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Report on the Actuarial Valuations of the

**Teachers' Retirement Plan and
Police Officers & Firefighters'
Retirement Plan**

**Prepared as of October 1, 2018
for the District of Columbia
Retirement Board**





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December 17, 2018

The Board of Trustees
District of Columbia Retirement Board
900 7th Street, NW, 2nd Floor
Washington, DC 20001

Dear Trustees:

We are pleased to submit the results of the annual valuations to the District of Columbia Retirement Board for the District of Columbia Teachers' Retirement Plan (the Teachers' Retirement Plan), and the District of Columbia Police Officers and Firefighters' Retirement Plan (the Police Officers and Firefighters' Retirement Plan), prepared as of October 1, 2018.

The purpose of this report is to provide a summary of the funded status of each Plan as of October 1, 2018, and to recommend rates of contribution to be paid by the District in the 2020 fiscal year. The information needed for this Plan under Governmental Accounting Standards Board (GASB) Statement No. 67 is provided in a separate report. However, for informational purposes only, we have also provided accounting information under GASB 25 and 27 in Section VIII of the report. While not verifying the data at source, the actuary performed tests for consistency and reasonability.

The promised benefits are included in the actuarially calculated contribution rates which are developed using the Entry Age Normal cost method. A five-year smoothed market value of assets is used for actuarial valuation purposes. The assumptions recommended by the actuary and adopted by the Board are reasonably related to the experience under the District of Columbia Teachers' Retirement Fund and the District of Columbia Police Officers and Fire Fighters' Retirement Fund (collectively referred to as the Fund) and to reasonable expectations of anticipated experience under the Fund.

There have been no changes in the actuarial assumptions and methods or the benefit provisions since the previous valuation. However, retroactive payroll increases were provided to active members in the Teachers' Retirement Plan and the Firefighters' Retirement Plan.

The funding policy adopted by the Board in 2012 includes the following funding goals:

- To maintain an increasing or stable ratio of Plan assets to actuarial accrued liabilities and reach a 100 percent minimum funded ratio;
- To develop a pattern of stable or declining contribution rates when expressed as a percentage of member payroll as measured by valuations prepared in accordance with the principles of practice prescribed by the Actuarial Standards Board, with a minimum employer contribution equal to the lesser of the normal cost determined under the Entry Age Normal cost method or the current active member contribution rate.



December 17, 2018
The Board of Trustees
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The funding policy was amended by the Board in 2017 to:

- Amortize the legacy Unfunded Actuarial Accrued Liability (UAAL) as of October 1, 2017 over a closed 15-year period on a level dollar basis.
- In subsequent valuations, all benefit changes, assumption and method changes and experience gains and/or losses that have occurred since the previous valuation will be amortized over a closed 20-year period from the date it is established.
- Change the asset smoothing period from seven years to five years.

Future actuarial results may differ significantly from the current results presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements; and changes in plan provisions or applicable law. Since the potential impact of such factors is outside the scope of a normal annual actuarial valuation, an analysis of the range of results is not presented herein.

This is to certify that the independent consulting actuary is a member of the American Academy of Actuaries and has experience in performing valuations for public retirement systems, that the valuation was prepared in accordance with principles of practice prescribed by the Actuarial Standards Board, and that the actuarial calculations were performed by qualified actuaries in accordance with accepted actuarial procedures, based on the current provisions of the Plans and on actuarial assumptions that are internally consistent and reasonably based on the actual experience of the Plans.

The actuarial computations presented in this report are for purposes of determining the recommended funding amounts for the Plans. Use of these computations for purposes other than meeting these requirements may not be appropriate.

The Table of Contents, which immediately follows, outlines the material contained in the report.

Respectfully submitted,

A handwritten signature in blue ink that reads "Edward J. Koebel".

Edward J. Koebel, EA, FCA, MAAA
Principal and Consulting Actuary

A handwritten signature in blue ink that reads "Jonathan T. Craven".

Jonathan T. Craven, ASA, EA, FCA, MAAA
Consulting Actuary

EJK/JTC:bvb



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Section I – Summary of Principal Results

1. For convenience of reference, the principal results of the valuation and a comparison with the preceding year's results for the Teachers' Retirement Plan and Police Officers and Firefighters' Retirement Plan are summarized below in the tables that follow.

SUMMARY OF PRINCIPAL RESULTS FOR TEACHERS' RETIREMENT PLAN (\$ IN THOUSANDS)

VALUATION DATE	October 1, 2018	October 1, 2017
Number of Active Members	5,066	5,199
Annual Covered Payroll	\$470,749	\$447,762
Number of Retired Members and Survivors	3,990	3,899
Annual Retirement Benefits	\$76,535	\$71,201
Assets:		
Actuarial Value	\$2,139,911	\$1,982,019
Market Value	\$2,193,598	\$2,051,006
Liabilities:		
Actuarial Accrued Liability	\$2,301,314	\$2,142,491
Unfunded Actuarial Accrued Liability (UAAL)	\$161,403	\$160,472
Funding Ratios:		
Based on Actuarial Value	92.99%	92.51%
Based on Market Value	95.32%	95.73%
CONTRIBUTION FOR FISCAL YEAR ENDING	09/30/2020	09/30/2019
Employer Normal Cost Rate*	7.97%	7.55%
Amortization of UAAL Rate	3.70	3.54
Actuarially Determined Contribution Rate (ADC)	11.67%	11.09%
Estimated Fiscal Year End Covered Payroll	\$490,756	\$466,792
Fiscal Year District Payment before 1-907.02(c)	\$57,271	\$51,767
Shortfall/(Overpayment)	1,617	1,576
Fiscal Year District Payment	\$58,888	\$53,343

*The normal cost rate includes the administrative expense rate of 1.20%.



Section I – Summary of Principal Results

SUMMARY OF PRINCIPAL RESULTS FOR POLICE OFFICERS' RETIREMENT PLAN (\$ IN THOUSANDS)

VALUATION DATE	October 1, 2018	October 1, 2017
Total Number of Active Members	3,567	3,583
Total Annual Covered Payroll	\$297,283	\$299,535
Number of Retired Members and Survivors	2,593	2,419
Annual Retirement Benefits	\$83,476	\$72,463
Total Assets:		
Actuarial Value	\$4,083,671	\$3,794,954
Market Value	\$4,199,797	\$3,949,045
Liabilities:		
Actuarial Accrued Liability	\$3,592,965	\$3,412,554
Unfunded Actuarial Accrued Liability (UAAL)	(\$490,706)	(\$382,400)
Funding Ratios:		
Based on Actuarial Value	113.66%	111.21%
Based on Market Value	116.89%	115.72%
CONTRIBUTION FOR FISCAL YEAR ENDING	09/30/2020	09/30/2019
Employer Normal Cost Rate*	33.03%	32.15%
Amortization of UAAL Rate	(17.45)	(13.10)
Actuarially Determined Contribution Rate (ADC)	15.58%	19.05%
Estimated Fiscal Year End Covered Payroll	\$309,918	\$312,265
Fiscal Year District Payment before 1-907.02(c)	\$48,285	\$59,486
Shortfall/(Overpayment)	(2,864)	(4,964)
Fiscal Year District Payment	\$45,421	\$54,522

* The normal cost rate includes the administrative expense rate of 2.10%.



Section I – Summary of Principal Results

SUMMARY OF PRINCIPAL RESULTS FOR FIREFIGHTERS' RETIREMENT PLAN (\$ IN THOUSANDS)

VALUATION DATE	October 1, 2018	October 1, 2017
Total Number of Active Members	1,782	1,729
Total Annual Covered Payroll	\$156,926	\$142,370
Number of Retired Members and Survivors	848	796
Annual Retirement Benefits	\$28,348	\$25,223
Total Assets:		
Actuarial Value	\$1,764,905	\$1,611,413
Market Value	\$1,816,156	\$1,680,866
Liabilities:		
Actuarial Accrued Liability	\$1,630,796	\$1,465,707
Unfunded Actuarial Accrued Liability (UAAL)	(\$134,109)	(\$145,706)
Funding Ratios:		
Based on Actuarial Value	108.22%	109.94%
Based on Market Value	111.37%	114.68%
CONTRIBUTION FOR FISCAL YEAR ENDING	09/30/2020	09/30/2019
Employer Normal Cost Rate*	35.29%	35.46%
Amortization of UAAL Rate	(8.54)	(10.07)
Actuarially Determined Contribution Rate (ADC)	26.75%	25.39%
Estimated Fiscal Year End Covered Payroll	\$163,595	\$148,421
Fiscal Year District Payment before 1-907.02(c)	\$43,762	\$37,684
Shortfall/(Overpayment)	3,878	(922)
Fiscal Year District Payment	\$47,640	\$36,762

* The normal cost rate includes the administrative expense rate of 2.10%.



Section I – Summary of Principal Results

SUMMARY OF PRINCIPAL RESULTS FOR POLICE OFFICERS & FIREFIGHTERS' RETIREMENT PLAN (\$ IN THOUSANDS)

VALUATION DATE	October 1, 2018	October 1, 2017
Number of Active Police Officers	3,567	3,583
Annual Covered Payroll	\$297,283	\$299,535
Number of Active Firefighters	1,782	1,729
Annual Covered Payroll	\$156,926	\$142,370
Total Number of Active Members	5,349	5,312
Total Annual Covered Payroll	\$454,209	\$441,905
Number of Retired Members and Survivors	3,441	3,215
Annual Retirement Benefits	\$111,824	\$97,686
Assets:		
Actuarial Value	\$5,848,576	\$5,406,366
Market Value	\$6,015,953	\$5,629,911
Liabilities:		
Actuarial Accrued Liability	\$5,223,761	\$4,878,260
Unfunded Actuarial Accrued Liability (UAAL)	(\$624,815)	(\$528,106)
Funding Ratios:		
Based on Actuarial Value	111.96%	110.84%
Based on Market Value	115.17%	115.41%
CONTRIBUTIONS FOR FISCAL YEAR ENDING	09/30/2020	09/30/2019
Employer Normal Cost Rate*	33.81%	33.21%
Amortization of UAAL Rate	(14.37)	(12.12)
Actuarially Determined Contribution Rate (ADC)	19.44%	21.09%
Estimated Fiscal Year End Covered Payroll	\$473,513	\$460,686
Fiscal Year District Payment before 1-907.02(c)	\$92,047	\$97,170
Shortfall/(Overpayment)	1,014	(5,886)
Fiscal Year District Payment	\$93,061	\$91,284

* The normal cost rate includes the administrative expense rate of 2.10%.



Section I – Summary of Principal Results

2. The valuation balance sheet showing the results is given in Schedule A.
3. Comments on the valuation results as of October 1, 2018 are given in Section IV and further adjustments of the contribution amounts are set out in Section V.
4. Schedule B of this report shows the development of the actuarial value of assets. Schedule D outlines the full set of actuarial assumptions and methods employed. No changes were made to the actuarial assumptions and methods since the previous valuation.
5. The funding policy adopted by the Board in 2012 was amended in 2017 to:
 - Amortize the legacy Unfunded Actuarial Accrued Liability (UAAL) as of October 1, 2017 over a closed 15-year period on a level dollar basis.
 - The assumption and method changes and experience gains for the October 1, 2017 valuation will be amortized over a closed 20-year period from the valuation date.
 - In subsequent valuations, all benefit changes, assumption and method changes and experience gains and/or losses that have occurred since the previous valuation will be amortized over a closed 20-year period from the date it is established.
 - Change the asset smoothing period from seven years to five years.
6. The valuation takes into account the effect of any amendments to the Plan through the valuation date. The Main Provisions of the Plans, as summarized in Schedule E, were taken into account in the current valuation. No changes were made to the main provisions since the previous valuation.
7. Membership and asset data was provided by the Plan's staff and was reviewed for reasonableness and consistency with data from prior valuations. Where data was incomplete but thought to be credible, assumptions were made for missing items. The valuation results depend on the integrity of the data. If any of this information is inaccurate, our results may differ and our calculations may need to be revised. All membership data was collected as of July 1, 2018, but for valuation purposes, (e.g., age, service) all members were treated as if remaining in the System as of October 1, 2018.



Section II – Membership Data

- Data regarding the membership of the Plans for use as a basis of the valuation were furnished by DCRB, the District Government and the U.S. Department of the Treasury. The following table shows the number of active members and their annual compensation as of October 1, 2018, on the basis of which the valuation was prepared.

