THE CLASSIFIED EMPLOYEES' RETIREMENT TRUST FUND OF THE CITY OF STAMFORD

Actuarial Valuation as of July 1, 2019
To Determine Funding For Fiscal Year 2020-21

Prepared by

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Certification

We have performed an actuarial valuation of the Plan as of July 1, 2019 to determine funding for fiscal year 2020-21. This report presents the results of our valuation.

The ultimate cost of a pension plan is the total amount needed to provide benefits for plan members and beneficiaries and to pay the expenses of administering the plan. Pension costs are met by contributions and by investment return on plan assets. The principal purpose of this report is to set forth an actuarial recommendation of the contribution, or range of contributions, which will properly fund the plan, in accordance with applicable government regulations. In addition, this report provides:

- A valuation of plan assets and liabilities to review the year-to-year progress of funding.
- Information needed to meet disclosure requirements.
- Review of plan experience for the previous year to ascertain whether the assumptions and methods employed for valuation purposes are reflective of actual events and remain appropriate for prospective application.
- Assessment of the relative funded position of the plan, i.e., through a comparison of plan assets and projected plan liabilities.
- Comments on any other matters which may be of assistance in the funding and operation of the plan.

This report may not be used for purposes other than those listed above without Milliman's prior written consent. If this report is distributed to other parties, it must be copied in its entirety, including this certification section.

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In preparing this report, we relied on employee census data and financial information as of the valuation date, furnished by the City. We performed a limited review of the data used directly in our analysis for reasonableness and consistency and have found them to be reasonably consistent and comparable with data used for other purposes. If the underlying data or information is inaccurate or incomplete, the results of our analysis may likewise be inaccurate or incomplete and our calculations may need to be revised. If there are material defects in the data, it is possible that they would be uncovered by a detailed, systematic review and comparison of the data to search for data values that are questionable or for relationships that are materially inconsistent. Such a review was beyond the scope of our assignment.

Certification

The calculations reported herein have been made on a basis consistent with our understanding of ERISA and the related sections of the tax code. Additional determinations may be needed for purposes other than meeting funding requirements, such as judging benefit security at plan termination or meeting employer accounting requirements. On the basis of the foregoing, we hereby certify that, to the best of our knowledge, this report is complete and accurate and all costs and liabilities were determined in conformance with generally accepted actuarial principles and practices. Figures for periods prior to July 1, 2018 have been obtained from actuarial valuation reports prepared by Hooker & Holcombe and from the City's Comprehensive Annual Financial Reports.

I further certify that, in my opinion, each actuarial assumption, method and technique used is reasonable taking into account the experience of the Plan and reasonable expectations. Future actuarial measurements may differ significantly from the current measurements presented in this report due to factors such as, but not limited to, 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 (such as the end of an amortization period or additional cost or contribution requirements based on the plan’s funded status); and changes in plan provisions or applicable law. Due to the limited scope of the actuarial assignment, we did not perform an analysis of the potential range of such future measurement.

The consultants who worked on this assignment are pension actuaries. Milliman’s advice is not intended to be a substitute for qualified legal or accounting counsel.

We are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Rebecca A. Sielman, FSA	Yelena Pelletier, ASA
Consulting Actuary	Consulting Actuary

Section I - Executive Summary
Changes Since the Prior Valuation

Plan Changes

For the LAW union, the definition of pension earnings was changed from salary in the final year of employment to the average of the highest 3 out of the last 10 years of salary.

For the LAW, TEA and DEN unions, employee contributions were changed from 5% to 6% of annual compensation.

These changes in combination caused the Unfunded Accrued Liability to decrease by about $106,300 and the Actuarially Determined Contribution to decrease by about $33,000.

Changes in Actuarial Methods and Assumptions

In order to better anticipate future plan experience, we lowered the interest rate assumption from 7.10% to 7.05% and we updated the mortality assumption from the 50/50 blend of the RP-2000 Blue Collar table and the RP-2000 No Collar table with generational projection per Scale BB to the PubG-2010 table with generational projection per the Ultimate MP scale. We also modified the calculation of the timing adjustment, which previously added interest to the net normal cost based on the rate of inflation (2.60%). The new calculation applies interest to both the net normal cost and past service cost based on the valuation interest rate.

These changes in combination caused the Unfunded Accrued Liability to increase by about $7,223,500 and the Actuarially Determined Contribution to increase by about $1,323,000.

Other Significant Changes

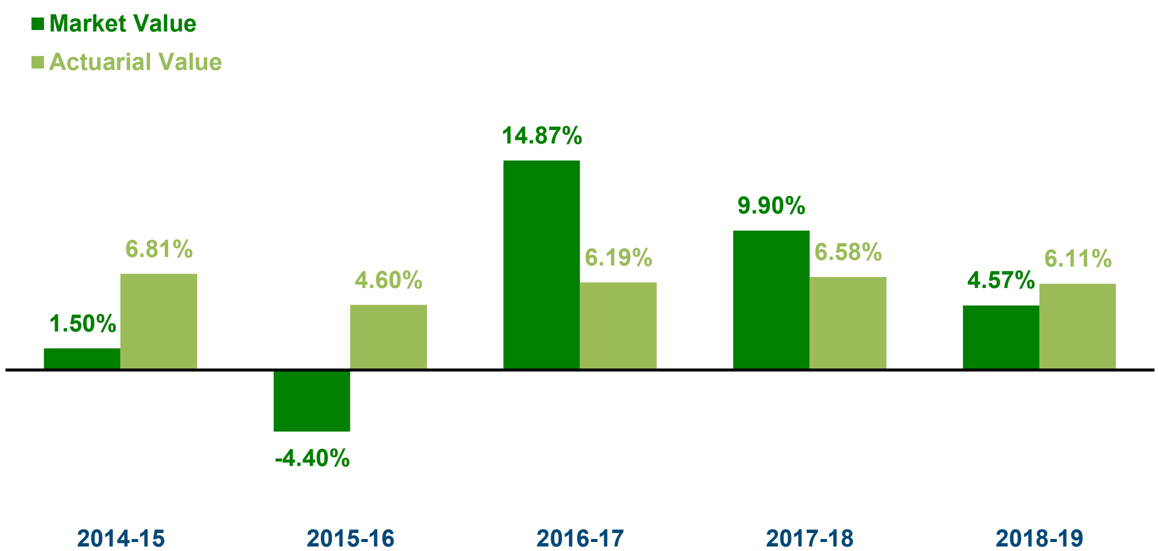
None.

Section I - Executive Summary
Assets

There are two different measures of the plan's assets that are used throughout this report. The Market Value is a snapshot of the plan's investments as of the valuation date. The Actuarial Value is a smoothed asset value designed to temper the volatile fluctuations in the market by recognizing investment gains or losses asymptotically over five years.

