divided by total water operations staffing; the base share of costs are computed using the ratio of non-pumping staffing divided by

total staffing. Based on actual 2020 results, the following staffing levels are utilized to compute the applicable ratio:

- Pumping Services Staffing = 75 personnel, multiplied by 21% which is the percentage of work hours pumping staff spent on water services, to arrive at 16 full-time equivalent positions;
- Water Services Staffing = 185 personnel; and
- Ratio of Base to Peak = 91.4:8.6.

The ratio shown above is applied to operation and maintenance expenses starting with 2021.

4. Administration expenses are allocated on the basis of the subtotal of expenses by category divided by total of all such expenses times the total administration costs.

A summary of the results of the proposed assignment of costs by year, assuming capitalization of hydrant upgrade and replacement costs, is presented in Table 3. The allocations by line item for each year are illustrated in Tables 3A – 3F of the Appendix for 2016 through 2021.

Table 3 – Annual Costs by Category (All amounts in $)

Year	Total Costs	Water Base	Water Peak	Water Other	Wastewater & Storm/CSO	Fire
2016	440,363,689	106,153,240	17,161,680	13,379,505	303,669,264	7,606,040
2017	456,785,429	102,622,519	14,474,968	21,214,675	318,473,266	10,275,858
2018	485,905,678	110,103,710	17,475,911	22,025,596	336,300,461	10,738,626
2019	509,463,127	114,943,815	17,313,485	21,717,681	355,488,147	11,675,089
2020	541,948,228	127,606,014	18,592,697	22,199,744	373,549,773	11,782,033
2021*	578,262,374	154,303,744	22,066,637	22,579,957	379,312,036	11,672,449

* Projected costs.

Allocation Factors – The allocation of a portion of the cost of peak water service to fire protection is based Design Fire Demand as explained in the previous page. For 2019, the maximum day delivery was 133.3 MGD (exhibit 19 of the 2019 CAFR[4]), resulting in a Design Fire Demand of 1.58%. The following table shows these values for a ten year period. The 2019 percentage will be used for 2020 and subsequent years.

[4] Comprehensive Annual Financial Report

Table 4 – Ratio Computation for Design Fire Demand

Fiscal Year	Average Day (MGD)	Peak Day (MGD)	Design Fire Demand
2010	105.7	146.9	1.43%
2011	102.9	143.7	1.46%
2012	100.9	142.9	1.47%
2013	95.1	129.7	1.62%
2014	95.1	123.7	1.70%
2015	104.5	148.4	1.42%
2016	99.4	127.7	1.64%
2017	98.2	122.7	1.71%
2018	94.1	132.5	1.58%
2019	96.4	133.3	1.58%

Units of Service – Fire costs can be presented as a per hydrant charge (for public fire protection) and as a per hydrant or fire connection equivalent charge (for private fire hydrants and private fire lines). Table 5 illustrates the number of public fire hydrants in service by year as provided by DC Water. The number of equivalent private fire lines and private hydrants is also shown recognizing that these are estimated at the time of this Report. Table 5 below presents the estimated units of service. Breakdowns of the estimates for each year and calculations of equivalent fire connections are provided in Tables 5A – 5B of the Appendix presented at end of this Report.

Table 5 – Units of Service

	2016	2017	2018	2019	2020
Average number of public hydrants	9,517	9,551	9,881	9,771	9,395
Estimated private hydrants	1,318	1,318	1,308	1,298	1,296
Estimated private fire lines	1,800	1,800	1,800	1,800	1,800

The allocation of the units of service between public and private fire service is shown in Table 6.

Table 6 – Public/Private Fire Protection Service & Cost Allocation %

Year	2016	2017	2018	2019	2020
Public %	75.32%	75.39%	76.07%	75.93%	75.21%
Private %	24.68%	24.61%	23.93%	24.07%	24.79%

3.3 Projected Cost of Service for Fire Protection

Table 2 illustrated the historical cost of service for 2016 through 2020. Tables 3 through 6 provided supporting information for the historical years. It is appropriate to consider both the current year and a reasonable period of future years to provide information for policy decisions concerning cost recovery. Table 7 provides the projected cost of service for 2021 through 2024.