TABLE 1
THE NUMBER AND ANNUAL COMPENSATION OF
ACTIVE MEMBERS AS OF OCTOBER 1, 2018
(\$ IN THOUSANDS)

GROUP	NUMBER	COMPENSATION
Teachers	5,066	\$470,749
Police Officers	3,567	297,283
Firefighters	<u>1,782</u>	<u>156,926</u>
Total	10,415	\$924,958

- The following table shows a five-year history of active member valuation data.

TABLE 2
SCHEDULE OF TOTAL ACTIVE MEMBER VALUATION DATA

VALUATION DATE	NUMBER	ANNUAL PAYROLL (\$ IN THOUSANDS)	ANNUAL AVERAGE PAY	% CHANGE IN AVERAGE PAY
10/01/2018	10,415	\$ 924,958	\$ 88,810	4.93 %
10/01/2017	10,511	889,667	84,642	1.43
10/01/2016	10,500	876,193	83,447	0.56
10/01/2015	10,403	863,291	82,985	2.04
10/01/2014	10,050	817,341	81,327	2.79



Section II – Membership Data

3. The following tables show the number and annual retirement benefits payable to retired members and survivors on the roll of DCRB as of the valuation date.

TABLE 3
THE NUMBER AND ANNUAL RETIREMENT BENEFITS
OF RETIRED MEMBERS AND SURVIVORS OF DECEASED MEMBERS*
ON THE ROLL AS OF OCTOBER 1, 2018
(\$ IN THOUSANDS)

DISTRICT ONLY

TYPE OF RETIREMENT	GROUP			TOTAL
	TEACHERS	POLICE OFFICERS	FIREFIIGHTERS	
Service:				
Number	3,709	1,894	623	6,226
Annual Benefits	\$72,709	\$68,224	\$23,216	\$164,149
Disability:				
Number	106	311	91	508
Annual Benefits	\$2,530	\$9,137	\$2,554	\$14,221
Survivors:				
Number	175	388	134	697
Annual Benefits	\$1,296	\$6,115	\$2,578	\$9,989
Total:				
Number	3,990	2,593	848	7,431
Annual Benefits	\$76,535	\$83,476	\$28,348	\$188,359

*In addition, there are 1,744 deferred vested participants with annual deferred benefits of \$26,780,433.



Section II – Membership Data

TABLE 4

**THE NUMBER AND ANNUAL RETIREMENT BENEFITS
OF RETIRED MEMBERS AND SURVIVORS OF DECEASED MEMBERS
ON THE ROLL AS OF OCTOBER 1, 2018
(\$ IN THOUSANDS)**

FEDERAL PLUS DISTRICT

TYPE OF RETIREMENT	GROUP			
	TEACHERS	POLICE OFFICERS	FIREFIIGHTERS	TOTAL
Service:				
Number	5,284	3,828	1,162	10,274
Annual Benefits	\$255,266	\$243,204	\$85,554	\$584,024
Disability:				
Number	275	925	346	1,546
Annual Benefits	\$9,045	\$41,379	\$17,682	\$68,106
Survivors:				
Number	447	1,476	529	2,452
Annual Benefits	\$9,395	\$44,868	\$16,597	\$70,860
Total:				
Number	6,006	6,229	2,037	14,272
Annual Benefits	\$273,706	\$329,451	\$119,833	\$722,990

4. Tables 4 through 6 of Schedule F show the distribution by age and service of the number and annual compensation of active members for each plan included in the valuation. Tables 7 through 12 of Schedule F show the distribution by age of the number and annual benefits of retired members for each plan included in the valuation.



Section III – Assets

- Schedule C shows the additions and deductions of DCRB for the year preceding the valuation date and a reconciliation of the fund balances at market value. As of October 1, 2018, the market value of assets used to determine the actuarial value of assets for each plan is shown below:

TABLE 5
COMPARISON OF MARKET VALUE OF ASSETS AT
OCTOBER 1, 2018 AND OCTOBER 1, 2017
(\$ IN THOUSANDS)

FUND	OCTOBER 1, 2018 MARKET VALUE	OCTOBER 1, 2017 MARKET VALUE
Teachers	\$2,193,598	\$2,051,006
Police Officers and Firefighters	<u>6,015,953</u>	<u>5,629,911</u>
Total Market Value of Assets	\$8,209,551	\$7,680,917

- The five-year market related actuarial value of assets used for the current valuation was \$7,988,487,377. Schedule B shows the development of the actuarial value of assets as of October 1, 2018. The following table shows the actuarial value of assets allocated between each plan.

TABLE 6
COMPARISON OF ACTUARIAL VALUE OF ASSETS AT
OCTOBER 1, 2018 AND OCTOBER 1, 2017
(\$ IN THOUSANDS)

FUND	OCTOBER 1, 2018 ACTUARIAL VALUE	OCTOBER 1, 2017 ACTUARIAL VALUE
Teachers	\$2,139,911	\$1,982,019
Police Officers and Firefighters	<u>5,848,576</u>	<u>5,406,366</u>
Total Actuarial Value of Assets	\$7,988,487	\$7,388,385



Section IV – Comments on Valuation

Teachers' Retirement Plan

1. The total valuation balance sheet on account of benefits shows that the Teachers' Retirement Plan has total prospective benefit liabilities of \$2,876,183,114, of which \$1,054,091,064 is for the prospective benefits payable on account of present retired members and survivors of deceased members, \$180,705,046 is for the prospective benefits payable on account of present inactive members, and \$1,641,387,004 is for the prospective benefits payable on account of present active members. Against these benefit liabilities the Teachers' Retirement Plan has a total present actuarial value of assets of \$2,139,911,003 as of October 1, 2018. The difference of \$736,272,111 between the total liabilities and the total present actuarial value of assets represents the present value of contributions to be made in the future on account of benefits.
2. The contributions to the Plan consist of normal cost contributions and actuarial accrued liability contributions. The valuation indicates the normal contributions at a rate of 14.67% of payroll are required under the entry age method. Of this amount 7.90% will be paid by the members (at the rate of 7.0% of salary for members hired before November 1, 1996 and 8.0% of salary for members hired on or after November 1, 1996), in 2020 and the remaining 6.77% is payable by the District.
3. Estimated budgeted administrative expenses are included in the normal rates. The expenses for the fiscal year ending September 30, 2020 are estimated to be 1.20% of payroll.
4. Prospective normal cost contributions (excluding administrative expenses) at the rate of 14.67% have a present value of \$574,869,053. When this amount is subtracted from \$736,272,111, which is the present value of total future contributions to be made, there remains \$161,403,058 as the amount of unfunded actuarial accrued liability contributions. The development of the unfunded actuarial accrued liability is shown in Schedule A.
5. The unfunded actuarial accrued liability (UAAL) increased approximately \$0.9 million for the plan year ending September 30, 2018 and the funding ratio increased slightly from 92.51% to 92.99%. The slight increase in the UAAL was primarily due to higher salary increases for active members than expected offset by lower actual Cost-of-Living Adjustment (COLA) for retired members than expected and investment earnings on an actuarial value basis that was higher than the expected rate of 6.50%. See Schedule H for a complete breakdown of the experience of the Plan.



Section IV – Comments on Valuation

Police Officers and Firefighters' Retirement Plan

1. The total valuation balance sheet on account of benefits shows that the combined Police Officers and Firefighters' Retirement Plan has total prospective benefit liabilities of \$7,252,999,116, of which \$2,170,286,507 is for the prospective benefits payable on account of present retired members and survivors of deceased members, \$88,408,692 is for the prospective benefits payable on account of present inactive members, and \$4,994,303,917 is for the prospective benefits payable on account of present active members. Against these benefit liabilities the Police Officers and Firefighters' Retirement Plan has a total present actuarial value of assets of \$5,848,576,374 as of October 1, 2018. The difference of \$1,404,422,742 between the total liabilities and the total present actuarial value of assets represents the present value of contributions to be made in the future on account of benefits.
2. The contributions to the Plan consist of normal cost contributions and actuarial accrued liability contributions. The valuation indicates the normal contributions at a rate of 39.45% of payroll are required under the entry age method. Of this amount 7.74% will be paid by the members (at the rate of 7.0% of salary for members hired before November 10, 1996 and 8.0% of salary for members hired on or after November 10, 1996), in 2020 and the remaining 31.71% is payable by the District.
3. Estimated budgeted administrative expenses are included in the normal rates. The expenses for the fiscal year ending September 30, 2020 are estimated to be 2.10% of payroll.
4. Prospective normal cost contributions (excluding administrative expenses) at the rate of 39.45% have a present value of \$2,029,238,400. When this amount is subtracted from \$1,404,422,742, which is the present value of total future contributions to be made, there remains a surplus of (\$624,815,658) as the amount of unfunded actuarial accrued liability contributions. The development of the unfunded actuarial accrued liability is shown in Schedule A.
5. The unfunded actuarial accrued liability (UAAL) decreased approximately \$96.7 million for the plan year ending September 30, 2018 and the funding ratio increased slightly from 110.83% to 111.96%. The decrease in the UAAL was primarily due to lower salary increases for active Police members than was expected, lower actual Cost-of-Living Adjustment (COLA) for retired members than expected, and investment earnings on an actuarial value basis that was higher than the expected rate of 6.50%. These gains were partially offset by the higher salary increase for active Firefighter members. See Schedule H for a complete breakdown of the experience of the Plan.



Section V – §1-907.02(c) Adjustments to 2020 Payment

- Beginning in fiscal year 2001, the District payment was adjusted pursuant to D.C. Code §1-907.02(c). This section stipulates that "...the enrolled actuary shall determine whether the amount appropriated for the applicable fiscal year resulted in an overpayment or a shortfall based upon the actual covered payroll."
- The D.C. Code §1-907.02(c) adjustment to the fiscal year 2020 District payment is calculated by taking the actual fiscal year 2018 covered payroll for each employee class (which is provided by the District) and multiplying by the corresponding fiscal year 2018 contribution rates, which were determined as of October 1, 2016. This result is the fiscal year 2018 contribution that was required to be made by the District, based on actual payroll. The required contribution is then compared to the actual contribution that was paid by the District based on projected payroll. The difference between the required and actual contributions is the D.C. Code §1-907.02(c) adjustment. Any adjustment amount that cannot be used in a given year is carried forward to the next fiscal year.

**ADJUSTMENT TO DISTRICT PAYMENT
AS OF OCTOBER 1, 2018
(\$ IN THOUSANDS)**

	Teachers	Police	Fire
(1) Actual FY 2018 Covered Payroll	\$470,749	\$297,283	\$156,926
(2) FY 2018 Contribution Rate	11.51%	20.69%	34.26%
(3) Actual FY 2018 Contribution Required	\$54,183	\$61,508	\$53,763
(4) Actual FY 2018 Contribution Paid without Adjustment	\$52,566	\$64,372	\$49,885
(5) Preliminary D.C. Code §1-907.02(c) Adjustment to FY 2019 Payment [(3) - (4)]	\$1,617	(\$2,864)	\$3,878
(6) FY 2018 Unrecognized Amount	\$0	\$0	\$0
(7) Final D.C. Code §1-907.02(c) Adjustment to FY 2019 Payment [(5) + (6) if applicable]	\$1,617	(\$2,864)	\$3,878
(8) Applicable Adjustment	\$1,617	(\$2,864)	\$3,878
(9) Carryover Adjustment [(7) - (8)]	\$0	\$0	\$0



Section VI – Contributions Payable

The following tables summarize the employer contribution rates, which were determined by the October 1, 2018 valuation and recommended for use for the fiscal year ending September 30, 2020.