	Market	Actuarial
Value as of July 1, 2018	$223,064,471	$228,435,137
City and Member Contributions	9,929,475	9,929,475
Investment Income	10,047,411	13,948,989
Benefit Payments and Administrative Expenses	(16,687,697)	(16,687,697)
Value as of July 1, 2019	226,353,660	235,625,904

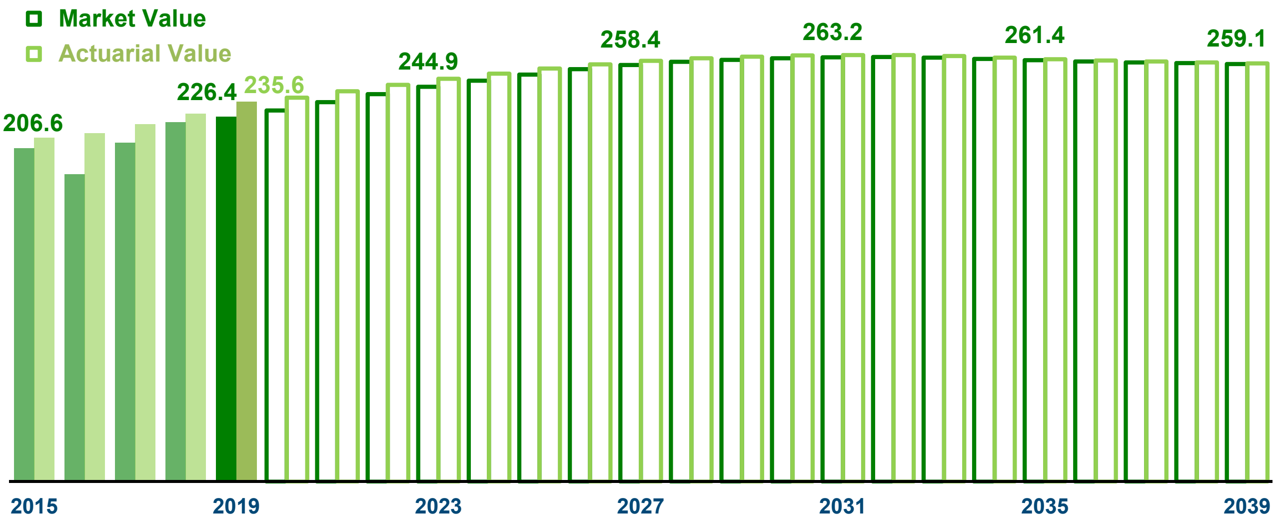
For fiscal year 2018-19, the plan's assets earned 4.57% on a Market Value basis and 6.11% on an Actuarial Value basis. The actuarial assumption for this period was 7.10%; the result is an asset loss of about $5.6 million on a Market Value basis and a loss of about $2.3 million on an Actuarial Value basis. Historical rates of return are shown in the graph below.



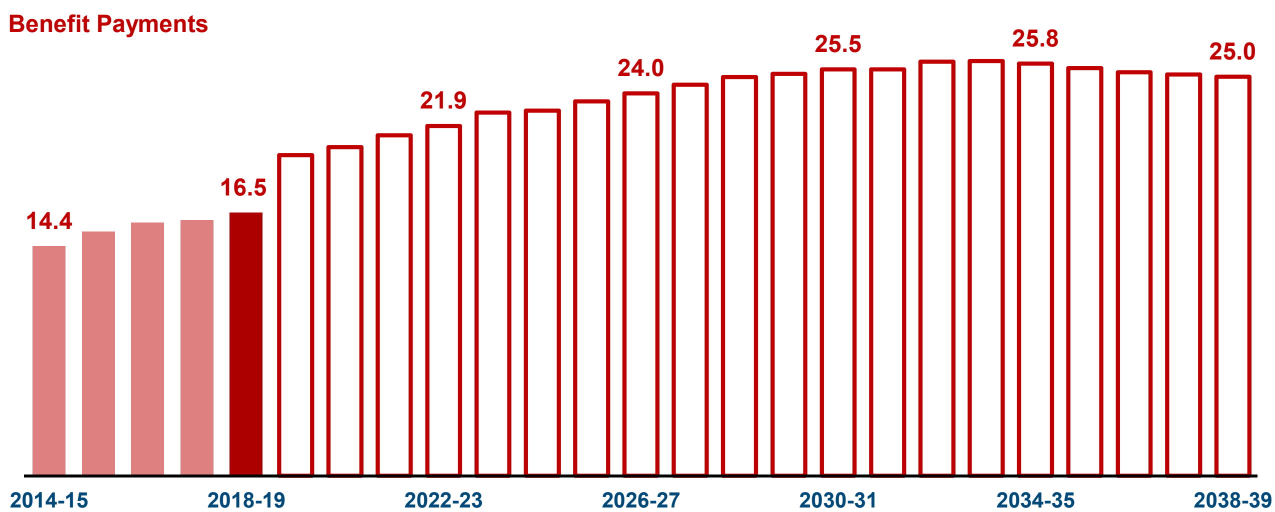
Please note that the Actuarial Value currently exceeds the Market Value by $9.3 million. This figure represents investment losses that will be gradually recognized in future years. This process will exert upward pressure on the City's contribution, unless there are offsetting market gains.

Section I - Executive Summary
Assets (continued)

The graph below shows how this year's asset values compare to where the plan's assets have been over the past several years and how they are projected to change over the next 20 years. For purposes of this projection, we have assumed that the City always contributes the Actuarially Determined Contribution and the investments always earn the assumed interest rate each year.

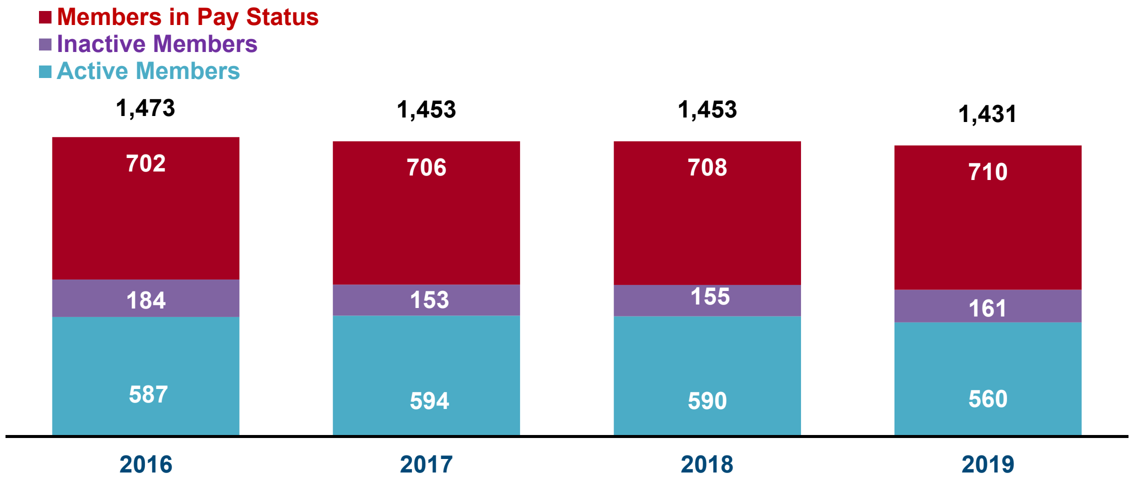


In 2018-19, the plan paid out $16.5 million in benefits to members. Over the next 20 years, the plan is projected to pay out a total of $482 million in benefits to members.