Table 7 – Projected Direct and Allocated Fire Costs (All amounts in $)

	Cost Category	2021	2022	2023	2024
			Projected		
	Direct Fire Costs				
1	Full time assigned personnel costs	1,242,463	1,279,736	1,318,129	1,357,672
2	Hydrant Parts	54,127	55,751	57,423	59,146
3	Material & Equipment (Fire Hydrant Program)	515,474	530,938	546,866	563,272
4	Hydrant Installation and Restoration	1,131,020	1,164,950	1,199,899	1,235,896
5	Personnel loaned from other departments (documented via WO)	2,103,870	2,166,986	2,231,996	2,298,956
6	DDOT Open Space Permits	339,023	349,193	359,669	370,459
7	Paid to Fire Department for Inspection Services (NTE)	0	0	0	0
8	Fire Protection Cost of Service Study	42,946			42,946
9	Burden applied to DC Water personnel costs	1,279,736	1,318,129	1,357,672	1,398,403
10	Burden applies to Personnel loaned (Hourly Rate, Salary Rate & OH)	2,166,986	2,231,996	2,298,956	2,367,924
11	Burden applied to Parts	25,981	26,760	27,563	28,390
12	Burden applied to Material & Equipment	247,427	254,850	262,496	270,371
13	Subtotal Direct Costs	9,149,053	9,379,291	9,660,669	9,993,436
	Allocated Fire Costs				
14	Fire Share of Water Base Costs @ 0.5%	771,519	794,664	818,504	843,059
15	Fire Share of Peak Costs @ 1.64% for 2016, decreasing to 1.58% by 2019	347,636	358,066	368,808	379,872
16	Subtotal	1,119,155	1,152,730	1,187,312	1,222,931
17	Allocated Public Fire Costs	841,763	867,016	893,026	919,817
18	**Total Direct and Allocated Public Fire Costs**	**9,990,817**	**10,246,307**	**10,553,696**	**10,913,253**

The projected personnel costs (salaries and wages) in 2021 through 2024 for lines 1 and 5 above are based on an annual increase of 3% from 2020 and were provided by DC Water. The burden applied to personnel costs in lines 9 and 10 is based on the projected personnel costs times the projected fringe benefit and overhead rates. The 2021 costs not related to personnel (lines 2, 3,4 and 6) reflect increases of 3% over either the 2020 or 2019 actual costs. The burden applied to non-personnel expenses is based on the projected non-personnel costs times the projected overhead rates.

3.4 Comparison of the Cost of Service With District Payments

Prior to 2011, the District had paid a maximum of $1.9 million each year for fire protection service. In 2011, DC Water received District payments of $6,148,720. In addition, DC Water offset a portion of its payments to the District by $4,773,720, resulting in total credits of $10,922,440 for 2011 towards the cost of fire protection service. In 2012, the District paid in full the fire protection service bill of DC Water of approximately $6,173,720. In 2015 through 2018, the District paid $10,796,000 each year. In 2019 and 2020, the District paid $12,527,000 each year. It is anticipated that the District will pay $12,527,000 in 2021.

Preceding tables have presented both the historical cost of fire protection service (Table 2) and the projected cost of service (Table 7). This part of the Report compares the cost of service to DC Water with the payments from the District for fire protection service. Table 8 illustrates a reconciliation of the cost of service with the payments made by the District for 2016 through 2020, together with a projected reconciliation for 2021. This reconciliation again assumes that all costs incurred by DC Water in each year are due in full as payments from the District; i.e., capital costs are not amortized.

Table 8 – Reconciliation of Fire Costs vs. District Payments (All amounts in $)

	Cost Category	2016	2017	2018	2019	2020	2021
				Historical			Projected
18	Total Direct and Allocated Public Fire Costs	5,831,317	8,889,998	9,283,931	9,705,567	10,146,422	9,990,817
19	District Payment	10,796,000	10,796,000	10,796,000	12,527,000	12,527,000	12,527,000
20	Annual Difference	4,964,683	1,906,002	1,512,069	2,821,433	2,380,578	2,536,183
21	2006-21 Cumulative Difference (Payments vs. Costs)	-27,386,887	-25,480,885	-23,968,816	-21,147,383	-18,766,805	-16,230,622

If DC Water had elected to charge the District actual annual costs for both expenses and capital-related projects for 2006 through 2021, the District would still owe DC Water $16.2 million in accumulated costs at the end of 2021 as reflected in Table 8.

The base method of computing the annual payments due from the District is presented in Section 4 of the Report. The alternate method assumes that most capital-related fire protection costs are paid for from the proceeds of bonds, with the remainder of such costs being paid for on an annual (cash) basis. The amount due in each year reflects the estimated debt service on those bonds plus the PAYGO amounts, plus operation and maintenance expenses.

3.5 Recommendation

The capacity made available to private fire connections provides both value and benefit to those customers. Presently the cost of fire protection service for private connections is being borne by all water customers. We respectfully suggest that DC Water consider the following steps so that it may consider whether or not to establish a separate charge for private fire protection service:

- Complete the inventory of private fire hydrants and private fire lines; and
- Include the development of private fire line charges in the scope of the next comprehensive rate study.