TEACHERS' RETIREMENT PLAN ACTUARIAL DETERMINED CONTRIBUTIONS (ADC) FOR FISCAL YEAR ENDING SEPTEMBER 30, 2020

	PERCENTAGE OF ACTIVE MEMBERS' COMPENSATION	EMPLOYER ACTUARIAL DETERMINED CONTRIBUTION (ADC)
Normal Cost	6.77%	\$33,224,000
Expense Load	1.20	5,889,000
Accrued Liability	<u>3.70</u>	<u>18,158,000</u>
Sub-Total	11.67%	\$57,271,000
DC Code Adjustment		<u>1,617,000</u>
Total		\$58,888,000

POLICE OFFICERS AND FIREFIGHTERS' RETIREMENT PLAN ACTUARIAL DETERMINED CONTRIBUTIONS (ADC) FOR FISCAL YEAR ENDING SEPTEMBER 30, 2020

	PERCENTAGE OF ACTIVE MEMBERS' COMPENSATION	EMPLOYER ACTUARIAL DETERMINED CONTRIBUTION (ADC)
Normal Cost	31.71%	\$150,155,000
Expense Load	2.10	9,944,000
Accrued Liability	<u>(14.37)</u>	<u>(68,052,000)</u>
Sub-Total	19.44%	\$92,047,000
DC Code Adjustment		<u>1,014,000</u>
Total		\$93,061,000



Section VII – Risk Assessment

OVERVIEW

Actuarial Standards of Practice (ASOP) No. 51, issued by the Actuarial Standards Board, provides guidance on assessing and disclosing risks related to pension plan funding. This guidance is binding on all credentialed actuaries practicing in the United States. While this standard will be first effective for the October 1, 2019 valuation, we have included some analysis in this valuation to introduce these new concepts to the Board and to provide information that can be useful to the Board and others in their oversight of DCRB.

The term “risk” frequently has a negative connotation, but from an actuarial perspective, it may be thought of as simply the fact that what actually happens in the real world will not always match what was expected, based on actuarial assumptions. Of course, when actual experience is better than expected, the favorable risk is easily absorbed. The risk of unfavorable experience will likely be unpleasant, and so there is an understandable focus on the aspects of risk that are negative.

Risk usually can be reduced or eliminated at some cost. Consumers, for example, buy auto and home insurance to reduce the risk of financial loss due to accidents or catastrophes. Another way to express this concept, however, is that there is generally some reward for assuming risk. Thus, retirement plans invest not just in US Treasury bonds which have almost no risk, but also in equities which are considerably riskier – because they have an expected reward of a higher return that justifies the risk.

Under ASOP 51, the actuary is called on to identify the significant risks to the pension plan and provide information to help those sponsoring and administering the plan understand the implications of these risks. In this section, we identify some of the key risks for DCRB and provide information to help interested parties better understand these risks.



Section VII – Risk Assessment

INVESTMENT RISK

The investment return on assets is the most obvious risk – and usually the largest risk – to funding a pension plan. To illustrate the magnitude of this risk, please review the following chart showing the Asset Volatility Ratio (AVR), defined as the market value of assets divided by covered payroll (dollars in millions).

Valuation	Teachers' Retirement Plan			Police Officers and Firefighters' Retirement Plan		
	Market Value of Assets	Covered Payroll	Asset Volatility Ratio	Market Value of Assets	Covered Payroll	Asset Volatility Ratio
2010	\$1,314	\$338	3.89	\$2,921	\$424	6.89
2011	1,341	384	3.49	3,127	421	7.43
2012	1,503	381	3.94	3,682	415	8.87
2013	1,622	369	4.40	4,168	413	10.09
2014	1,746	379	4.61	4,588	438	10.47
2015	1,671	417	4.01	4,462	446	10.00
2016	1,822	438	4.16	4,954	438	11.31
2017	2,051	448	4.58	5,630	442	12.74
2018	2,193	471	4.66	6,016	454	13.25

The asset volatility ratio is especially useful to compare across plans or through time. It is also frequently useful to consider how the AVR translates into changes in the Required Contribution Rate (actuarially determined contribution rate). For example, the following table demonstrates that with an AVR of 4.00, if the market value return is 10% below assumed, or negative 3.50% for DCRB, there will be an increase in the Required Contribution Rate of 0.73% of payroll in the first year. Without asset smoothing or without returns above the expected return in the next four years, the impact on the Required Contribution Rate would be 3.63%. A higher AVR, as is seen in the Police Officers and Firefighters' Retirement Plan, would produce even more volatility in the Required Contribution Rate.

AVR	Impact of Return 10% Below Expected (Percent of Payroll)		
	Asset Value	Unsmoothed Amortization	Smoothed Amortization
4.0	40%	3.63%	0.73%
5.0	50%	4.54	0.91
6.0	60%	5.45	1.09
7.0	70%	6.35	1.27
8.0	80%	7.26	1.45
9.0	90%	8.17	1.63
10.0	100%	9.08	1.82
11.0	110%	9.98	2.00
12.0	120%	10.89	2.18
13.0	130%	11.80	2.36
14.0	140%	12.71	2.54



Section VII – Risk Assessment

SENSITIVITY MEASURES

Valuations are generally performed with a single set of assumptions that reflects the best estimate of future conditions, in the opinion of the actuary and typically the governing board. Note that under actuarial standards of practice, the set of economic assumptions used for funding must be consistent. To enhance the understanding of the importance of an assumption, a sensitivity test can be performed where the valuation results are recalculated using a different assumption or set of assumptions.

The following table contains the key measures for DCRB under the valuation assumption for investment return of 6.5%, along with the results if the assumption were 5.5% or 7.5%. In this analysis, only the investment return assumption is changed. Consequently, there may be inconsistencies between the investment return and other economic assumptions such as inflation or payroll increases. In addition, simply because the valuation results under alternative assumptions are shown here, it should not be implied that Cavanaugh Macdonald Consulting believes that either assumption (5.5% or 7.5%) would comply with actuarial standards of practice.

Teachers' Retirement Plan	Investment Return Assumption		
	5.50%	6.50%	7.50%
Normal Cost Rate	12.41%	7.97%	4.80%
Amortization of UAAL	<u>11.07%</u>	<u>3.70%</u>	<u>(3.13)%</u>
Total Required Contribution	23.48%	11.67%	1.67%
Contribution in Dollars (\$M) – Minimum Normal Cost	\$116.8	\$58.9	\$25.2
Funded Ratio	79.12%	92.99%	107.92%
Actuarial Accrued Liability (\$M)	\$2,704.8	\$2,301.3	\$1,982.8
Unfunded Actuarial Accrued Liability (\$M)	\$564.9	\$161.4	\$(157.1)

Police Officers and Firefighters' Retirement Plan	Investment Return Assumption		
	5.50%	6.50%	7.50%
Normal Cost Rate	46.79%	33.81%	24.25%
Amortization of UAAL	<u>5.71%</u>	<u>(14.37)%</u>	<u>(32.45)%</u>
Total Required Contribution	52.50%	19.44%	0.00%
Contribution in Dollars (\$M) – Minimum Employee Contribution	\$249.4	\$93.0	\$37.7
Funded Ratio	94.21%	111.96%	131.43%
Actuarial Accrued Liability (\$B)	\$6,208.1	\$5,223.8	\$4,449.8
Unfunded Actuarial Accrued Liability (\$B)	\$359.6	\$(624.8)	\$(1,398.7)



Section VII – Risk Assessment

MORTALITY RISK

The mortality assumption is a significant assumption for valuation results, second only to the investment assumption in most situations. The DCRB mortality assumption utilizes a mortality table (with separate rates for males and females, as well as different rates by status) and a projection scale for how the mortality table is expected to improve through time. This approach is the current state of the art in retirement actuarial practice, made possible by the increase in computational power over the past 20 years.

The future, however, is not known, and actual mortality improvements may occur at a faster rate than expected, or at a slower rate than expected (or even decline). Although changes in mortality will affect the benefits paid, this assumption is carefully studied during the regular experience studies that DCRB conducts so that incremental changes can be made to smoothly reflect unfolding experience.

CONTRIBUTION RISK

DCRB is primarily funded by member and employer contributions to the trust fund, together with the earnings on those accumulated contributions. Each year in the valuation, the Required Contribution Rate is determined, based on DCRB's funding policy (also in statute). This rate is the sum of the rates for the normal cost for the plan, the amortization of the UAAL, and the administrative expenses. Since the District is obligated to make 100% of the Required Contribution Rate by statute, there is no contribution risk for the Retirement Plans.



Section VIII – Accounting Information

1. Governmental Accounting Standards Board (GASB) Statements 67 and 68 are now used to determine the accounting results for the plans and are provided in a separate report. GASB 25 and 27 results are provided for informational purposes only. One such item is a distribution of the number of employees by type of membership, as follows:

**NUMBER OF ALL MEMBERS
AS OF OCTOBER 1, 2018**

GROUP	RETIREMENT PLAN			
	Teachers	Police Officers	Firefighters	Total
Retirees and survivors currently receiving benefits	3,990	2,593	848	7,431
Terminated employees entitled to benefits but not yet receiving benefits	1,429	222	93	1,744
Inactive Members	523	81	20	624
Active Members				
Vested	2,486	2,707	1,469	6,662
Non-vested	<u>2,580</u>	<u>860</u>	<u>313</u>	<u>3,753</u>
Total Active Members	5,066	3,567	1,782	10,415
Totals	11,008	6,463	2,743	20,214



Section VIII – Accounting Information

2. Another such item is the schedule of funding progress as shown below.

SCHEDULE OF FUNDING PROGRESS (\$ IN THOUSANDS)

Actuarial Valuation Date	Actuarial Value of Plan Assets (a)	Actuarial Liability (AAL) Entry Age (b)	Unfunded AAL (UAAL) (b - a)	Funded Ratio (a / b)	Covered Payroll (c)	UAAL as a Percentage of Covered Payroll ((b - a) / c)
TEACHERS' RETIREMENT PLAN						
10/1/2014	\$1,638,583	\$1,849,230	\$210,647	88.6 %	\$378,926	55.6 %
10/1/2015	1,732,017	1,953,305	221,288	88.7 %	417,090	53.1 %
10/1/2016	1,845,476	2,029,640	184,164	90.9 %	438,079	42.0 %
10/1/2017	1,982,019	2,142,491	160,472	92.5 %	447,762	35.8 %
10/1/2018	2,139,911	2,301,314	161,403	93.0 %	470,749	34.3 %
POLICE OFFICERS AND FIREFIGHTERS' RETIREMENT PLAN						
10/1/2014	\$4,288,727	\$3,998,537	(\$290,190)	107.3 %	\$438,415	(66.2)%
10/1/2015	4,607,300	4,283,093	(324,206)	107.6 %	446,201	(72.7)%
10/1/2016	4,985,051	4,498,513	(486,538)	110.8 %	438,114	(111.1)%
10/1/2017	5,406,366	4,878,260	(528,106)	110.8 %	441,905	(119.5)%
10/1/2018	5,848,576	5,223,760	(624,816)	112.0 %	454,209	(137.6)%
TOTAL						
10/1/2014	\$5,927,310	\$5,847,767	(\$79,543)	101.4 %	\$817,341	(9.7)%
10/1/2015	6,339,317	6,236,398	(102,918)	101.7 %	863,291	(11.9)%
10/1/2016	6,830,527	6,528,153	(302,374)	104.6 %	876,193	(34.5)%
10/1/2017	7,388,385	7,020,751	(367,634)	105.2 %	889,667	(41.3)%
10/1/2018	7,988,487	7,525,074	(463,413)	106.2 %	924,958	(50.1)%



Section VIII – Accounting Information

3. The information presented in the required supplementary schedules was determined as part of the actuarial valuation at October 1, 2018.

	Teachers	Police Officers & Firefighters
Valuation Date	10/1/2018	10/1/2018
Actuarial cost method	Entry Age Normal	Entry Age Normal
Amortization method	Level Dollar Closed	Level Dollar Closed
Remaining amortization period	13.3 years	13.9 years
Asset valuation method	5 year smoothed Market	5 year smoothed Market
Actuarial assumptions:		
Investment rate of return*	6.50%	6.50%
Projected salary increases**	5.50 – 8.63%	4.25 – 9.98%
Cost of living adjustments:	3.50%	3.50%
	(COLA limited to 3.00% for those hired after 11/1/1996)	(COLA limited to 3.00% for those hired after 11/10/1996)

* Includes inflation of 3.50%.

** Includes wage inflation of 4.25%.



Section IX – Experience

Actual experience will never (except by coincidence) coincide exactly with assumed experience. It is assumed that gains and losses will be in balance over a period of years, but sizable year to year fluctuations are common. Detail on the derivation of the experience gain/(loss) for the year ended September 30, 2018 is shown below.