Section I - Executive Summary
Membership

There are three basic categories of plan members included in the valuation: (1) members who are receiving monthly pension benefits, (2) former employees who have a vested right to benefits but have not yet started collecting, and (3) active employees who have met the eligibility requirements for membership.

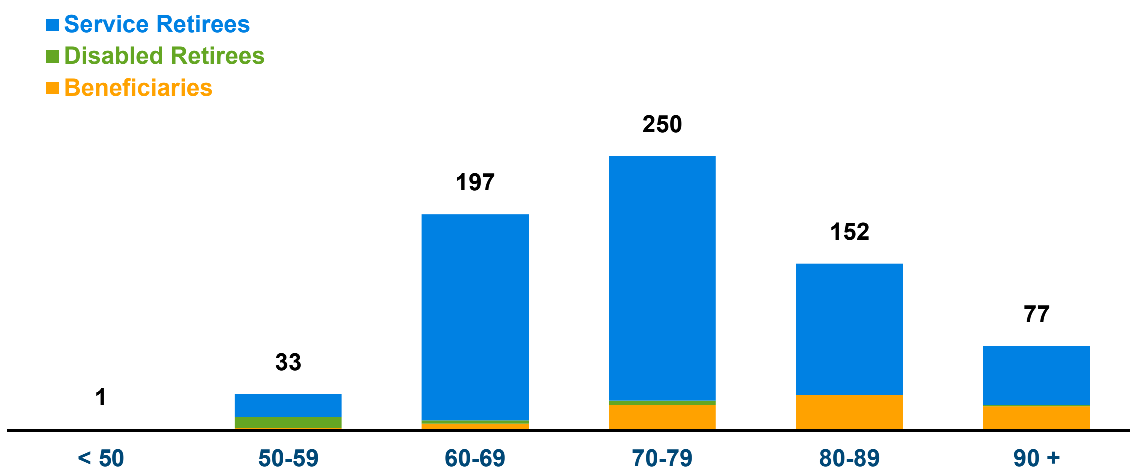


Members in Pay Status on July 1, 2019

Board of Education	85	Average Age	75.6
City	601	Total Annual Benefit	$15,822,248
WPCA	24	Average Annual Benefit	22,285
Total	710		

As of July 1, 2019, there were 606 Service Retirees, 19 Disabled Retirees, and 85 Beneficiaries.

The total members in pay status fall across a wide distribution of ages:



Section I - Executive Summary
Membership (continued)

Terminated Vested Members on July 1, 2019

Board of Education	9	Average Age	51.7
City	134	Total Annual Benefit	$1,966,409
WPCA	2	Average Annual Benefit	13,561
Total	145		

Nonvested Members Due Refunds on July 1, 2019

Board of Education	0
City	14
WPCA	2
Total	16

Active Members on July 1, 2019

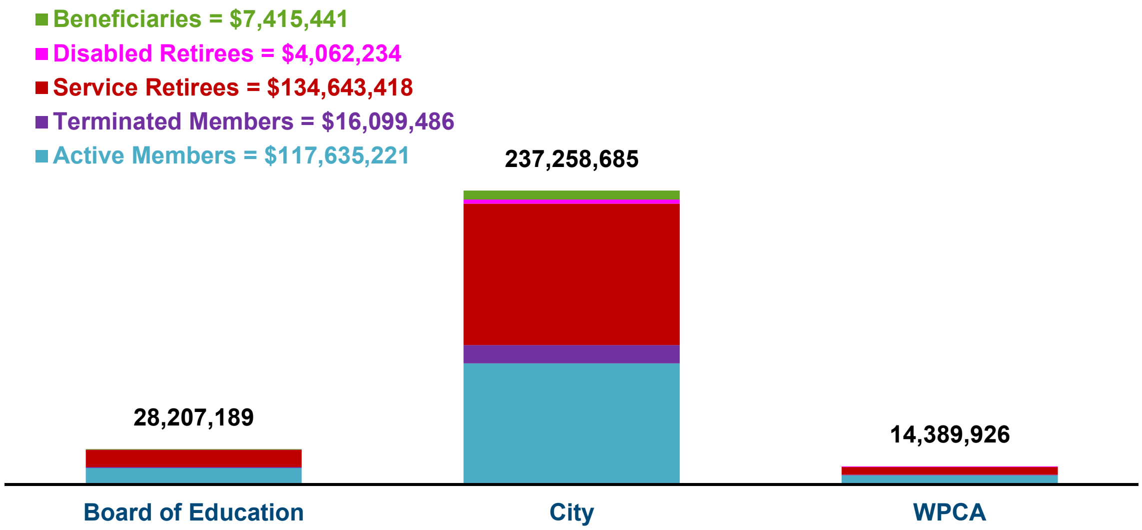
Board of Education	88	Average Age	52.2
City	445	Average Service	15.3
WPCA	27	Payroll	$42,111,975
Total	560	Average Payroll	75,200

The table below illustrates the age and years of service of the active membership:

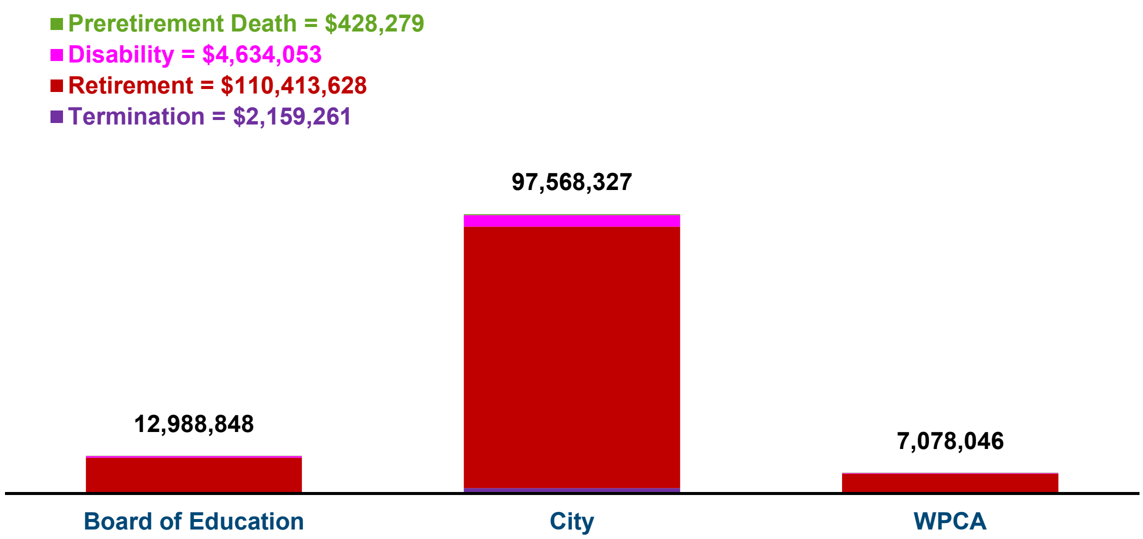
	Years of Service							
Age	**0-4**	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30+**	**Total**
< 25	5							5
25-29	23	1						24
30-34	14	12	3					29
35-39	19	11	10	2				42
40-44	10	8	16	11	2			47
45-49	18	9	9	15	13		1	65
50-54	16	18	9	14	24	7	9	97
55-59	8	10	13	25	19	6	20	101
60-64	10	9	17	11	17	3	17	84
65+	5	3	8	6	20	1	23	66
Total	128	81	85	84	95	17	70	560