4. Cost Recovery Options

In the prior report there was a large accumulated deficit of District payment obligations for the scenario where no amortization of capital costs was used; the current deficit is smaller. Thus, no alternatives are presented for recovering the unpaid amounts; such amounts are assumed to be recovered over the three-year period of 2022 through 2024. An assumed 4.5% interest factor, intended to approximate DC Water's cost of borrowing, is used for the outstanding balance of the accumulated costs and underpayments/overpayments. It is slightly lower than the assumed cost of borrowing incorporated in the DC Water 10-year financial plan.

If DC Water desired instead to request that the District pay in 2022 the approximately $16.2 million in accumulated, unreimbursed costs incurred by DC Water to date, there would be a substantial one-time increase in receipts in that year followed by significant reductions in subsequent years due to the absence of an obligation to include debt service in the fire protection cost of service.

The Base Case assumes that DC Water's construction-related costs for fire protection are capitalized to a large extent; i.e., most of the costs are paid for through the proceeds of bonds and the debt service on those bonds must be paid each year through the maturity of the bonds. The remaining portions of such costs are treated as PAYGO. With the exception of 2019[5], for the period of 2016 through 2024, the PAYGO percentages range from a low of 12% in 2016 to a high of 41% in 2024; the percentages reflect the calculated actual or anticipated percentage of the CIP that DC Water has financed or expects to finance with PAYGO in each year.

To compute debt service attributable to fire protection, fire protection investments to date at a given point in time are added and that result is divided by the sum of all bond issues (excluding refunding bonds) for that same time period. The resulting percentage is a debt service attributable to fire protection which can be multiplied by debt service in a given year to arrive at the debt service attributable to fire protection. Debt issued prior to 2007 and the resulting debt service on such debt is excluded because there were no fire protection costs tracked prior to 2006. Table 9A in the Appendix provides the results of the percentage calculations.

The Base Case, using a mix of PAYGO and the proceeds of debt for fire protection investments, coupled with periodic reconciliation of costs and payments, has worked well in that annual District payments have reduced and then eliminated the amounts owed to DC Water by the end of 2019. The net credit due to the District of $836,469 at the end of 2019, the first year in which cumulative District payments from 2006 onward exceed cumulative fire protection costs for the District, is expected to increase to $2,435,987 at the end of 2021. Applying that credit against the projected cost of service results in an annual charge to the District of $11,535,000 for 2022 through 2024, including the effects of the reconciliation of historical costs and District payments using this methodology.

[5] For 2019, the PAYGO percentage is calculated to be 60%, reflecting the fact that bond proceeds from Series 2019 Bonds were used in 2020.

Table 9 – Amortized and Expensed Direct & Allocated Fire Costs (All amounts in $)

	Cost Category	2016	2017	2018	2019	2020	2021	2022	2023	2024
				Historical				Projected		
18	**Total Direct and Allocated Fire Costs**	5,831,317	8,889,998	9,283,931	9,705,567	10,146,422	9,990,817	10,246,307	10,553,696	10,913,253
23	**PAYGO %**	12%	19%	19%	60%	24%	24%	26%	28%	41%
24	Less: Construction Costs not Paid via PAYGO	176,643	773,291	742,055	306,167	832,281	862,889	863,500	861,061	728,961
25	**Expense- Related Fire Costs**	**5,654,674**	**8,116,707**	**8,541,876**	**9,399,401**	**9,314,141**	**9,127,928**	**9,382,807**	**9,692,635**	**10,184,291**
26	Capital Costs to be Amortized	176,643	773,291	742,055	306,167	832,281	862,889	863,500	861,061	728,961
27	Debt Service Allocation Ratio Based on Cumulative Costs	1.77%	1.76%	1.57%	1.42%	1.43%	1.34%	1.25%	1.19%	1.13%
28	Debt Service to be Allocated (Excludes Issuances Prior to 2007)	110,152,741	122,666,429	139,838,768	160,754,197	173,095,643	190,230,822	208,460,060	225,418,550	244,665,611
29	**Fire Share of Debt Service**	**1,951,366**	**2,159,151**	**2,196,750**	**2,275,688**	**2,467,892**	**2,544,521**	**2,605,502**	**2,674,219**	**2,767,002**
30	**Total Annual Costs**	**7,606,040**	**10,275,858**	**10,738,626**	**11,675,089**	**11,782,033**	**11,672,449**	**11,988,309**	**12,366,854**	**12,951,294**
19	**District Payment**	**10,796,000**	**10,796,000**	**10,796,000**	**12,527,000**	**12,527,000**	**12,527,000**			
31	**Annual Difference**	**3,189,960**	**520,142**	**57,374**	**851,911**	**744,967**	**854,551**			
32	**2006-21 Cumulative Difference (Payments vs.Costs)**	**-592,958**	**-72,817**	**-15,443**	**836,469**	**1,581,435**	**2,435,987**			
33	**Level charges (2022-24) including catch-up**							**11,535,000**	**11,535,000**	**11,535,000**