Teachers' Retirement Plan

		<u>\$ Thousands</u>
(1)	UAAL* as of October 1, 2017	\$ 160,472
(2)	Total normal cost from last valuation (Including expenses)	69,108
(3)	Total actual contributions	99,370
(4)	Interest accrual: $[[(1) + (2)] \times .065] - [(3) \times .0325]$	<u>11,693</u>
(5)	Expected UAAL before changes: (1) + (2) – (3) + (4)	\$ 141,903
(6)	Change due to plan amendments	0
(7)	Change due to actuarial assumptions or methods	<u>0</u>
(8)	Expected UAAL after changes: (5) + (6) + (7)	\$ 141,903
(9)	Actual UAAL as of October 1, 2018	\$ 161,403
(10)	Gain/(loss): (8) – (9)	\$ (19,500)
(11)	Gain/(loss) as percent of actuarial accrued liabilities at start of year (\$2,142,491)	(0.9)%

*Unfunded actuarial accrued liability.

Valuation Date September 30	Actuarial Gain/(Loss) as a % of Beginning Accrued Liabilities
2015	(0.5)%
2016	1.9
2017	3.1
2018	(0.9)



Section IX – Experience

Police Officers and Firefighters' Retirement Plan

		<u>\$ Thousands</u>
(1)	UAAL* as of October 1, 2017	\$ (528,106)
(2)	Total normal cost from last valuation (including expenses)	180,774
(3)	Total actual contributions	140,074
(4)	Interest accrual: $[(1) + (2)] \times .065 - [(3) \times .0325]$	<u>(27,129)</u>
(5)	Expected UAAL before changes: (1) + (2) – (3) + (4)	\$ (514,535)
(6)	Change due to plan amendments	0
(7)	Change due to actuarial assumptions or methods	<u>0</u>
(8)	Expected UAAL after changes: (5) + (6) + (7)	\$ (514,535)
(9)	Actual UAAL as of October 1, 2018	\$ (624,816)
(10)	Gain/(loss): (8) – (9)	\$ 110,280
(11)	Gain/(loss) as percent of actuarial accrued liabilities at start of year (\$4,878,260)	2.3%

*Unfunded actuarial accrued liability.

Valuation Date September 30	Actuarial Gain/(Loss) as a % of Beginning Accrued Liabilities
2015	1.9%
2016	4.0
2017	3.2
2018	2.3



Schedule A – Valuation Balance Sheet and Solvency Test

SHOWING THE PRESENT AND PROSPECTIVE ASSETS AND LIABILITIES OF
THE DISTRICT OF COLUMBIA RETIREMENT BOARD
AS OF OCTOBER 1, 2018

TEACHERS' RETIREMENT PLAN

PRESENT AND PROSPECTIVE ASSETS		
Actuarial Value of Present Assets		2,139,911,003
Present value of future members' contributions		278,863,039
Present value of future employer contributions		
Normal contributions	\$296,006,014	
Unfunded accrued liability contributions	<u>161,403,058</u>	
Total prospective employer contributions		<u>457,409,072</u>
Total Present and Prospective Assets		<u>\$2,876,183,114</u>
ACTUARIAL LIABILITIES		
Present value of benefits payable on account of retired members and survivors of deceased members now drawing retirement benefits		\$1,054,091,064
Present value of prospective benefits payable on account of inactive members		180,705,046
Present value of prospective benefits payable on account of present active members:		
Service retirement benefits	\$1,325,984,381	
Disability retirement benefits	32,268,502	
Survivor benefits	19,499,150	
Separation benefits	<u>263,634,971</u>	
Total		<u>1,641,387,004</u>
Total Actuarial Liabilities		<u>\$2,876,183,114</u>



Schedule A – Valuation Balance Sheet and Solvency Test

SHOWING THE PRESENT AND PROSPECTIVE ASSETS AND LIABILITIES OF
THE DISTRICT OF COLUMBIA RETIREMENT BOARD
AS OF OCTOBER 1, 2018

POLICE OFFICERS & FIREFIGHTERS' RETIREMENT PLAN

PRESENT AND PROSPECTIVE ASSETS		
Actuarial Value of Present Assets		5,848,576,374
Present value of future members' contributions		362,332,767
Present value of future employer contributions		
Normal contributions	\$1,666,905,633	
Unfunded accrued liability contributions	<u>(624,815,658)</u>	
Total prospective employer contributions		<u>1,042,089,975</u>
Total Present and Prospective Assets		<u>\$7,252,999,116</u>
ACTUARIAL LIABILITIES		
Present value of benefits payable on account of retired members and survivors of deceased members now drawing retirement benefits		\$2,170,286,507
Present value of prospective benefits payable on account of inactive members		88,408,692
Present value of prospective benefits payable on account of present active members:		
Service retirement benefits	\$4,469,905,317	
Disability retirement benefits	230,591,346	
Survivor benefits	91,144,686	
Separation benefits	<u>202,662,568</u>	
Total		<u>4,994,303,917</u>
Total Actuarial Liabilities		<u>\$7,252,999,116</u>



Schedule A – Valuation Balance Sheet and Solvency Test

(\$ IN THOUSANDS)

Valuation Date	Aggregate Accrued Liabilities For				Portion of Accrued Liabilities Covered by Reported Asset		
	(1) Active Member Contributions	(2) Retirees, Survivors and Inactive Members	(3) Active Members (Employer Financed Portion)	Reported Assets	(1)	(2)	(3)
TEACHERS' RETIREMENT PLAN							
10/1/2014	\$141,943	\$968,446	\$738,841	\$1,746,030	100%	100.0%	86.0%
10/1/2015	144,927	1,053,078	755,300	1,670,976	100%	100.0%	62.6%
10/1/2016	152,459	1,108,032	769,149	1,822,113	100%	100.0%	73.0%
10/1/2017	156,263	1,154,696	831,532	2,051,006	100%	100.0%	89.0%
10/1/2018	165,629	1,234,796	900,889	2,193,598	100%	100.0%	88.0%
POLICE OFFICERS AND FIREFIGHTERS' RETIREMENT PLAN							
10/1/2014	\$255,735	\$1,149,515	\$2,593,287	\$4,588,319	100%	100.0%	100.0%
10/1/2015	262,674	1,388,908	2,631,511	4,462,228	100%	100.0%	100.0%
10/1/2016	260,786	1,650,195	2,587,532	4,954,464	100%	100.0%	100.0%
10/1/2017	261,428	1,990,699	2,626,133	5,629,911	100%	100.0%	100.0%
10/1/2018	267,845	2,258,695	2,697,220	6,015,953	100%	100.0%	100.0%



Schedule B – Development of Actuarial Value of Assets

TEACHERS' RETIREMENT PLAN AS OF OCTOBER 1, 2018

(1)	Actuarial Value Beginning of Year*	\$	1,982,018,820
(2)	Market Value End of Year	\$	2,193,598,000
(3)	Market Value Beginning of Year	\$	2,051,006,000
(4)	Cash Flow		
	a. Contributions	\$	99,370,000
	b. Benefit Payments, Refunds, and Transfers		(84,556,000)
	c. Administrative Expenses		(4,374,000)
	d. Net Cash Flow: [(4)a + (4)b + (4)c]	\$	10,440,000
(5)	Investment Income		
	a. Market total: (2) – (3) – (4)d	\$	132,152,000
	b. Assumed Rate		6.50%
	c. Amount of Immediate Recognition	\$	133,654,690
	d. Amount for Phased-in Recognition: (5)a – (5)c	\$	(1,502,690)
(6)	Phased-In Recognition of Investment Income		
	a. Current Year: (1/5) x (5)d	\$	(300,538)
	b. First Prior Year		20,395,559
	c. Second Prior Year		(2,099,176)
	d. Third Prior Year		(2,099,176)
	e. Fourth Prior Year		(2,099,176)
	f. Total Recognized Investment Gain	\$	13,797,493
(7)	Preliminary Actuarial Value End of Year: (1) + (4)d + (5)c + (6)f	\$	2,139,911,003
(8)	Actuarial Value End of Year with 20% Corridor Applied:	\$	2,139,911,003
(9)	Rate of Return on Actuarial Value of Assets		7.42%

*Prior to any corridor restraints.



Schedule B – Development of Actuarial Value of Assets

POLICE OFFICERS & FIREFIGHTERS' RETIREMENT PLAN AS OF OCTOBER 1, 2018

(1)	Actuarial Value Beginning of Year*	\$	5,406,366,400
(2)	Market Value End of Year	\$	6,015,953,000
(3)	Market Value Beginning of Year	\$	5,629,911,000
(4)	Cash Flow		
	a. Contributions	\$	140,074,000
	b. Benefit Payments, Refunds, and Transfers		(108,374,000)
	c. Administrative Expenses		(12,008,000)
	d. Net Cash Flow: [(4)a + (4)b + (4)c]	\$	19,692,000
(5)	Investment Income		
	a. Market total: (2) – (3) – (4)d	\$	366,350,000
	b. Assumed Rate		6.50%
	c. Amount of Immediate Recognition	\$	366,584,205
	d. Amount for Phased-in Recognition: (5)a – (5)c	\$	(234,205)
(6)	Phased-In Recognition of Investment Income		
	a. Current Year: (1/5) x (5)d	\$	(46,841)
	b. First Prior Year		55,791,685
	c. Second Prior Year		62,975
	d. Third Prior Year		62,975
	e. Fourth Prior Year		62,975
	f. Total Recognized Investment Gain	\$	55,933,769
(7)	Preliminary Actuarial Value End of Year: (1) + (4)d + (5)c + (6)f	\$	5,848,576,374
(8)	Actuarial Value End of Year with 20% Corridor Applied:	\$	5,848,576,374
(9)	Rate of Return on Actuarial Value of Assets		7.79%

*Prior to any corridor restraints.



Schedule C – Summary of Changes in Net Assets

TEACHERS' RETIREMENT PLAN FOR THE YEAR ENDING OCTOBER 1, 2018

Additions for the Year

Contributions:

Members (including purchased service)	\$	40,324,000	
Employers		<u>59,046,000</u>	
Total	\$		99,370,000

Net Investment Income			<u>132,152,000</u>
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TOTAL	\$		<u>231,522,000</u>
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Deductions for the Year

Benefit Payments (including refunds and transfers)	\$	(84,556,000)	
Administrative Expenses		<u>(4,374,000)</u>	
TOTAL	\$		<u>(88,930,000)</u>

<u>Excess of Additions Over Deductions</u>	\$		<u><u>142,592,000</u></u>
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Reconciliation of Asset Balances

Market Value of Assets as of 9/30/2017	\$	2,051,006,000	
Excess of Additions over Deductions			<u>142,592,000</u>
Market Value of Assets as of 9/30/2018*	\$		<u><u>2,193,598,000</u></u>

Rate of Return on Market Value of Assets**			6.43%
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* The Market Value of Assets shown above is used in the determination of the Actuarial Value of Assets (Schedule B).

** Based on the approximation formula: $I/[0.5x(A + B - I)]$, where

I = Investment increment

A = Beginning of year asset value

B = End of year asset value



Schedule C – Summary of Changes in Net Assets

POLICE OFFICERS & FIREFIGHTERS' RETIREMENT PLAN FOR THE YEAR ENDING OCTOBER 1, 2018

Additions for the Year

Contributions:	
Members (including purchased service)	\$ 34,478,000
Employers	<u>105,596,000</u>
Total	\$ 140,074,000
Net Investment Income	<u>366,350,000</u>
TOTAL	\$ 506,424,000

Deductions for the Year

Benefit Payments (including refunds and transfers)	\$ (108,374,000)
Administrative Expenses	<u>(12,008,000)</u>
TOTAL	\$ (120,382,000)

<u>Excess of Additions Over Deductions</u>	<u>\$ 386,042,000</u>
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Reconciliation of Asset Balances

Market Value of Assets as of 9/30/2017	\$ 5,629,911,000
Excess of Additions over Deductions	<u>386,042,000</u>
Market Value of Assets as of 9/30/2018*	<u>\$ 6,015,953,000</u>

Rate of Return on Market Value of Assets**	6.50%
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* The Market Value of Assets shown above is used in the determination of the Actuarial Value of Assets (Schedule B).

** Based on the approximation formula: $I/[0.5x(A + B - I)]$, where

I = Investment increment

A = Beginning of year asset value

B = End of year asset value



Schedule D – Outline of Actuarial Assumptions and Methods

**(DEMOGRAPHIC ASSUMPTIONS ADOPTED ON JUNE 22, 2017)
(ECONOMIC ASSUMPTIONS ADOPTED ON JUNE 22, 2017)**

VALUATION DATE: All assets and liabilities are computed as of October 1, 2018. Demographic information was collected as of June 30, 2018.