Section I - Executive Summary
Accrued Liability

The Accrued Liability as of July 1, 2019 is $279,855,800, which consists of the following pieces:



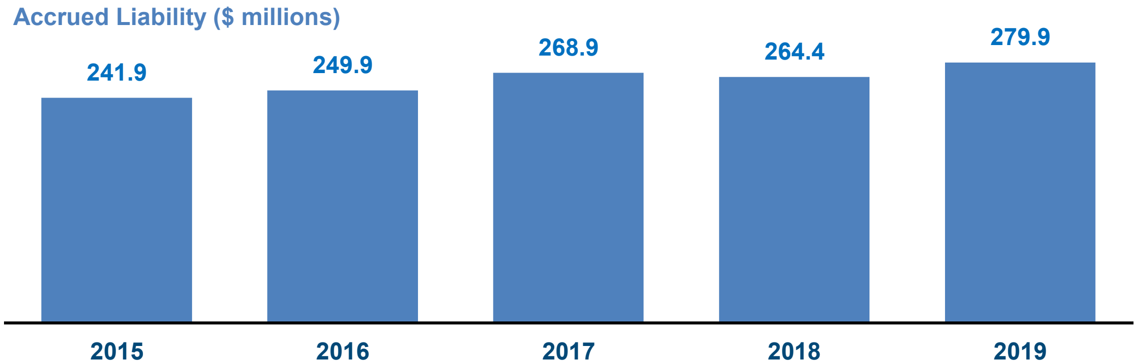
The Accrued Liability for active members can be broken down further by the different types of benefits provided by the plan:

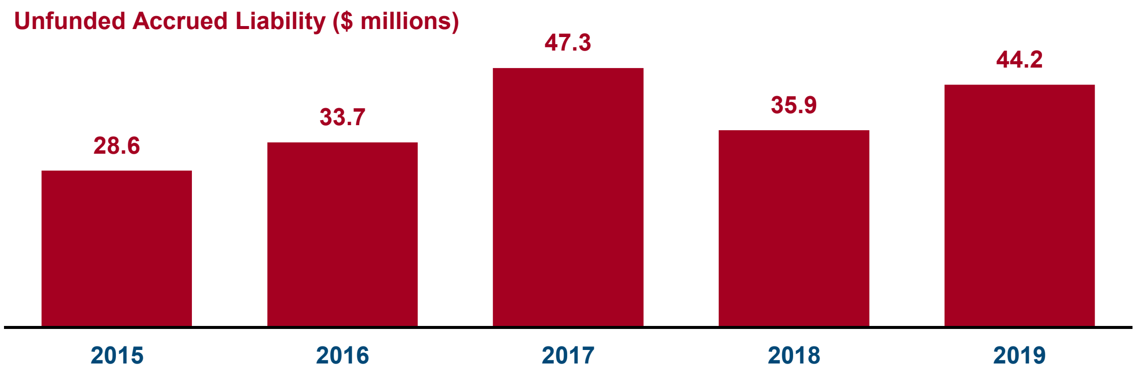


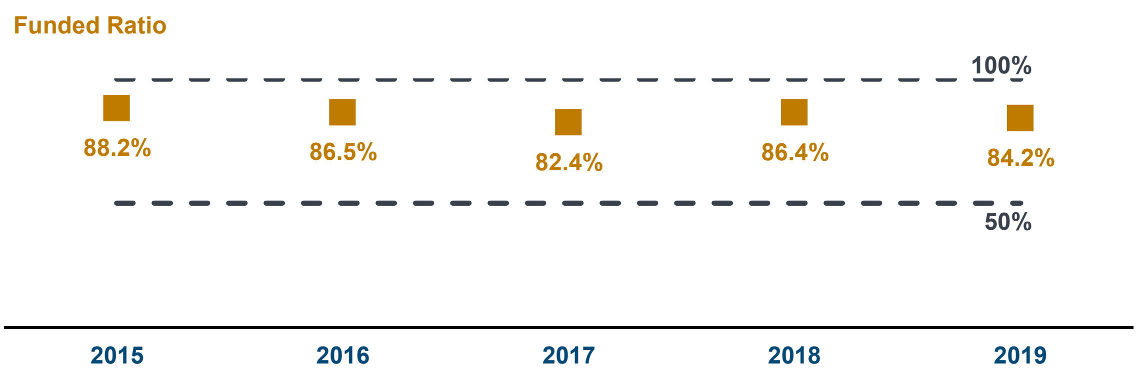
For purposes of determining the City's contribution, the Accrued Liability is measured using the Projected Unit Credit actuarial cost method. A different actuarial cost method, Entry Age Normal, is required to be used to measure liability for financial reporting purposes per GASB 67/68. As of July 1, 2019, the Entry Age Normal Accrued Liability is $288,218,759.

Section I - Executive Summary
Funded Status

The Accrued Liability grows over time as active members earn additional benefits, and goes down over time as members receive benefits; it may also change when there are changes to the plan provisions or changes in the actuarial assumptions. The Unfunded Accrued Liability is the dollar difference between the Accrued Liability and the Actuarial Value of Assets; the Funded Ratio is the ratio of the two.