Notes

(A.) Line 23 is the actual moneys from operations, including revenues from System Availability Fees and from Clean River Impervious Area Charges, as percentage of the total sources for capital construction.
(B.) Line 27 allocation ratio is based on cumulative fire construction costs divided by cumulative bond proceeds in each year starting with Series 2007 A&B and continuing through Series 2019 A&B&C&D.
(C.) Line 28 includes debt service payments on subordinate bonds and senior lien bonds starting with the Series 2007 A&B and continuing through anticipated future issuances, commercial paper, EMCP and capital equipment financing.
(D.) Debt service payments on bonds used to refund Series 2003 and 2004 bonds are excluded.
(E.) Positive annual difference indicates revenue received is more than the cost of service, negative annual difference indicates the revenue received is less than the cost of service
(F.) Total public fire cost for FY 2017 reflect actual FY 2017 operating expenses which are slightly lower than the preliminary figures used in the prior report.

5. Appendix

5.1 Supporting Information for Table 2

Tables 2A below presents the breakdown for DC Water full-time personnel costs.

Table 2A – Components of Full-time Personnel Costs

	FY 2020	FY 2021 (Projected)
Water Services Worker 06	192,217	197,983
Water Services Worker 07	88,057	90,698
Water Services Worker 08	385,290	396,849
Water Services Worker 10	442,346	455,617
Foreman, Water Services	98,365	101,315
Grand Total Manpower Cost	1,206,274	1,242,463

5.2 Supporting Information for Table 3

The tables presented below present the allocation of costs by year for Water Base, Water Peak, Water Other, Wastewater and Fire Direct for 2016 through 2021. Please note that the figures are presented in thousands of dollars.

Table 3A – 2016 Cost Allocation

Category	2016 Actual ($000)	Water Base	Water Peak	Water Other	Wastewater & Storm/CSO
Operating Expense					
Wastewater Treatment - Operations	64,983				64,983
Wastewater Treatment - Process Engineer	6,921				6,921
Water services	23,407	19,643	3,764		
Sewer Services	14,846				14,846
Maintenance	18,564	1,091	209		17,265
Distribution & Conveyance System					
Water Purchase	26,345	26,345			
Net Distribution & Conveyance	18,957	12,252	2,348		4,357
Engineering and Technical Services	24,319	7,133	1,367	1,150	14,669
Customer Service	17,677			8,839	8,839
Permits	2,049	1,324	254		471
Clean Rivers	2,835				2,835
Administration	74,986	23,011	2,696	3,391	45,889
Less Fire O&M	-5,655	-4,745	-909		
Debt Service					
Jennings Randolph Bonds	805	588	217		
1998 Revenue Bonds	23,368	5,118	1,893		16,358
Capital Equipment Financing	0	0	0		0
Series 2007A Subordinate Bond	1,893	793	293		807
Series 2008A Subordinate Bond	9,969	3,608	1,334		5,026
Series 2009A Revenue Bond	6,611	1,698	628		4,286
Series 2010A Revenue Bond	11,230	1,810	669		8,751
Series 2012A,B-1,B-2,C Subordinate Bond	21,107	1,723	637		18,747
Series 2013A Subordinate Bond	14,994	1,131	418		13,445
Series 2014A Revenue Bond	16,849				16,849
Series 2014B, C Subordinate Bond	17,720	1,336	494		15,890
Series 2015A,B Subordinate Bond	16,793	2,269	839		13,684
Series 2016 Subordinate Bond	10,500	1,419	525		8,556
Series 2016B Subordinate Bond	0				
DC Water Future Bonds	0	0	0		0
Commercial Paper	149	20	7		121
EMCP	93	13	5		76
Less Debt Service Attributable to Fire	-1,951	-1,424	-527		
Total Allocated	440,364	106,153	17,162	13,380	303,669

2016 Fire Protection Costs ($000)	Before Capitalization
Fire Share of Water Base Costs@.005	531
Fire Share of Peak Costs@1.64%	282