INVESTMENT RATE OF RETURN: 6.50% per annum, compounded annually (net of investment expenses).

INFLATION ASSUMPTION: 3.50% per annum.

PAYROLL GROWTH ASSUMPTION: 4.25% per annum.

PERCENT MARRIED: 64% of Teachers are assumed to be married and 80% of Police Officers and Firefighters are assumed to be married, with the wife 3 years younger than the husband. Active members are assumed to have one dependent child aged 10.

ACTUARIAL METHOD: Entry Age Normal Cost Method. The amortization of the unfunded actuarial accrued liability uses a level dollar basis.

ASSETS: The method of valuing assets is intended to recognize a “smoothed” market value of assets. Under this method, the difference between actual return on market value from investment experience and the expected return on market value is recognized over a five-year period. The actuarial value of assets is constrained to an 80% to 120% corridor around market value of assets.

WITHDRAWAL ASSUMPTION: For Teachers and Firefighters, it was assumed that 15% of the vested members who terminate elect to withdraw their contributions while the remaining 85% elect to leave their contributions in the plan in order to be eligible for a benefit at their retirement date. For Police Officers, it was assumed that 25% of the vested members who terminate elect to withdraw their contributions while the remaining 75% elect to leave their contributions in the plan.

OTHER ASSUMPTIONS: To value the pre-retirement death benefit for Police Officers and Firefighters, the benefit form for all retirements (normal or disabled) is assumed to be a 67.8% Joint and Survivor annuity for all participants (based on 40% of average pay survivor benefits). One-fourth of all Police Officers and Firefighter active deaths are assumed to occur in the line of duty.

COST-OF-LIVING ADJUSTMENT: The cost of living, as measured by the Consumer Price Index (CPI), will increase at the rate of 3.5% per year for members hired before November 1, 1996, and 3.0% per year for members hired on or after November 1, 1996.

MILITARY SERVICE: All Police and Fire members are assumed to have 0.40 years of military service at retirement.



Schedule D – Outline of Actuarial Assumptions and Methods

ADMINISTRATIVE EXPENSES: For Teachers, budgeted administrative expenses of 1.20% of payroll are added to the normal cost rate. For Police Officers and Firefighters, budgeted administrative expenses of 2.10% of payroll are added to the normal cost rate.

MORTALITY: The RPH-2014 Blue Collar Mortality Table projected generationally with Scale BB, set back 1 year for males is used for healthy active members, retirees, and beneficiaries. The RPH-2014 Disabled Mortality Table set back 6 years for males and set forward 7 years for females is used for disabled retirees. Mortality improvement is anticipated under these assumptions.



Schedule D – Outline of Actuarial Assumptions and Methods

TEACHERS

SALARY INCREASES: Representative values of the assumed annual rates of future salary increases are as follows, and include inflation at 4.25% per annum:

Pay Increase Assumptions for an Individual Member			
Years of Service	Merit & Seniority	Inflation & Productivity (Economy)	Total Increase (Next Year)
5	4.20%	4.25%	8.63%
10	3.20	4.25	7.59
15	1.20	4.25	5.50
20	1.20	4.25	5.50
25	1.20	4.25	5.50
30	1.20	4.25	5.50
35	1.20	4.25	5.50

SEPARATIONS FROM ACTIVE SERVICE: Representative values of the assumed annual rates of withdrawal, service retirement, and disability are shown in the following tables:

Sample Ages	Percent of Members Separating Within the Next Year				
	Withdrawal		Service Retirement		Disability Retirement
	5 years of service and up ¹		Under 30 yrs service	30 & up yrs service	
	Male	Female			
25	18.00%	18.00%			0.01%
30	16.00	16.00			0.02
35	12.00	10.00			0.03
40	12.00	8.00			0.07
45	8.00	6.50			0.12
50	8.00	6.50	5.00%	5.00%	0.20
55	8.00	6.50	9.00	22.00	0.25
60			27.00	28.00	0.30
62			22.00	25.00	
65			25.00	35.00	
70			30.00	30.00	
71			25.00	30.00	
75			100.00	100.00	

¹ Members of any age with less than 5 years of service have withdrawal rates of 18% to 26% for males, and 16% to 23% for females



Schedule D – Outline of Actuarial Assumptions and Methods

POLICE OFFICERS

SALARY INCREASES: Police Officers are assumed to receive longevity increases applied to individual base pay after 25, and 30 years of service. Representative values of the assumed annual rates of future salary increases before longevity increases are as follows and include inflation at 4.25% per annum:

Pay Increase Assumptions for an Individual Member			
Years of Service	Merit & Seniority	Inflation & Productivity (Economy)	Total Increase (Next Year)
5	2.00%	4.25%	6.34%
10	2.00	4.25	6.34
15	2.00	4.25	6.34
20	1.75	4.25	6.07
25	0.75	4.25	5.03
30	0.00	4.25	4.25

SEPARATIONS FROM ACTIVE SERVICE: Representative values of the assumed annual rates of withdrawal, service retirement, and disability are shown in the following tables:

Percent of Members Separating Within the Next Year						
Sample Ages	Withdrawal		Disability Retirement ²		Years of Service	Service Retirement ³
	(5 years of service & up) ¹		Males	Females		
	Males	Females				
20	5.00%	5.00%	0.03%	0.02%	20	15.0%
25	5.00	5.00	0.06	0.05	25	22.0
30	4.25	4.50	0.11	0.10	30	38.0
35	2.75	3.50	0.16	0.15	35	18.0
40	1.50	1.50	0.23	0.30	40	16.0
45	1.50	1.50	0.32	0.40		
50	1.50	1.50	0.42	0.60		
55	1.50	1.50	0.44	0.70		
60	1.50	1.50	0.51	1.00		

¹ Members of any age with less than 5 years of service have withdrawal rates of 6% to 13% for males, and 5% to 11% for females

² It is assumed that 75% of the disabilities are due to accidents in the line of duty and the 'percent of disability' is assumed to be 100%.

³ 100% of active members are assumed to retire at age 65, regardless of service.



Schedule D – Outline of Actuarial Assumptions and Methods

FIREFIGHTERS

SALARY INCREASES: Firefighters are assumed to receive longevity increases applied to individual base pay after 15, 20, 25, and 30 years of service. Representative values of the assumed annual rates of future salary increases before longevity increases are as follows and include inflation at 4.25% per annum:

Pay Increase Assumptions for an Individual Member			
Years of Service	Merit & Seniority	Inflation & Productivity (Economy)	Total Increase (Next Year)
5	3.00%	4.25%	7.38%
10	3.00	4.25	7.38
15	3.00	4.25	7.38
20	1.25	4.25	5.55
25	1.25	4.25	5.55
30	1.25	4.25	5.55
35	1.25	4.25	5.55

SEPARATIONS FROM ACTIVE SERVICE: Representative values of the assumed annual rates of withdrawal, service retirement, and disability are shown in the following tables:

Percent of Members Separating Within the Next Year				
Sample Ages	Withdrawal		Years of Service	Service Retirement ³
	(5 years of service & up) ¹	Disability Retirement ²		
20	3.00%	0.01%	20	12.5%
25	3.00	0.05	25	12.5
30	2.60	0.18	30	22.0
35	1.80	0.25	35	40.0
40	1.40	0.30	40	40.0
45	1.20	0.35		
50	1.20	0.40		
55	0.80	0.45		
60	0.60	0.50		

¹ Members of any age with less than 5 years of service have withdrawal rates of 4.0% to 7.5%.

² It is assumed that 75% of the disabilities are due to accidents in the line of duty and the “percent of disability” is assumed to be 100%.

³ 100% of active members are assumed to retire at age 60, regardless of service.



Schedule E – Summary of Main Plan Provisions As Interpreted for Valuation Purposes

TEACHERS' RETIREMENT PLAN

Effective Date Established on July 1, 1997. The U.S. Department of the Treasury is responsible for paying all benefits accrued before this date.

DEFINITIONS

Affiliated Employers District of Columbia Public Schools

Covered Members Permanent, temporary, and probationary teachers who work for the District of Columbia public day schools become members automatically on their date of employment. Other employees covered by the Retirement of Public School Teachers Act – including librarians, principals, and counselors – also become members on their date of employment. Substitute teachers are not covered. Some former D.C teachers working at charter schools are eligible to remain in the Program.

Service Credit One year of school service is given for each year of employment with DCPS. After five years of service are accrued, additional service may be purchased or credited for service outside of DCPS. For purposes of eligibility and benefit accrual, federal service is included in the calculation of the normal retirement benefit.

Average Salary Highest 36 consecutive months of pay, divided by three.

Vested Members who accrue five or more years of Service Credit are vested for benefits. If these members leave service, they may leave their Member Contribution Accounts with the Plan for a future benefit when reaching eligibility (deferred vested in this report).

CONTRIBUTIONS

Member Contributions Members hired before November 1, 1996 are required to contribute 7% of annual pay. Members hired on or after November 1, 1996 contribute 8% of annual pay. Interest is not credited to each Member's accumulated contributions.

Refund of Member Contributions In the event a member leaves service for a reason other than death or retirement, member contribution accounts are refunded upon request.



Schedule E – Summary of Main Plan Provisions As Interpreted for Valuation Purposes

SERVICE RETIREMENT

Eligibility

The Age and Service Credit requirements to be eligible for a full Service Retirement are listed below:

- **Members hired before November 1, 1996**

Age	Service Credit
55	30, including 5 years school service
60	20, including 5 years school service
62	5 years school service

- **Members hired on and after November 1, 1996**

Age	Service Credit
Any Age	30, including 5 years school service
60	20, including 5 years school service
62	5 years school service

Benefit

For members hired before November 1, 1996:

- 1.5% of Average Salary times service up to 5 years, plus
- 1.75% of Average Salary times service between 5 and 10 years, plus
- 2.0% of Average Salary times service over 10 years.

For members hired on or after November 1, 1996:

- 2.0% of Average Salary times service.

All members receive a minimum benefit of 1.0% of Average Salary plus \$25 for each year of service.

INVOLUNTARY SERVICE RETIREMENT

Eligibility

The Age and Service Credit requirements to be eligible for a Reduced Service Retirement are listed below:

- **All Members, regardless of date of hire**

Age	Service Credit
Any Age	25, including 5 years school service
50	20, including 5 years school service

Benefit

Service Retirement Benefit reduced by 1/6% per month (or 2% per year) that date of retirement precedes age 55.



Schedule E – Summary of Main Plan Provisions As Interpreted for Valuation Purposes

DISABILITY RETIREMENT

Eligibility	Active members with five or more years of school service credit are covered (vested) for disability retirement. To be eligible, the member must be found to be incapable of satisfactorily performing the duties of his/her position.
Benefit	Equal to Service Retirement benefit. Minimum benefit is the lesser of a) or b): a) 40% of Average Salary b) Calculated benefit amount by projecting service to age 60.

SURVIVOR BENEFITS

LUMP SUM	
Eligibility	Death before completion of 18 months of school service or death without an eligible spouse, child or parent.
Benefit	Refund of member contributions.
SPOUSE/DOMESTIC PARTNER ONLY	
Eligibility	Death before retirement and married/registered domestic partnership for at least two years, or have a child by the marriage or registered domestic partnership.
Benefit	55% of Service Retirement benefit. Minimum benefit is the lesser of a) or b): a) 55% of 40% of Average Salary b) 55% of the calculated benefit amount by projecting service to age 60.

SPOUSE/DOMESTIC PARTNER & DEPENDENT CHILDREN

Eligibility	Death before retirement and married/registered domestic partnership for at least two years, or have a child by the marriage or registered domestic partnership. Children must be unmarried and under age 18, 22 if full-time student, or any dependent child having a disability incurred before age 18. Death does not have to occur before retirement for the children's benefit.
Spouse/Domestic Partner Benefit	55% of Service Retirement benefit. Minimum benefit is the lesser of a) or b): a) 55% of 40% of Average Salary b) 55% of the calculated benefit amount by projecting service to age 60.
Child Benefit	A benefit per child equal to the smallest of a) or b) or c): a) 60% of Average Salary divided by the number of eligible children b) \$7,083* (if hired before 1/1/1980), \$6,840* (if hired between 1/1/1980 and 10/31/1996), or \$6,661* (if hired on or after 11/1/1996) per child



Schedule E – Summary of Main Plan Provisions As Interpreted for Valuation Purposes

- c) \$21,419* (if hired before 1/1/1980), \$20,685* (if hired between 1/1/1980 and 10/31/1996), or \$20,144* (if hired on or after 11/1/1996) divided by the number of children.