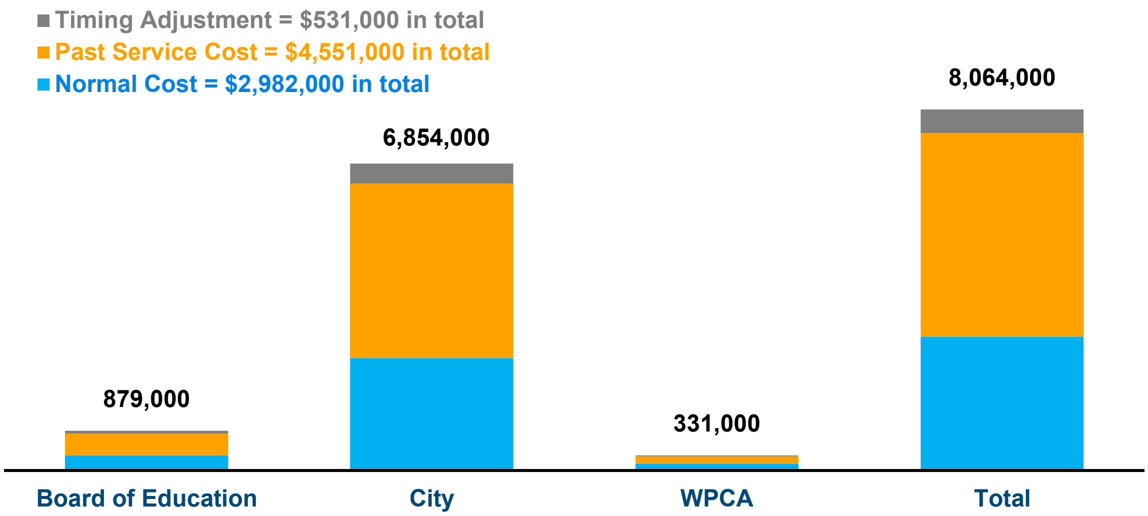




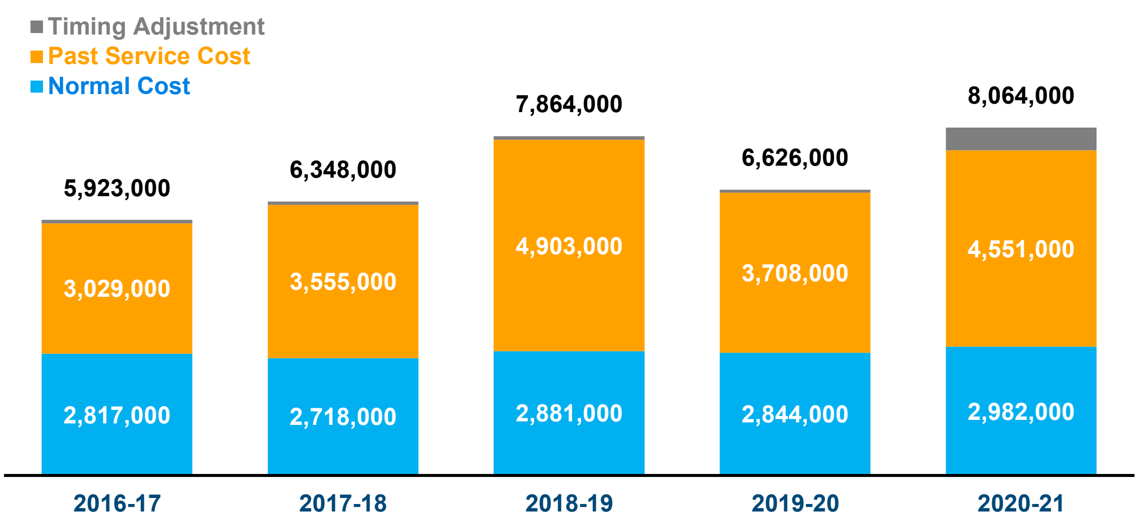
Section I - Executive Summary
Actuarially Determined Contribution

The Actuarially Determined Contribution consists of three pieces: a Normal Cost payment to fund the benefits earned each year, a Past Service Cost to gradually reduce any unfunded or surplus liability, and a Timing Adjustment to reflect the timing of the contribution relative to the valuation date.

The Actuarially Determined Contribution for fiscal year 2020-21 is shown graphically below.

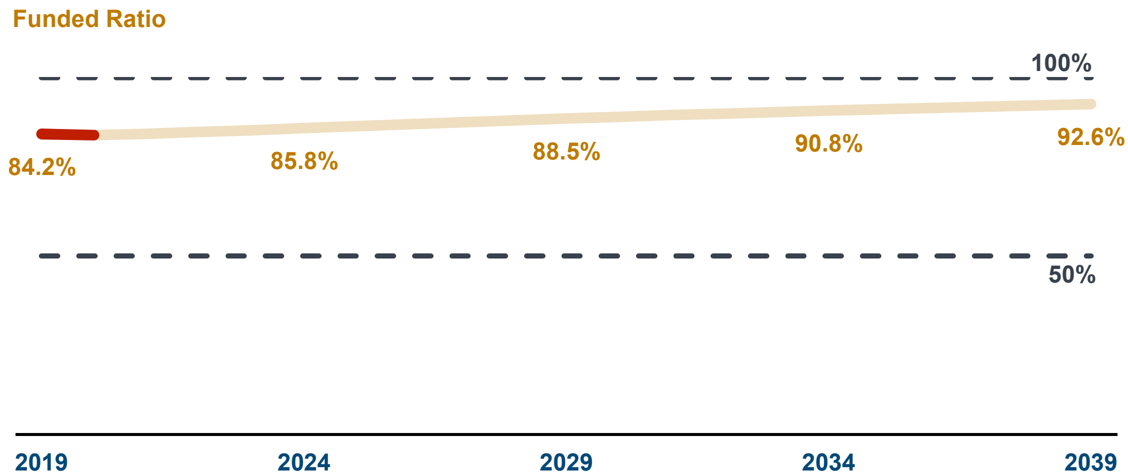


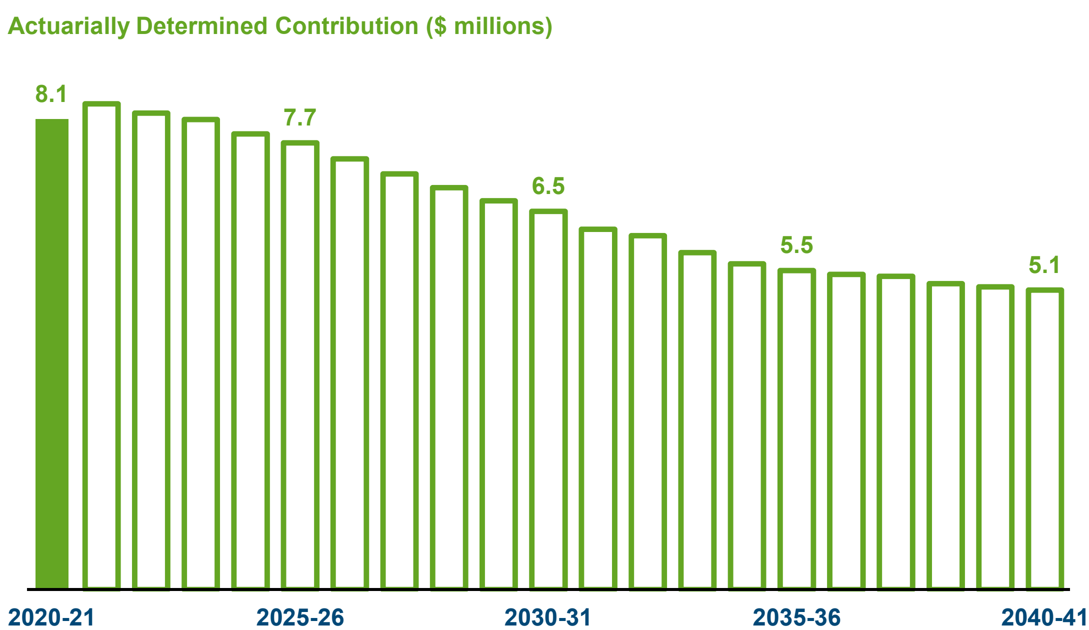
The chart below shows the Actuarially Determined Contribution for the past five fiscal years. Note that the Normal Cost is relatively consistent from year to year, whereas the Past Service Cost tends to be more volatile since it reflects the impact of asset performance.