Table 3B – 2017 Cost Allocation

Category	2017 Actual ($000)	Water Base	Water Peak	Water Other	Wastewater & Storm/CSO
Operating Expense					
Wastewater Treatment - Operations	73,066				73,066
Wastewater Treatment - Process Engineer	7,008				7,008
Water Operations	24,703	22,634	2,069		
Sewer Operations	13,513				13,513
Maintenance	18,719	1,201	110		17,409
Pumping Operations/DDCS					
Water Purchase	26,796	26,796			
Net Distribution & Conveyance	19,789	14,363	1,313		4,113
Engineering and Technical Services	25,756	8,248	754	1,218	15,536
Customer Experience	31,686			15,843	15,843
Permits	2,233	1,621	148		464
Clean Rivers	2,704				2,704
Administration	59,880	18,224	1,070	4,153	36,432
Less: Fire O&M	-8,117	-7,437	-680		
Debt Service					
Jennings Randolph Bonds	805	518	287		
1998 Revenue Bonds	22,471	4,339	2,403		15,730
Capital Equipment Financing	0	0	0		0
Series 2007A Subordinate Bond	0	0	0		0
Series 2008A Subordinate Bond	7,392	2,359	1,306		3,727
Series 2009A Revenue Bond	4,163	942	522		2,699
Series 2010A Revenue Bond	10,744	1,527	845		8,372
Series 2012A,B-1,B-2,C Subordinate Bond	21,014	1,512	837		18,665
Series 2013A Subordinate Bond	14,940	993	550		13,397
Series 2014A Revenue Bond	16,823				16,823
Series 2014B, C Subordinate Bond	18,142	1,206	668		16,268
Series 2015A,B Subordinate Bond	17,511	2,086	1,155		14,269
Series 2016 Subordinate Bond	17,397	2,073	1,148		14,176
Series 2016B Subordinate Bond	863	88	49		727
Series 2017 A&B Revenue Bond	8,488	862	477		7,149
Commercial Paper	0	0	0		0
EMCP	455	46	26		383
Less Debt Service Attributable to Fire	-2,159	-1,576	-583		
Total Allocated	456,785	102,623	14,475	21,215	318,473

2017 Fire Protection Costs ($000)	Before Capitalization
Fire Share of Water Base Costs@.005	513
Fire Share of Peak Costs@1.71%	248

Table 3C – 2018 Cost Allocation

Category	2018 Actual ($000)	Water Base	Water Peak	Water Other	Wastewater & Storm/CSO
Operating Expense					
Wastewater Treatment - Operations	72,716				72,716
Wastewater Treatment - Process Engineer	6,944				6,944
Wastewater Engineering	1,964				1,964
Water Operations	23,927	21,423	2,504		
Water Quality and Technology	2,929	2,622	307		
Sewer Operations	14,074				14,074
Maintenance	17,807	1,116	130		16,561
Pumping Operations/DDCS					
Water Purchase	28,357	28,357			
Net Distribution & Conveyance	20,441	14,420	1,685		4,335
Engineering and Technical Services	23,995	7,509	878	1,135	14,474
Customer Experience	32,406			16,203	16,203
Permits	2,680	1,891	221		568
Clean Rivers	2,274				2,274
Administration	67,731	20,910	1,548	4,688	40,586
Less: Fire O&M	-8,542	-7,648	-894		
Debt Service					
Jennings Randolph Bonds	805	518	287		
1998 Revenue Bonds	22,647	4,373	2,422		15,853
Capital Equipment Financing	0	0	0		0
Series 2007A Subordinate Bond	0	0	0		0
Series 2008A Subordinate Bond	7,208	2,300	1,274		3,634
Series 2009A Revenue Bond	4,436	1,004	556		2,876
Series 2010A Revenue Bond	10,999	1,563	865		8,570
Series 2012A,B-1,B-2,C Subordinate Bond	21,058	1,515	839		18,704
Series 2013A Subordinate Bond	14,994	997	552		13,445
Series 2014A Revenue Bond	16,849				16,849
Series 2014B, C Subordinate Bond	18,717	1,244	689		16,784
Series 2015A,B Subordinate Bond	18,101	2,157	1,194		14,750
Series 2016 Subordinate Bond	17,420	2,075	1,149		14,195
Series 2016B Subordinate Bond	858	87	48		722
Series 2017 A&B Revenue Bond	17,072	1,733	960		14,379
Series 2018 A&B Revenue Bond	6,292	1,340	742		4,209
Commercial Paper	271	58	32		181
EMCP	674	144	80		451
Less Debt Service Attributable to Fire	-2,197	-1,604	-593		
Total Allocated	485,906	110,104	17,476	22,026	336,300

2018 Fire Protection Costs ($000)	Before Capitalization
Fire Share of Water Base Costs@.005	551
Fire Share of Peak Costs@1.58%	277