DEPENDENT CHILDREN ONLY

Eligibility

Children must be unmarried and under age 18, 22 if full-time student, or any dependent child having a disability incurred before age 18. Death does not have to occur before retirement for the children's benefit.

Benefit

A benefit per child equal to the smallest of a) or b) or c):

- a) 75% of Average Salary divided by the number of eligible children
- b) \$8,656* (if hired before 1/1/1980), \$8,336* (if hired between 1/1/1980 and 10/31/1996), or \$7,253* (if hired on or after 11/1/1996) per child
- c) \$26,175* (if hired before 1/1/1980), \$25,210* (if hired between 1/1/1980 and 10/31/1996), or \$24,436* (if hired on or after 11/1/1996) divided by the number of children.

PARENTS ONLY

Eligibility

Death before retirement and no eligible spouse/domestic partner or children, and parents must have received at least one-half of their total income from the member immediately before the member's death.

Benefit

55% of Service Retirement benefit. Minimum benefit is the lesser of a) or b):

- a) 55% of 40% of Average Salary
- b) 55% of the calculated benefit amount by projecting service to age 60.

*Survivor benefit amounts are as of March 1, 2018, and are subject to annual inflation adjustments.

DEFERRED VESTED RETIREMENT

Eligibility

Active members with five or more years of school service credit.

Benefit

Benefit is calculated in the same manner as Service Retirement benefit and may be collected starting at age 62.



Schedule E – Summary of Main Plan Provisions As Interpreted for Valuation Purposes

RETIREMENT OPTIONS

Retirement and disability benefits are payable for the life of the retired member. Optional reduced benefits may be elected at the time of retirement to provide for continuation of a reduced benefit amount to a designated beneficiary. Optional forms include:

a) Reduced Annuity with a Maximum Survivor Annuity (to Spouse or Registered Domestic Partner)

Reduced benefit paid to the member so that upon the member's death, the spouse/domestic partner will receive 55% of the unreduced (normal life) annuity. Member's benefit is reduced by 2.5% of retirement benefit, up to \$3,600, plus 10% of any retirement benefit over \$3,600.

b) Reduced Annuity with a Partial Survivor Annuity (to Spouse or Registered Domestic Partner)

Reduced benefit paid to the member so that upon the member's death, the spouse/domestic partner will receive a partial annuity that can range from \$1 up to any amount less than 55% of the unreduced (normal life) annuity amount. Member's benefit is reduced by the same amount as option a) above, multiplied by the ratio of the chosen benefit percent to the maximum benefit percent (55%).

c) Reduced Annuity with a Life Insurance Benefit

Member elects a life insurance amount, payable in a lump sum to a designated beneficiary upon the member's death.

d) Reduced Annuity with a Survivor Annuity to a Person with an Insurable Interest

A 55% joint and survivor annuity where the original benefit is reduced by 10% plus an additional 5% for each full 5 years, up to 25 years, that the designated beneficiary is younger than the member. Maximum reduction is 40% for any beneficiary who is 25 or more years younger than the member.

COST-OF-LIVING ADJUSTMENTS (COLA)

Each year on March 1, benefits which have been paid for at least twelve months preceding March 1 may be increased. The increase is equal to the annual CPI. COLA's are included in benefit payments on and after April 1. If a member's retirement is effective after March 1 of the preceding year, the COLA amount will be prorated.

For members hired on or after November 1, 1996, the cost-of-living increase is limited to no more than 3% per year.



Schedule E – Summary of Main Plan Provisions As Interpreted for Valuation Purposes

POLICE OFFICERS & FIREFIGHTERS' RETIREMENT AS INTERPRETED FOR VALUATION PURPOSES

Effective Date Established on July 1, 1997. The U.S. Department of the Treasury is responsible for paying all benefits accrued before this date.

DEFINITIONS

Affiliated Employers The District of Columbia Metropolitan Police Department (MPD) and the District of Columbia Department of Fire and Emergency Medical Services (FEMS).

Covered Members Sworn Police Officers and Firefighters become members on their first day of active duty (cadets are not eligible). Membership is not automatic for uniformed EMT Firefighters.

Service Credit One year of service is given for each year of employment with MPD or FEMS. Additional service may be purchased or credited for lateral transfer service, EMT service, prior military service, and certain civilian service. For purposes of eligibility and benefit accrual, federal service is included in the calculation of the normal retirement benefit.

Average Salary For members hired before February 15, 1980, the highest 12 consecutive months of pay. For members hired on or after February 15, 1980, the highest 36 consecutive months of pay, divided by 3. Base pay does not include overtime, holiday or military pay.

Vested Members who accrue five or more years of Service Credit are vested for benefits. If these members leave service, they may leave their Member Contribution Accounts with the Plan for a future benefit when reaching eligibility (deferred vested in this report).

CONTRIBUTIONS

Member Contributions Members hired before November 10, 1996 contribute 7.0% of salary. Members hired on or after November 10, 1996 contribute 8.0% of salary. Member contributions, together with any purchased service credit payments, are credited to individual Member Contribution Accounts. No interest is accrued on contributions.

Refund of Member Contributions In the event a member leaves service for a reason other than death or retirement, member contribution accounts are refunded upon request.



Schedule E – Summary of Main Plan Provisions As Interpreted for Valuation Purposes

SERVICE RETIREMENT

Eligibility

The Age and Service Credit requirements to be eligible for a full Service Retirement are listed below:

- **Members hired before November 10, 1996**

Age	Service Credit
Any age	20 years departmental service (only if hired before 2/15/1980)
50	25 years departmental service
60	5 years departmental service

- **Members hired on and after November 10, 1996**

Age	Service Credit
Any Age	25 years departmental service
60	

Benefit

For members hired before November 10, 1996:

- 2.5% of Average Salary times departmental service up to 25 years (20 years if hired before 2/15/1980), plus
- 3.0% of Average Salary times departmental service over 25 years (or 20 years if hired before 2/15/1980), plus
- 2.5% of Average Salary times purchased or credited service.

For members hired on or after November 10, 1996:

- 2.5% of Average Salary times total service.

All members are subject to a maximum benefit of 80% of Average Salary.

SERVICE-RELATED DISABILITY RETIREMENT

Eligibility

Disabled as a result of an injury or disease that permanently disables him/her for the performance of duty.

Benefit

For members hired before February 15, 1980:

2.5% of Average Salary times total years of service, subject to a minimum of 66-2/3% of Average Salary and a maximum of 70% of Average Salary.

For members hired on or after February 15, 1980:

70% of final pay times percentage of disability, subject to a minimum of 40% of final pay.



Schedule E – Summary of Main Plan Provisions As Interpreted for Valuation Purposes

NONSERVICE-RELATED DISABILITY RETIREMENT

Eligibility	Active members with five or more years of departmental service are covered (vested) for disability retirement. The member is eligible if found that the disability precludes further service with his/her department.
Benefit	<p>For members hired before February 15, 1980: 2.0% of Average Salary times total years of service, subject to a minimum of 40% of Average Salary and a maximum of 70% of Average Salary.</p> <p>For members hired on or after February 15, 1980: 70% of final pay times percentage of disability, subject to a minimum of 30% of final pay.</p>

SURVIVOR BENEFITS

LUMP SUM

Eligibility	Death before retirement without an eligible spouse or child.
Benefit	Refund of member contributions according to Plan's order of precedence.

LUMP SUM – DEATH IN LINE OF DUTY

Eligibility	Death occurring in the line of duty, not resulting from willful misconduct.
Benefit	\$50,000

SPOUSE ONLY – DEATH IN LINE OF DUTY

Eligibility	Member killed in line of duty, after December 29, 1993.
Benefit	100% of final pay.

SPOUSE ONLY – DEATH NOT IN LINE OF DUTY

Eligibility	Member death, not in line of duty, after December 29, 1993. If retired, must be married for at least one year or have a child by the marriage.
Benefit	40% of the greater of a) or b):
	<ul style="list-style-type: none"> a) Average Salary b) Salary for step 6 salary class 1 of the DC Police and Fireman's Salary Act in effect, adjusted for cost-of-living increases if death occurs after retirement.

Benefit cannot be higher than rate of pay at death (or retirement if death occurs after retirement).



Schedule E – Summary of Main Plan Provisions As Interpreted for Valuation Purposes

SPOUSE & DEPENDENT CHILDREN

Eligibility

Member death, not in line of duty, after December 29, 1993. If retired, must be married for at least one year or have a child by the marriage. Children must be unmarried and under age 18, 22 if full-time student, or any dependent child having a disability incurred before age 18. Death does not have to occur before retirement for the children's benefit.

Spouse Benefit

40% of the greater of a) or b):

- a) Average Salary
- b) Salary for step 6 salary class 1 of the DC Police and Fireman's Salary Act in effect, adjusted for cost-of-living increases if death occurs after retirement.

Benefit cannot be higher than rate of pay at death (or retirement if death occurs after retirement).

Child Benefit

A benefit per child equal to the smallest of a) or b) or c):

- a) 60% of Average Salary divided by the number of eligible children
- b) \$4,163* (if hired before 11/10/1996) or \$4,072* (if hired on or after 11/10/1996) per child
- c) \$12,488* (if hired before 11/10/1996) or \$12,218* (if hired on or after 11/10/1996) divided by the number of children.

DEPENDENT CHILDREN ONLY

Eligibility

Children must be unmarried and under age 18, 22 if full-time student, or any dependent child having a disability incurred before age 18. Death does not have to occur before retirement for the children's benefit.

Benefit

75% of Average Salary divided by the number of eligible children, adjusted for cost-of-living increases.

*Survivor benefit amounts are as of March 1, 2018, and are subject to annual inflation adjustments.

DEFERRED VESTED RETIREMENT

Eligibility

Active members with five or more years of departmental service.

Benefit

Benefit is calculated in the same manner as Service Retirement benefit and may be collected starting at age 55.



Schedule E – Summary of Main Plan Provisions As Interpreted for Valuation Purposes

RETIREMENT OPTIONS

Retirement and disability benefits are payable for the life of the retired member. This includes an unreduced joint and survivor annuity as defined above in the “Survivor Benefits – Spouse and Dependent Children” sections.

An optional reduced benefit may be elected at the time of retirement to provide for an additional survivor benefit to a designated beneficiary. Member’s original annuity is reduced by 10% and that amount is added to the survivor’s benefit. If the designated beneficiary is more than five years younger than the member, the additional amount will be reduced by 5% for each full five years that the beneficiary is younger than the member, subject to a maximum of 40%.

COST-OF-LIVING ADJUSTMENTS (COLA)

Each year on March 1, benefits which have been paid for at least twelve months preceding March 1 may be increased. The increase is equal to the annual CPI. COLA’s are included in benefit payments on and after April 1. If member’s retirement is effective after March 1 of the preceding year, the COLA amount will be prorated.

For members hired on or after November 10, 1996, the cost-of-living increase is limited to no more than 3% per year. Members hired before February 15, 1980, receive equalization pay, which is defined as the percentage increase of active employees’ salary increases. Equalization increases are not paid to survivors.