Section I - Executive Summary
Long-Range Forecast

If the City pays the Actuarially Determined Contribution each year, the investments earn exactly the assumed interest rate each year, and there are no changes in the plan provisions or in the actuarial methods and assumptions, then we project the following changes in the plan's funded status and the long-range contribution levels:

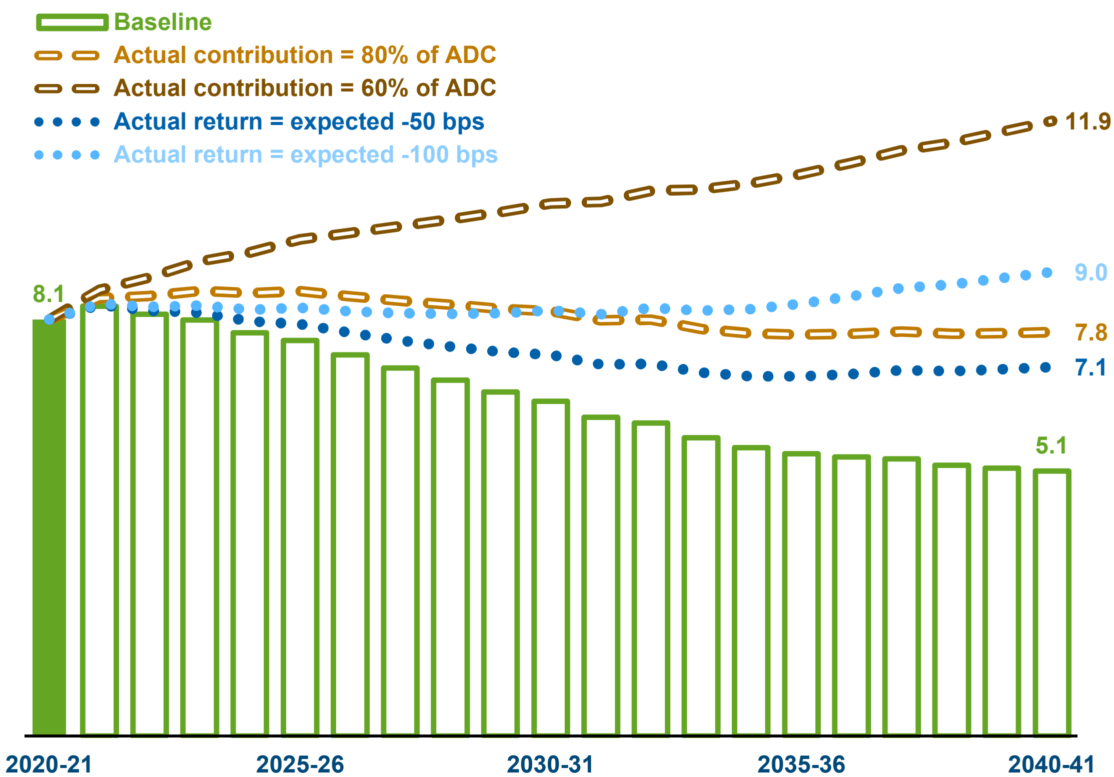




To the extent that there are future investment or liability gains or losses, changes in the actuarial assumptions or methods, or plan changes, the actual valuation results will differ from these forecasts. Please see Section III C for more details of the long range forecast.

Section I - Executive Summary
Long-Range Forecast (continued)

Pension benefits are paid for through a combination of contributions from the City and from employees, and from investment income. If the City pays less than the Actuarially Determined Contribution each year, or if the investments persistently earn less than the assumed interest rate, then the plan's funded status would suffer, and to compensate, the City's contribution levels would be pushed higher. The risks of underfunding and underearning are illustrated in the hypothetical scenarios below:



The scenarios illustrated above are based on deterministic projections that assume emerging plan experience always exactly matches the actuarial assumptions; in particular that actual asset returns will be constant in every year of the projection period. Variation in asset returns, contribution amounts, and many other factors may have a significant impact on the long-term financial health of the plan, the liquidity constraints on plan assets, and the City's future contribution levels. Stochastic projections could be prepared that would enable the City to understand the potential range of future results based on the expected variability in asset returns and other factors. Such analysis was beyond the scope of this engagement.

Section I - Executive Summary
Summary of Principal Results

Membership as of	July 1, 2019	July 1, 2018
Active Members	560	590
Inactive Members	161	155
Members in Pay Status	710	708
Total Count	1,431	1,453
Payroll	$42,111,975	$42,277,750

Assets and Liabilities as of	July 1, 2019	July 1, 2018
Market Value of Assets	$226,353,660	$223,064,471
Actuarial Value of Assets	235,625,904	228,435,137
Accrued Liabiilty for Active Members	117,635,221	114,154,895
Accrued Liabiilty for Inactive Members	16,099,486	15,030,129
Accrued Liabiilty for Members in Pay Status	146,121,093	135,195,127
Total Accrued Liability	279,855,800	264,380,151
Unfunded Accrued Liability	44,229,896	35,945,014
Funded Ratio	84.2%	86.4%

Actuarially Determined Contribution for Fiscal Year	2020-21	2019-20
Normal Cost	$2,982,000	$2,844,000
Past Service Cost	4,551,000	3,708,000
Timing Adjustment	531,000	74,000
Actuarially Determined Contribution	8,064,000	6,626,000
Allocated to Board of Education	879,000	673,000
Allocated to City	6,854,000	5,685,000
Allocated to WPCA	331,000	268,000
Total	8,064,000	6,626,000

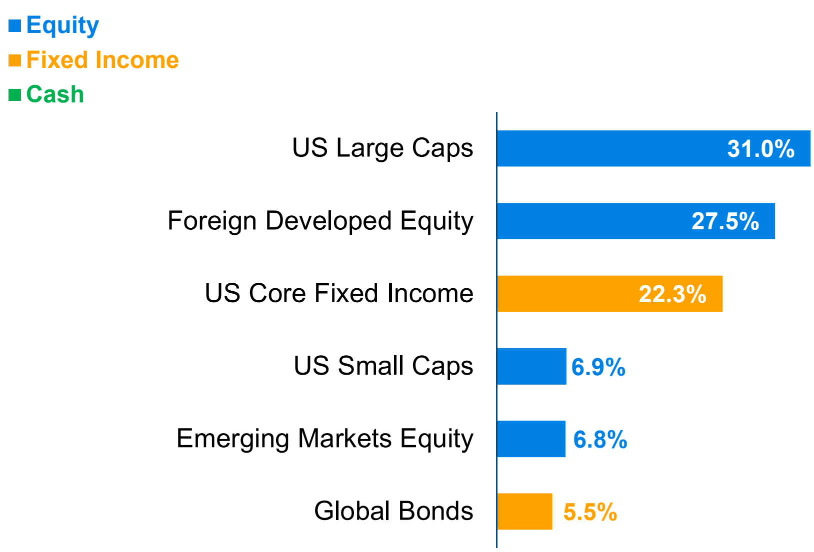
Section II - Plan Assets
A. Summary of Fund Transactions

Assets are allocated directly to WPCA based on the WPCA cash flows and a prorata share of the net investment income; the remaining non-WPCA market value is allocated to the Board of Education and the City in proportion to their respective total Accrued Liability, measured prior to any plan or assumption changes (Board of Education $27,238,086; City $231,436,292).