Table 3D – 2019 Cost Allocation

Category	2019 Actual ($000)	Water Base	Water Peak	Water Other	Wastewater & Storm/CSO
Operating Expense					
Wastewater Treatment - Operations	77,024				77,024
Wastewater Treatment - Process Engineer	6,892				6,892
Wastewater Engineering	1,740				1,740
Water Operations	23,863	21,563	2,300		
Water Quality and Technology	3,436	3,105	331		
Sewer Operations	15,916				15,916
Maintenance	18,867	1,193	127		17,546
Pumping Operations/DDCS					
Water Purchase	32,430	32,430			
Net Distribution & Conveyance	20,071	14,139	1,508		4,424
Engineering and Technical Services	21,564	6,810	726	1,020	13,007
Customer Experience	32,311			16,156	16,156
Permits	3,192	2,249	240		704
Clean Rivers	2,175				2,175
Administration	68,622	21,550	1,384	4,542	41,145
Less: Fire O&M	-9,399	-8,493	-906		
Debt Service					
Jennings Randolph Bonds	805	518	287		
1998 Revenue Bonds	23,281	4,495	2,489		16,297
Capital Equipment Financing	0	0	0		0
Series 2007A Subordinate Bond	0	0	0		0
Series 2008A Subordinate Bond	0	0	0		0
Series 2009A Revenue Bond	0	0	0		0
Series 2010A Revenue Bond	10,864	1,544	855		8,466
Series 2012A,B-1,B-2,C Subordinate Bond	20,923	1,505	834		18,584
Series 2013A Subordinate Bond	14,905	991	549		13,365
Series 2014A Revenue Bond	16,749				16,749
Series 2014B, C Subordinate Bond	19,466	1,294	717		17,455
Series 2015A,B Subordinate Bond	19,412	2,313	1,281		15,818
Series 2016 Subordinate Bond	28,843	3,437	1,903		23,503
Series 2016B Subordinate Bond	853	87	48		719
Series 2017 A&B Revenue Bond Bond	16,973	1,723	954		14,296
Series 2018 A&B Revenue Bond	18,279	3,894	2,157		12,228
Commercial Paper	827	127	70		629
EMCP	856	132	73		651
Less Debt Service Attributable to Fire	-2,276	-1,661	-614		
Total Allocated	509,463	114,944	17,313	21,718	355,488

2018 Fire Protection Costs ($000)	Before Capitalization
Fire Share of Water Base Costs@.005	575
Fire Share of Peak Costs@1.58%	273

Table 3E – 2020 Cost Allocation

Category	2020 Approved ($000)	Water Base	Water Peak	Water Other	Wastewater & Storm/CSO
Operating Expense					
Wastewater Treatment - Operations	77,105				77,105
Wastewater Treatment - Process Engineer	7,064				7,064
Wastewater Engineering	3,995				3,995
Water Operations					
Water Purchase	34,929	34,929			
Other Water Operations	30,195	27,584	2,611		
Sewer Operations	15,829				15,829
Maintenance	19,653	1,257	119		18,277
Pumping Operations/DDCS	18,616	13,681	1,295		3,640
Engineering and Technical Services	24,962	7,970	755	1,181	15,057
Customer Experience	32,149			16,075	16,075
Permits	3,693	2,714	257		722
Clean Rivers	2,761				2,761
Administration	77,642	25,255	1,443	4,945	45,999
Less: Fire O&M	-9,314	-8,509	-806		
Debt Service					
Jennings Randolph Bonds	805	518	287		
1998 Revenue Bonds	23,368	4,512	2,499		16,357
Capital Equipment Financing	0	0	0		0
Series 2007A Subordinate Bond	0	0	0		0
Series 2008A Subordinate Bond	0	0	0		0
Series 2009A Revenue Bond	0	0	0		0
Series 2010A Revenue Bond	15,456	2,196	1,216		12,044
Series 2012A,B-1,B-2,C Subordinate Bond	20,091	1,446	801		17,845
Series 2013A Subordinate Bond	0	0	0		0
Series 2014A Revenue Bond	16,849				16,849
Series 2014B, C Subordinate Bond	32,304	2,147	1,189		28,967
Series 2015A,B Subordinate Bond	19,423	2,314	1,282		15,827
Series 2016 Subordinate Bond	17,039	2,030	1,124		13,885
Series 2016B Subordinate Bond	858	87	48		722
Series 2017 A&B Revenue Bond Bond	17,845	1,811	1,003		15,030
Series 2018 A&B Revenue Bond	18,324	3,904	2,162		12,258
Series 2019A,B Subordinate Bond	6,883	1,060	587		5,237
Series 2019C Subordinate Bond	1,572	242	134		1,196
Series 2019D Subordinate Bond	11,320	1,743	965		8,612
Commercial Paper	1,500	259	143		1,098
EMCP	1,500	259	143		1,098
Less Debt Service Attributable to Fire	-2,468	-1,802	-666		
Total Allocated	541,948	127,606	18,593	22,200	373,550