Schedule F – Schedules of Member Data

TABLE 1

RECONCILIATION OF MEMBER DATA
AS OF OCTOBER 1, 2018

TEACHERS' RETIREMENT PLAN

	Actives	Retirees	Disabled	Beneficiaries	Vested Terms	Total
1. Headcounts as of October 1, 2017	5,199	3,636	110	153	1,330	10,428
2. Change in status during the year:						
a. Death		(54)	(3)	(4)		(61)
b. Disabled			1		(1)	
c. Retired	(55)	125			(69)	
d. Vested Termination	(257)				257	
e. Nonvested Termination	(513)				(10)	(523)
f. Benefits Expired/Refund	(153)	(4)	(2)	(2)	(48)	(209)
3. New member due to:						
a. New Hire	781					781
b. Rehire	64				(30)	34
c. Death of Participant				28		28
d. Adjustments		6				6
4. Headcounts as of October 1, 2018	5,066	3,709	106	175	1,429	10,485



Schedule F – Schedules of Member Data

TABLE 2

RECONCILIATION OF MEMBER DATA
AS OF OCTOBER 1, 2018

POLICE OFFICERS' RETIREMENT PLAN

	Actives	Retirees	Disabled	Beneficiaries	Vested Terms	Total
1. Headcounts as of October 1, 2017	3,583	1,736	310	373	246	6,248
2. Change in status during the year:						
a. Death		(16)	(5)	(3)		(24)
b. Disabled	(3)		5		(1)	
c. Retired	(112)	172			(59)	
d. Vested Termination	(53)				53	
e. Nonvested Termination	(77)				(4)	(81)
f. Benefits Expired/Refund	(30)			(9)	(9)	(48)
3. New member due to:						
a. New Hire	245					245
b. Rehire	14				(4)	10
c. Death of Participant				29		29
d. Adjustments		2	1	(2)		1
4. Headcounts as of October 1, 2018	3,567	1,894	311	388	222	6,382



Schedule F – Schedules of Member Data

TABLE 3

RECONCILIATION OF MEMBER DATA AS OF OCTOBER 1, 2018

FIREFIGHTERS' RETIREMENT PLAN

	Actives	Retirees	Disabled	Beneficiaries	Vested Terms	Total
1. Headcounts as of October 1, 2017	1,729	575	87	134	94	2,619
2. Change in status during the year:						
a. Death		(3)	(1)	(4)	(1)	(9)
b. Disabled	(4)		5		(1)	
c. Retired	(46)	50			(4)	
d. Vested Termination	(11)				11	
e. Nonvested Termination	(17)				(3)	(20)
f. Benefits Expired/Refund	(4)			(1)	(2)	(7)
3. New member due to:						
a. New Hire	134					134
b. Rehire	1				(1)	0
c. Death of Participant				7		7
d. Adjustments		1		(2)		(1)
4. Headcounts as of October 1, 2018	1,782	623	91	134	93	2,723



Schedule F – Schedules of Member Data

TABLE 4

SCHEDULE OF ACTIVE MEMBER DATA
AS OF OCTOBER 1, 2018

TEACHERS' RETIREMENT PLAN

Attained Age	Completed Years of Service							Total	Payroll
	Under 5	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30+		
Under 20	0	0	0	0	0	0	0	0	\$ 0
20 to 24	46	0	0	0	0	0	0	46	\$ 2,789,430
25 to 29	567	48	0	0	0	0	0	615	\$ 41,451,851
30 to 34	675	336	24	1	0	0	0	1,036	\$ 85,519,453
35 to 39	503	300	110	20	0	0	0	933	\$ 87,217,490
40 to 44	352	192	105	93	5	0	0	747	\$ 75,296,051
45 to 49	199	154	63	127	64	5	0	612	\$ 62,798,538
50 to 54	116	67	48	67	33	38	16	385	\$ 40,595,538
55 to 59	55	42	34	58	38	36	45	308	\$ 33,292,477
60 to 64	43	31	33	43	28	30	35	243	\$ 26,095,895
65 to 69	20	11	16	16	9	11	25	108	\$ 11,984,193
70 & Over	4	1	4	5	6	3	10	33	\$ 3,707,904
Total	2,580	1,182	437	430	183	123	131	5,066	\$ 470,748,820

Average Age: 41.00

Average Service: 7.97



Schedule F – Schedules of Member Data

TABLE 5

SCHEDULE OF ACTIVE MEMBER DATA
AS OF OCTOBER 1, 2018

POLICE OFFICERS' RETIREMENT PLAN

Attained Age	Completed Years of Service								Payroll
	Under 5	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30+	Total	
Under 20	0	0	0	0	0	0	0	0	\$ 0
20 to 24	105	1	0	0	0	0	0	106	\$ 6,289,755
25 to 29	429	94	0	0	0	0	0	523	\$ 34,184,726
30 to 34	200	254	83	1	0	0	0	538	\$ 38,755,748
35 to 39	78	131	329	47	0	0	0	585	\$ 46,962,118
40 to 44	28	31	160	194	57	0	0	470	\$ 41,217,201
45 to 49	11	25	93	180	205	146	0	660	\$ 62,892,309
50 to 54	8	5	54	94	104	210	9	484	\$ 47,447,419
55 to 59	1	10	18	43	28	49	28	177	\$ 17,184,580
60 to 64	0	2	1	8	4	4	5	24	\$ 2,349,383
65 to 69	0	0	0	0	0	0	0	0	\$ 0
70 & Over	0	0	0	0	0	0	0	0	\$ 0
Total	860	553	738	567	398	409	42	3,567	\$ 297,283,239

Average Age: 40.04

Average Service: 13.38



Schedule F – Schedules of Member Data

TABLE 6

SCHEDULE OF ACTIVE MEMBER DATA
AS OF OCTOBER 1, 2018

FIREFIGHTERS' RETIREMENT PLAN

Attained Age	Completed Years of Service							Total	Payroll
	Under 5	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30+		
Under 20	0	0	0	0	0	0	0	0	\$ 0
20 to 24	76	12	0	0	0	0	0	88	\$ 5,273,011
25 to 29	124	41	0	0	0	0	0	165	\$ 10,184,609
30 to 34	75	88	144	2	0	0	0	309	\$ 22,616,753
35 to 39	26	55	222	11	0	0	0	314	\$ 25,509,711
40 to 44	6	19	141	90	11	2	0	269	\$ 24,368,433
45 to 49	4	3	38	110	49	95	1	300	\$ 30,846,084
50 to 54	2	2	11	29	73	93	11	221	\$ 24,619,658
55 to 59	0	0	0	2	25	47	30	104	\$ 12,141,511
60 to 64	0	0	3	0	0	4	5	12	\$ 1,365,926
65 & Over	0	0	0	0	0	0	0	0	\$ 0
Total	313	220	559	244	158	241	47	1,782	\$ 156,925,696

Average Age: 40.11

Average Service: 14.49



Schedule F – Schedules of Member Data

TABLE 7

SCHEDULE OF RETIREE MEMBER DATA
AS OF OCTOBER 1, 2018

TEACHERS' RETIREMENT PLAN
DISTRICT ONLY

Attained Age	Service Retirement		Disability Retirement		Survivors and Beneficiaries		Total	
	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits
Under 20	0	\$0	0	\$0	7	\$39,641	7	\$39,641
20 to 24	0	\$0	0	\$0	2	\$12,261	2	\$12,261
25 to 29	0	\$0	0	\$0	0	\$0	0	\$0
30 to 34	0	\$0	0	\$0	0	\$0	0	\$0
35 to 39	0	\$0	0	\$0	3	\$37,620	3	\$37,620
40 to 44	0	\$0	0	\$0	3	\$31,812	3	\$31,812
45 to 49	0	\$0	4	\$155,052	2	\$39,900	6	\$194,952
50 to 54	7	\$254,129	3	\$86,172	1	\$2,534	11	\$342,835
55 to 59	63	\$2,373,430	14	\$550,116	8	\$118,449	85	\$3,041,995
60 to 64	334	\$10,943,577	22	\$614,333	16	\$180,595	372	\$11,738,505
65 to 69	884	\$22,031,748	28	\$582,436	34	\$239,272	946	\$22,853,456
70 to 74	1,315	\$22,754,244	31	\$512,073	43	\$259,723	1,389	\$23,526,040
75 to 79	793	\$10,744,786	4	\$29,894	35	\$174,024	832	\$10,948,704
80 to 84	248	\$2,835,750	0	\$0	13	\$91,337	261	\$2,927,087
85 to 89	57	\$661,090	0	\$0	6	\$62,578	63	\$723,668
90 to 94	6	\$82,249	0	\$0	1	\$2,144	7	\$84,393
95 & Over	2	\$27,887	0	\$0	1	\$3,776	3	\$31,663
Total	3,709	\$72,708,890	106	\$2,530,076	175	\$1,295,665	3,990	\$76,534,631



Schedule F – Schedules of Member Data

TABLE 8

SCHEDULE OF RETIREE MEMBER DATA
AS OF OCTOBER 1, 2018

TEACHERS' RETIREMENT PLAN
FEDERAL PLUS DISTRICT

Attained Age	Service Retirement		Disability Retirement		Survivors and Beneficiaries		Total	
	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits
Under 20	0	\$0	0	\$0	7	\$47,184	7	\$47,184
20 to 24	0	\$0	0	\$0	2	\$13,512	2	\$13,512
25 to 29	0	\$0	0	\$0	0	\$0	0	\$0
30 to 34	0	\$0	0	\$0	0	\$0	0	\$0
35 to 39	0	\$0	0	\$0	3	\$37,620	3	\$37,620
40 to 44	0	\$0	0	\$0	3	\$46,764	3	\$46,764
45 to 49	0	\$0	4	\$155,052	5	\$64,308	9	\$219,360
50 to 54	7	\$320,208	3	\$86,172	2	\$14,868	12	\$421,248
55 to 59	63	\$3,317,124	18	\$643,080	12	\$237,792	93	\$4,197,996
60 to 64	336	\$16,968,660	25	\$816,288	19	\$415,260	380	\$18,200,208
65 to 69	894	\$43,052,772	32	\$1,079,952	41	\$748,404	967	\$44,881,128
70 to 74	1,397	\$68,253,768	66	\$2,103,180	75	\$1,474,884	1,538	\$71,831,832
75 to 79	1,041	\$50,416,416	36	\$1,045,488	89	\$1,754,832	1,166	\$53,216,736
80 to 84	700	\$34,216,200	39	\$1,241,928	62	\$1,443,072	801	\$36,901,200
85 to 89	484	\$22,560,132	22	\$678,069	60	\$1,389,120	566	\$24,627,321
90 to 94	250	\$10,824,408	15	\$577,572	41	\$979,932	306	\$12,381,912
95 & Over	112	\$5,335,932	15	\$618,372	26	\$727,320	153	\$6,681,624
Total	5,284	\$255,265,620	275	\$9,045,153	447	\$9,394,872	6,006	\$273,705,645



Schedule F – Schedules of Member Data

TABLE 9

**SCHEDULE OF RETIREE MEMBER DATA
AS OF OCTOBER 1, 2018**

**POLICE OFFICERS' RETIREMENT PLAN
DISTRICT ONLY**

Attained Age	Service Retirement		Disability Retirement		Survivors and Beneficiaries		Total	
	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits
Under 20	0	\$0	0	\$0	38	\$287,851	38	\$287,851
20 to 24	0	\$0	0	\$0	10	\$102,252	10	\$102,252
25 to 29	0	\$0	2	\$47,424	0	\$0	2	\$47,424
30 to 34	0	\$0	1	\$26,472	1	\$2,514	2	\$28,986
35 to 39	0	\$0	10	\$344,100	2	\$58,476	12	\$402,576
40 to 44	0	\$0	13	\$451,512	5	\$132,492	18	\$584,004
45 to 49	1	\$22,896	51	\$1,970,952	25	\$471,188	77	\$2,465,036
50 to 54	478	\$24,118,832	90	\$3,279,588	49	\$945,139	617	\$28,343,559
55 to 59	575	\$25,173,218	71	\$1,747,791	53	\$831,857	699	\$27,752,865
60 to 64	399	\$12,474,728	48	\$1,023,844	62	\$943,796	509	\$14,442,367
65 to 69	301	\$5,223,488	20	\$156,535	67	\$1,123,306	388	\$6,503,330
70 to 74	119	\$1,010,677	4	\$73,016	54	\$751,572	177	\$1,835,265
75 to 79	21	\$199,628	1	\$16,145	13	\$286,589	35	\$502,362
80 to 84	0	\$0	0	\$0	5	\$79,838	5	\$79,838
85 to 89	0	\$0	0	\$0	4	\$98,112	4	\$98,112
90 to 94	0	\$0	0	\$0	0	\$0	0	\$0
95 & Over	0	\$0	0	\$0	0	\$0	0	\$0
Total	1,894	\$68,223,467	311	\$9,137,379	388	\$6,114,982	2,593	\$83,475,827