	Board of Education	City	WPCA	Total
Market Value as of July 1, 2018	$22,653,940	$188,257,432	$12,153,099	$223,064,471
City Contributions			416,000	7,864,000
Member Contributions			101,344	2,065,475
Net Investment Income			513,001	10,047,411
Benefit Payments			(875,001)	(16,506,669)
Administrative Expenses			(9,243)	(181,028)
Market Value as of June 30, 2019	22,539,665	191,514,795	12,299,200	226,353,660
Expected Return on Market Value of Assets				15,609,763
Market Value (Gain)/Loss				5,562,352
Approximate Rate of Return *				4.57%

* The rate shown here is not the dollar or time weighted investment yield rate which measures investment performance. It is an approximate net return assuming all activity occurred on average midway through the fiscal year.

Target Asset Allocation as of June 30, 2019



Section II - Plan Assets
B. Development of Actuarial Value of Assets

In order to minimize the impact of market fluctuations on the contribution level, we use an Actuarial Value of Assets that recognizes gains and losses asymptotically over a five year period. The Actuarial Value of Assets as of July 1, 2019 is determined below.

1.	Expected Actuarial Value of Assets:	
	a. Actuarial Value of Assets as of July 1, 2018	$228,435,137
	b. City and Member Contributions	9,929,475
	c. Benefit Payments and Administrative Expenses	(16,687,697)
	d. Expected Earnings Based on 7.10% Interest	16,267,050
	e. Expected Actuarial Value of Assets as of July 1, 2019	237,943,965
2.	Market Value of Assets as of July 1, 2019	226,353,660
3.	Unrecognized Gains/(Losses): (2) - (1e)	(11,590,305)
4.	Amount Recognized as of July 1, 2019: 20% of (3)	(2,318,061)
5.	Preliminary Actuarial Value of Assets as of July 1, 2019: (1e) + (4)	235,625,904
6.	Preliminary Actuarial Value of Assets as a % of Market Value: (5) / (2)	104.1%
7.	Actuarial Value of Assets as of July 1, 2019: (5), within +/- 30% of (2)	235,625,904
8.	Actual Earnings on Actuarial Value of Assets: (7) - [(1a) + (1b) + (1c)]	13,948,989
9.	Approximate Rate of Return on Actuarial Value of Assets	6.11%
10.	Actuarial Value (Gain)/Loss: (1d) - (8)	2,318,061
11.	Actuarial Value of Assets as of July 1, 2019 allocated in proportion to Market Value:	

	Market Value	Actuarial Value
Board of Education	$22,539,665	$23,462,969
City	191,514,795	199,359,916
WPCA	12,299,200	12,803,019
Total	226,353,660	235,625,904

Section III - Development of Contribution
A. Past Service Cost

In determining the Past Service Cost, the Unfunded Accrued Liability is amortized as a level dollar amount over 15 years.

		Board of Education	City	WPCA	Total
1.	Accrued Liability				
	Active Members	$12,988,848	$97,568,327	$7,078,046	$117,635,221
	Inactive Members	827,959	14,800,251	471,276	16,099,486
	Service Retirees	13,898,875	114,445,323	6,299,220	134,643,418
	Disabled Retirees	157,418	3,363,432	541,384	4,062,234
	Beneficiaries	334,089	7,081,352	0	7,415,441
	Total Accrued Liability	28,207,189	237,258,685	14,389,926	279,855,800
2.	Actuarial Value of Assets (see Section IIB)	23,462,969	199,359,916	12,803,019	235,625,904
3.	Unfunded Accrued Liability: (1) - (2)	4,744,220	37,898,769	1,586,907	44,229,896
4.	Funded Ratio: (2) / (1)	83.2%	84.0%	89.0%	84.2%
5.	Amortization Period	15	15	15	15
6.	Amortization Growth Rate	0.00%	0.00%	0.00%	0.00%
7.	Past Service Cost: (3) amortized over (5)	488,123	3,899,329	163,274	4,550,726

Section III - Development of Contribution
B. Actuarially Determined Contribution

		Board of Education	City	WPCA	Total
1.	Total Normal Cost	$522,488	$3,777,959	$225,863	$4,526,310
2.	Expected Member Contributions	206,776	1,400,032	87,779	1,694,587
3.	Expected Administrative Expenses	17,384	125,697	7,514	150,595
4.	Net Normal Cost: (1) - (2) + (3)	333,096	2,503,624	145,598	2,982,318
5.	Past Service Cost (see Section IIIA)	488,123	3,899,329	163,274	4,550,726
6.	Interest on (4) + (5) to start of the fiscal year*	58,000	451,000	22,000	531,000
7.	Actuarially Determined Contribution: (4) + (5) + (6), rounded to $1,000	879,000	6,854,000	331,000	8,064,000

**Previously the timing adjustment added interest to the net normal based on the rate of inflation.*

Section III - Development of Contribution
C. Long Range Forecast

This forecast is based on the results of the July 1, 2019 actuarial valuation and assumes that the City will pay the Actuarially Determined Contribution each year, the assets will return the assumed interest rate on a market value basis each year, and there are no future changes in the actuarial methods or assumptions or in the plan provisions. Actual results at each point in time will yield different values, reflecting the actual experience of the plan membership and assets.