2018 Fire Protection Costs ($000)	Before Capitalization
Fire Share of Water Base Costs@.005	638
Fire Share of Peak Costs@1.58%	293

Table 3F – 2021 Cost Allocation

Category	2021 Approved ($000)	Water Base	Water Peak	Water Other	Wastewater & Storm/CSO
Operating Expense					
Wastewater Treatment - Operations	79,533				79,533
Wastewater Treatment - Process Engineer	7,232				7,232
Wastewater Engineering	3,599				3,599
Water Operations					
Water Purchase	36,250	36,250			
Other Water Operations	31,795	29,045	2,750		
Sewer Operations	0				0
Maintenance	20,075	1,284	122		18,670
Pumping Operations/DDCS	37,970	27,402	2,594		7,974
Engineering and Technical Services	24,937	7,962	754	1,180	15,042
CIP Infrastructure Management	1,259	402	38	60	759
Customer Experience	32,149			16,075	16,075
Permits	4,165	3,006	285		875
Clean Rivers	2,951				2,951
Administration	85,752	32,045	1,990	5,266	46,451
Less: Fire O&M	-9,128	-8,338	-789		
Debt Service					
Jennings Randolph Bonds	805	518	287		
1998 Revenue Bonds	23,365	4,511	2,498		16,355
Capital Equipment Financing	0	0	0		0
Series 2007A Subordinate Bond	0	0	0		0
Series 2008A Subordinate Bond	0	0	0		0
Series 2009A Revenue Bond	0	0	0		0
Series 2010A Revenue Bond	15,564	2,211	1,225		12,128
Series 2012A,B-1,B-2,C Subordinate Bond	20,087	1,445	800		17,841
Series 2013A Subordinate Bond	0	0	0		0
Series 2014A Revenue Bond	16,849				16,849
Series 2014B, C Subordinate Bond	32,846	2,183	1,209		29,453
Series 2015A,B Subordinate Bond	24,733	2,947	1,632		20,154
Series 2016 Subordinate Bond	17,039	2,030	1,124		13,885
Series 2016B Subordinate Bond	835	85	47		703
Series 2017 A&B Revenue Bond Bond	17,848	1,812	1,003		15,033
Series 2018 A&B Revenue Bond	18,324	3,904	2,162		12,258
Series 2019A,B Subordinate Bond	7,625	1,174	650		5,801
Series 2019C Subordinate Bond	1,741	268	148		1,325
Series 2019D Subordinate Bond	12,308	1,895	1,049		9,364
DC Water Future Bonds	9,298	1,603	888		6,807
Commercial Paper	1,500	259	143		1,098
EMCP	1,500	259	143		1,098
Less Debt Service Attributable to Fire	-2,545	-1,858	-687		
Total Allocated	578,262	154,304	22,067	22,580	379,312

2018 Fire Protection Costs ($000)	Before Capitalization
Fire Share of Water Base Costs@.005	772
Fire Share of Peak Costs@1.58%	348

5.3 Supporting Information for Table 5

The tables presented below convert public and private customer values into equivalent connections based on the diameter of the fire connections for 2016 to 2020 (it is assumed that all hydrants have a six inch connection). The values for 2020 are used for 2021 and each year thereafter.

Table 5A – 2016 through 2018 Equivalent Fire Connections

Fire Hydrants	Number in Service	Demand Factor	Equivalent Connections	% of Total
2016				
Public Fire Hydrants	9,517	111.31	1,059,337	75.32%
Private Fire Hydrants	1,318	111.31	146,707	10.43%
Private Fire Lines (Estimated)	1,800	111.31	200,358	14.25%
Total Public and Private	12,635		1,406,402	100.00%
2017				
Public Fire Hydrants	9,551	111.31	1,063,122	75.39%
Private Fire Hydrants	1,318	111.31	146,707	10.40%
Private Fire Lines (Estimated)	1,800	111.31	200,358	14.21%
Total Public and Private	12,669		1,410,186	100.00%
2018				
Public Fire Hydrants	9,881	111.31	1,099,854	76.07%
Private Fire Hydrants	1,308	111.31	145,593	10.07%
Private Fire Lines (Estimated)	1,800	111.31	200,358	13.86%
Total Public and Private	12,989		1,445,806	100.00%

Table 5B – 2019 and 2020 Equivalent Fire Connections

Fire Hydrants	Number in Service	Demand Factor	Equivalent Connections	% of Total
2019				
Public Fire Hydrants	9,771	111.31	1,087,610	75.93%
Private Fire Hydrants	1,298	111.31	144,480	10.09%
Private Fire Lines (Estimated)	1,800	111.31	200,358	13.99%
Total Public and Private	12,869		1,432,448	100.00%
2020				
Public Fire Hydrants	9,395	111.31	1,045,757	75.21%
Private Fire Hydrants	1,296	111.31	144,258	10.38%
Private Fire Lines (Estimated)	1,800	111.31	200,358	14.41%
Total Public and Private	12,491		1,390,373	100.00%