Schedule F – Schedules of Member Data

TABLE 10

**SCHEDULE OF RETIREE MEMBER DATA
AS OF OCTOBER 1, 2018**

**POLICE OFFICERS' RETIREMENT PLAN
FEDERAL PLUS DISTRICT**

Attained Age	Service Retirement		Disability Retirement		Survivors and Beneficiaries		Total	
	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits
Under 20	0	\$0	0	\$0	40	\$389,484	40	\$389,484
20 to 24	0	\$0	0	\$0	12	\$233,820	12	\$233,820
25 to 29	0	\$0	2	\$47,424	0	\$0	2	\$47,424
30 to 34	0	\$0	1	\$26,472	1	\$4,104	2	\$30,576
35 to 39	0	\$0	10	\$344,100	2	\$58,476	12	\$402,576
40 to 44	0	\$0	13	\$451,512	5	\$132,492	18	\$584,004
45 to 49	1	\$22,896	52	\$1,992,324	29	\$855,324	82	\$2,870,544
50 to 54	478	\$34,199,088	97	\$3,432,420	57	\$1,462,044	632	\$39,093,552
55 to 59	576	\$40,859,388	93	\$3,365,244	80	\$2,301,792	749	\$46,526,424
60 to 64	433	\$31,281,576	92	\$3,882,648	129	\$3,771,909	654	\$38,936,133
65 to 69	705	\$41,993,160	133	\$6,238,752	217	\$6,539,653	1,055	\$54,771,565
70 to 74	897	\$51,003,864	155	\$6,871,152	273	\$8,454,853	1,325	\$66,329,869
75 to 79	442	\$25,773,168	111	\$5,321,028	223	\$7,107,600	776	\$38,201,796
80 to 84	223	\$12,788,544	83	\$4,436,904	186	\$6,161,652	492	\$23,387,100
85 to 89	53	\$3,566,472	46	\$2,665,152	110	\$3,717,984	209	\$9,949,608
90 to 94	17	\$1,475,832	31	\$1,886,724	77	\$2,527,908	125	\$5,890,464
95 & Over	3	\$240,084	6	\$417,108	35	\$1,149,300	44	\$1,806,492
Total	3,828	\$243,204,072	925	\$41,378,964	1,476	\$44,868,395	6,229	\$329,451,432



Schedule F – Schedules of Member Data

TABLE 11

**SCHEDULE OF RETIREE MEMBER DATA
AS OF OCTOBER 1, 2018**

**FIREFIIGHTERS' RETIREMENT PLAN
DISTRICT ONLY**

Attained Age	Service Retirement		Disability Retirement		Survivors and Beneficiaries		Total	
	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits
Under 20	0	\$0	0	\$0	18	\$198,854	18	\$198,854
20 to 24	0	\$0	0	\$0	8	\$54,830	8	\$54,830
25 to 29	0	\$0	0	\$0	0	\$0	0	\$0
30 to 34	0	\$0	4	\$91,800	2	\$29,433	6	\$121,233
35 to 39	0	\$0	6	\$214,344	1	\$2,974	7	\$217,318
40 to 44	0	\$0	7	\$276,960	1	\$27,828	8	\$304,788
45 to 49	0	\$0	13	\$551,328	8	\$280,538	21	\$831,866
50 to 54	45	\$2,256,057	14	\$421,212	11	\$249,661	70	\$2,926,930
55 to 59	171	\$7,920,984	9	\$342,722	19	\$358,171	199	\$8,621,877
60 to 64	230	\$9,504,920	16	\$309,511	20	\$556,728	266	\$10,371,159
65 to 69	118	\$2,724,692	20	\$344,565	22	\$371,367	160	\$3,440,625
70 to 74	50	\$727,473	2	\$1,655	14	\$260,623	66	\$989,751
75 to 79	9	\$81,502	0	\$0	7	\$130,160	16	\$211,662
80 to 84	0	\$0	0	\$0	3	\$57,384	3	\$57,384
85 to 89	0	\$0	0	\$0	0	\$0	0	\$0
90 to 94	0	\$0	0	\$0	0	\$0	0	\$0
95 & Over	0	\$0	0	\$0	0	\$0	0	\$0
Total	623	\$23,215,628	91	\$2,554,097	134	\$2,578,551	848	\$28,348,277



Schedule F – Schedules of Member Data

TABLE 12

**SCHEDULE OF RETIREE MEMBER DATA
AS OF OCTOBER 1, 2018**

**FIREFIIGHTERS' RETIREMENT PLAN
FEDERAL PLUS DISTRICT**

Attained Age	Service Retirement		Disability Retirement		Survivors and Beneficiaries		Total	
	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits
Under 20	0	\$0	0	\$0	18	\$260,484	18	\$260,484
20 to 24	0	\$0	0	\$0	9	\$90,336	9	\$90,336
25 to 29	0	\$0	0	\$0	0	\$0	0	\$0
30 to 34	0	\$0	4	\$91,800	2	\$53,448	6	\$145,248
35 to 39	0	\$0	6	\$214,344	1	\$4,152	7	\$218,496
40 to 44	0	\$0	7	\$276,960	2	\$56,856	9	\$333,816
45 to 49	0	\$0	13	\$551,328	8	\$334,812	21	\$886,140
50 to 54	45	\$3,155,220	14	\$421,212	13	\$384,732	72	\$3,961,164
55 to 59	171	\$13,052,964	12	\$486,216	26	\$648,288	209	\$14,187,468
60 to 64	232	\$19,072,572	29	\$1,319,820	36	\$1,201,032	297	\$21,593,424
65 to 69	152	\$11,528,064	48	\$2,516,772	50	\$1,533,552	250	\$15,578,388
70 to 74	198	\$13,940,640	44	\$2,274,996	77	\$2,432,442	319	\$18,648,078
75 to 79	193	\$13,155,456	75	\$4,275,288	100	\$3,102,008	368	\$20,532,752
80 to 84	107	\$7,038,564	45	\$2,389,608	63	\$2,040,360	215	\$11,468,532
85 to 89	47	\$3,408,588	27	\$1,513,524	61	\$2,148,732	135	\$7,070,844
90 to 94	16	\$1,143,000	16	\$962,064	48	\$1,784,940	80	\$3,890,004
95 & Over	1	\$58,752	6	\$387,816	15	\$521,256	22	\$967,824
Total	1,162	\$85,553,820	346	\$17,681,748	529	\$16,597,430	2,037	\$119,832,998



Schedule G – Schedules of Retirees Added to and Removed from Rolls

DISTRICT BENEFIT ONLY (\$ IN THOUSANDS)

Fiscal Year Ended	Plan	Added		Removed			Rolls at End of Year		Percentage Increase in Annual Allowances	Average Annual Allowances
		Number	Annual Allowances	Number	Annual Allowances	Increase Due to Plan Amendments	Number	Annual Allowances		
September 30, 2014	Teachers	218	\$6,079	65	\$955	\$597	3,601	\$58,687	10.8%	\$16
	Police	157	\$6,139	34	\$399	\$139	1,707	\$40,271	17.1%	\$24
	Fire	80	\$3,326	21	\$496	\$211	658	\$18,179	20.1%	\$28
September 30, 2015	Teachers	183	\$4,950	66	\$822	\$84	3,718	\$62,899	7.2%	\$17
	Police	240	\$10,865	24	\$189	-\$535	1,923	\$50,412	25.2%	\$26
	Fire	44	\$1,953	16	\$235	-\$95	686	\$19,802	8.9%	\$29
September 30, 2016	Teachers	222	\$6,844	58	\$1,021	\$68	3,882	\$68,790	9.4%	\$18
	Police	381	\$15,394	39	\$822	-\$1,397	2,265	\$63,587	26.1%	\$28
	Fire	60	\$2,811	8	\$200	-\$262	738	\$22,151	11.9%	\$30
September 30, 2017	Teachers	96	\$2,599	79	\$1,211	\$1,023	3,899	\$71,201	3.5%	\$18
	Police	189	\$8,485	35	\$537	\$928	2,419	\$72,463	14.0%	\$30
	Fire	63	\$2,802	5	\$141	\$411	796	\$25,223	13.9%	\$32
September 30, 2018	Teachers	160	\$4,892	69	\$977	\$1,419	3,990	\$76,535	7.5%	\$19
	Police	208	\$10,269	34	\$683	\$1,427	2,593	\$83,476	15.2%	\$32
	Fire	63	\$2,910	11	\$226	\$441	848	\$28,348	12.4%	\$33



Schedule G – Schedules of Retirees Added to and Removed from Rolls

FEDERAL PLUS DISTRICT BENEFIT (\$ IN THOUSANDS)

Fiscal Year Ended	Plan	Added		Removed		Increase Due to Plan Amendments	Rolls at End of Year		Percentage Increase in Annual Allowances	Average Annual Allowances
		Number	Annual Allowances	Number	Annual Allowances		Number	Annual Allowances		
September 30, 2014	Teachers	245	\$10,540	228	\$8,792	\$4,251	6,189	\$269,690	2.3%	\$44
	Police	240	\$13,009	218	\$8,382	\$3,689	5,717	\$275,815	3.1%	\$48
	Fire	121	\$6,969	89	\$3,880	\$1,391	2,026	\$110,000	4.2%	\$54
September 30, 2015	Teachers	197	\$8,040	249	\$17,224	\$7,071	6,137	\$267,577	-0.8%	\$44
	Police	312	\$19,957	168	\$9,132	\$4,269	5,861	\$290,909	5.5%	\$50
	Fire	70	\$3,988	103	\$5,370	\$2,006	1,993	\$110,624	0.6%	\$56
September 30, 2016	Teachers	446	\$15,992	400	\$18,508	\$5,143	6,183	\$270,204	1.0%	\$44
	Police	465	\$25,416	216	\$9,739	-\$1,317	6,110	\$305,269	4.9%	\$50
	Fire	83	\$4,887	68	\$3,260	-\$16	2,008	\$112,235	1.5%	\$56
September 30, 2017	Teachers	107	\$3,937	229	\$8,829	\$5,495	6,061	\$270,807	0.2%	\$45
	Police	261	\$14,438	214	\$9,061	\$5,772	6,157	\$316,418	3.7%	\$51
	Fire	84	\$4,919	58	\$2,727	\$2,233	2,034	\$116,660	3.9%	\$57
September 30, 2018	Teachers	226	\$8,601	281	\$9,897	\$4,195	6,006	\$273,706	1.1%	\$46
	Police	300	\$17,322	228	\$9,611	\$5,322	6,229	\$329,451	4.1%	\$53
	Fire	81	\$4,649	78	\$3,786	\$2,310	2,037	\$119,833	2.7%	\$59



Schedule H – Analysis of Financial Experience

Gains & Losses in Actuarial Accrued Liabilities Resulting from Difference Between Assumed Experience & Actual Experience (\$ Millions)

Type of Activity	Teachers	Police	Fire	Police and Fire	Total
Age & Service Retirements. If members retire at older ages, there is a gain. If younger ages, a loss.	(\$1.5)	\$10.4	\$5.0	\$15.4	\$13.9
Disability Retirements. If disability claims are less than assumed, there is a gain. If more claims, a loss.	\$0.0	\$2.7	\$0.5	\$3.2	\$3.2
Death-in Service Benefits. If survivor claims are less than assumed, there is a gain. If more claims, there is a loss.	(\$0.6)	\$1.3	\$0.5	\$1.8	\$1.2
Withdrawal from Employment. If more liabilities are released by withdrawals than assumed, there is a gain. If smaller releases, a loss.	\$6.5	\$11.7	\$0.2	\$11.9	\$18.4
Pay Increases. If there are smaller pay increases than assumed, there is a gain. If greater increases, a loss.	(\$16.8)	\$59.7	(\$35.8)	\$23.9	\$7.1
New Members. Additional unfunded actuarial accrued liability will produce a loss.	(\$31.6)	(\$13.8)	(\$8.9)	(\$22.7)	(\$54.3)
Investment Income. If there is a greater investment income than assumed, there is a gain. If less income, a loss.	\$18.3	\$47.7	\$22.8	\$70.5	\$88.8
Death after Retirement. If retirants live longer than assumed, there is a loss. If not as long, a gain.	\$0.0	(\$1.1)	\$1.2	\$0.1	\$0.1
COLA/CPI. If inflation is different than expected, gains or losses can occur.	\$7.6	\$9.4	\$1.9	\$11.3	\$18.9
Other. Miscellaneous gains and losses resulting from changes in valuation software, data adjustments, timing of financial transactions, etc.	(\$1.4)	(\$3.4)	(\$1.7)	(\$5.1)	(\$6.5)
Gain or (Loss) During Year From Financial Experience	(\$19.5)	\$124.6	(\$14.3)	\$110.3	\$90.8
Non-Recurring Items. Adjustments for plan amendments, assumption changes, method changes or audit changes.	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Composite Gain or (Loss) During Year	(\$19.5)	\$124.6	(\$14.3)	\$110.3	\$90.8