5.4 Fire-Related Capitalization Policy

The fire hydrant is an asset tracked by DWS. The asset includes both the visible and invisible mechanical parts. The non-visible parts are connected to the fire hydrant lead pipe (pipe that connects the fire hydrant to the main) and terminate at the safety flange. All but two to six inches of this portion of the fire hydrant is below ground. The visible parts are connected at the safety flange and are referred to as the top section.

DWS performs tasks that increase the life of the asset to 30 years (meeting capitalization requirements) by meeting the criteria agreed upon by FEMS and DC Water in the MOU signed in 2013. These tasks include the following:

- Upgrading the 4 inch nozzle to 4.5 inches.
- Replacing the top section of the hydrant (does not involve construction).
- Replacing the entire fire hydrant assembly (involves construction).

Additionally, DWS provides maintenance of all hydrants in the public space. This is accomplished by providing preventative maintenance and upgrades to existing fire hydrants. Preventative maintenance consists of but is not limited to the following:

- Replacing key nuts, bolts, caps, nozzles, gaskets, chains.
- Repairing operating assembly, damaged threads.

These tasks are operational and do not increase the life of the asset but do help it achieve its intended useful life.

Valves are assets that are also tracked by DWS. Control valves are used to isolate flow to fire hydrants without impacting customers. DWS performs tasks that help preserve the useful life of the asset. This task is exercising the valve during the annual unidirectional flow program. This is an operational task. Furthermore, daily tasks associated with designing valve shuts and providing oversight to those who operate the valves in support of the fire hydrant program are considered to be operating expenses.

5.5 Allocation Ratios for Capitalization

The following table illustrates the allocation ratios that were used in computing debt service attributable to hydrant installation and restoration costs that are assumed to be financed through DC Water debt obligations and not funded through PAYGO.

Table 9A – Allocation Ratio

Bond	Bond Proceeds	Paygo %	Cumulative Fire Costs Not Funded via PAYGO	Allocation
2006		22%	144,445	
2007A	231,550,000			
2007B	58,450,000	6%	4,554,391	
2008 Total	290,000,000		4,698,836	1.62%
2008A	Refunding	0%	13,545,049	
2009 Total	290,000,000		18,243,885	6.29%
2009A	299,033,760	4%	11,029,212	
2010 Total	589,033,760		29,273,097	4.97%
2010A	287,219,747	11%	4,595,778	
2011 Total	876,253,507		33,868,875	3.87%
	No Bond Issued	1%	2,699,084	
2012 Total	876,253,507		36,567,959	4.17%
2012A	202,951,631			
2012B1, B2	97,050,144			
2012C	Refunding	7%	2,513,958	
2013 Total	1,176,255,282		39,081,917	3.32%
2013A	298,920,565	9%	1,441,563	
2014 Total	1,475,175,847		40,523,480	2.75%
2014A	346,002,729			
2014B	99,521,298			
2014C	Refunding	4%	448,933	
2015 Total	1,920,699,874		40,972,414	2.13%
2015A/B	404,453,241	24%	217,891	
2016 Total	2,325,153,115		41,190,305	1.77%
2016A	Refunding			
2016B	25,000,000	12%	176,643	
2017 Total	2,350,153,115		41,366,948	1.76%

2017AB	332,372,567	19%	773,291	
2018 Total	2,682,525,682		42,140,238	1.57%
2018 AB	346,672,033	19%	742,055	
2019 Total	3,029,197,715		42,882,294	1.42%
	No Bond Issued	60%	306,167	
2020 Total	3,029,197,715		43,188,460	1.43%
2019A	104,010,000			
2019B	58,320,000			
2019C	99,505,000			
2019D	Refunding	24%	832,281	
2021 Total	3,291,032,715		44,020,741	1.34%
2021 Bonds	300,000,000	24%	862,889	
2022 Total	3,591,032,715		44,883,630	1.25%
2022 Bonds	265,140,000	26%	863,500	
2023 Total	3,856,172,715		45,747,130	1.19%
2023 Bonds	265,046,000	28%	861,061	
2024 Total	4,121,218,715		46,608,191	1.13%
2024 Bonds	153,040,000	41%	728,961	
2025 Total	4,274,258,715		47,337,153	1.11%

Notes:
1. Source: Sources and Uses tables from the Official Statement for each bond issue.
2. 2021-2024 Bond proceeds and fire costs are projected.