	Values as of the Valuation Date					Cash Flows Projected to the Following Fiscal Year			
Valuation Date	Accrued Liability	Actuarial Value of Assets	Unfunded Accrued Liability	Funded Ratio	Fiscal Year	City Contributions	Member Contributions	Benefit Payments	Net Cash Flows
7/1/2019	$279,855,800	$235,625,904	$44,229,896	84.2%	2020-21	$8,064,000	$1,806,719	($20,602,010)	($10,731,291)
7/1/2020	283,819,000	238,104,000	45,715,000	83.9%	2021-22	8,323,000	1,736,000	(21,356,000)	(11,297,000)
7/1/2021	287,548,000	242,177,000	45,371,000	84.2%	2022-23	8,164,000	1,721,000	(21,930,000)	(12,045,000)
7/1/2022	290,537,000	246,199,000	44,338,000	84.7%	2023-24	8,054,000	1,693,000	(22,768,000)	(13,021,000)
7/1/2023	293,140,000	249,928,000	43,212,000	85.3%	2024-25	7,809,000	1,717,000	(22,891,000)	(13,365,000)
7/1/2024	294,915,000	253,080,000	41,835,000	85.8%	2025-26	7,657,000	1,696,000	(23,478,000)	(14,125,000)
7/1/2025	296,693,000	256,236,000	40,457,000	86.4%	2026-27	7,381,000	1,680,000	(23,986,000)	(14,925,000)
7/1/2026	297,844,000	258,947,000	38,897,000	86.9%	2027-28	7,123,000	1,690,000	(24,517,000)	(15,704,000)
7/1/2027	298,447,000	261,116,000	37,331,000	87.5%	2028-29	6,888,000	1,660,000	(25,010,000)	(16,462,000)
7/1/2028	298,448,000	262,713,000	35,735,000	88.0%	2029-30	6,663,000	1,645,000	(25,203,000)	(16,895,000)
7/1/2029	297,865,000	263,705,000	34,160,000	88.5%	2030-31	6,482,000	1,599,000	(25,490,000)	(17,409,000)
7/1/2030	297,018,000	264,374,000	32,644,000	89.0%	2031-32	6,172,000	1,655,000	(25,482,000)	(17,655,000)
7/1/2031	295,691,000	264,605,000	31,086,000	89.5%	2032-33	6,063,000	1,624,000	(25,959,000)	(18,272,000)
7/1/2032	294,322,000	264,630,000	29,692,000	89.9%	2033-34	5,774,000	1,643,000	(26,000,000)	(18,583,000)
7/1/2033	292,185,000	264,050,000	28,135,000	90.4%	2034-35	5,584,000	1,654,000	(25,837,000)	(18,599,000)
7/1/2034	289,836,000	263,128,000	26,708,000	90.8%	2035-36	5,468,000	1,695,000	(25,568,000)	(18,405,000)
7/1/2035	287,552,000	262,141,000	25,411,000	91.2%	2036-37	5,404,000	1,732,000	(25,300,000)	(18,164,000)
7/1/2036	285,492,000	261,300,000	24,192,000	91.5%	2037-38	5,366,000	1,733,000	(25,168,000)	(18,069,000)
7/1/2037	283,687,000	260,660,000	23,027,000	91.9%	2038-39	5,244,000	1,766,000	(25,013,000)	(18,003,000)
7/1/2038	281,923,000	260,083,000	21,840,000	92.3%	2039-40	5,185,000	1,790,000	(24,816,000)	(17,841,000)

Section III - Development of Contribution
D. History of Funded Status

Valuation Date	Actuarial Value of Assets	Accrued Liability	Unfunded Accrued Liability	Funded Ratio
July 1, 2019	$235,625,904	$279,855,800	$44,229,896	84.2%
July 1, 2018	228,435,137	264,380,151	35,945,014	86.4%
July 1, 2017	221,592,260	268,864,782	47,272,522	82.4%
July 1, 2016	216,205,953	249,941,161	33,735,208	86.5%
July 1, 2015	213,353,135	241,905,000	28,551,865	88.2%
July 1, 2014	205,056,151	235,975,000	30,918,849	86.9%
July 1, 2013	194,421,794	227,311,000	32,889,206	85.5%
July 1, 2012	188,447,106	219,465,000	31,017,894	85.9%
July 1, 2011	185,098,968	202,613,000	17,514,032	91.4%
July 1, 2010	180,544,359	194,670,000	14,125,641	92.7%

Section III - Development of Contribution
E. History of City Contributions

Fiscal Year	Actuarially Determined Contribution	Actual City Contribution	Payroll	Actual Contribution as a Percent of Payroll
2020-21	$8,064,000	TBD	$42,111,975	TBD
2019-20	6,626,000	TBD	42,277,750	TBD
2018-19	7,864,000	$7,864,000	41,463,538	19.0%
2017-18	6,348,000	6,348,000	42,603,785	14.9%
2016-17	5,923,000	5,923,000	40,776,678	14.5%
2015-16	6,387,000	6,348,000	39,506,337	16.1%
2014-15	6,799,000	6,799,000	44,213,643	15.4%
2013-14	6,504,000	6,504,000	44,997,000	14.5%
2012-13	5,902,000	5,897,100	43,686,085	13.5%
2011-12	5,362,000	5,390,000	48,396,000	11.1%

Section IV - Membership Data
A. Reconciliation of Membership from Prior Valuation

Details of the changes in the Plan membership since the last valuation are shown below. Additional details on the Plan membership are provided in the remainder of Section IV.

	Active Members	Terminated Vested Members	Nonvested Members Due Refunds	Service Retirees	Disabled Retirees	Beneficiaries	Total
Count July 1, 2018	590	141	14	599	22	87	1,453
Terminated							
- due refund	(3)	-	3	-	-	-	0
- paid refund	(4)	-	(1)	-	-	-	(5)
- vested benefits due	(10)	10	-	-	-	-	0
Retired	(33)	(6)	-	39	-	-	0
Died							
- with beneficiary		-	-	(5)	(1)	(1)	(7)
- no beneficiary	(1)	-	-	(29)	(2)	(8)	(40)
Benefits expired	-	-	-	-	-	-	0
New member	21	-	-	-	-	8	29
Rehired	-	-	-	-	-	-	0
New Alternate Payee	-	-	-	-	-	1	1
Correction	-	-	-	2	-	(2)	0
Count July 1, 2019	560	145	16	606	19	85	1,431
Breakdown July 1, 2019							
Board of Education	88	9	0	79	1	5	182
City	445	134	14	505	16	80	1,194
WPCA	27	2	2	22	2	0	55
Total	560	145	16	606	19	85	1,431

Section IV - Membership Data
B. Statistics of Active Membership

		As of July 1, 2019	As of July 1, 2018
Number of Active Members	Board of Education	88	84
	City	445	478
	WPCA	27	28
	Total	560	590
Average Age	Board of Education	52.6	53.3
	City	51.9	51.7
	WPCA	56.3	56.1
	Total	52.2	52.1
Average Service	Board of Education	13.0	14.0
	City	15.6	15.1
	WPCA	17.5	16.7
	Total	15.3	15.0
Total Payroll	Board of Education	$5,739,595	$5,315,077
	City	34,123,428	34,672,568
	WPCA	2,248,952	2,290,105
	Total	42,111,975	42,277,750
Average Payroll	Board of Education	$65,223	$63,275
	City	76,682	72,537
	WPCA	83,295	81,789
	Total	75,200	71,657

Section IV - Membership Data
C. Distribution of Active Members as of July 1, 2019

Board of Education

	Years of Service							
Age	**0-4**	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30+**	**Total**
< 25								0
25-29	1							1
30-34	5	2						7
35-39	10	2	1					13
40-44	1		2	1	1			5
45-49	4	2	1	2				9
50-54	4	4	1	4	1	1		15
55-59	3	3		1	6	2	1	16
60-64		1	4	2	1			8
65+		1	2	1	5		5	14
Total	28	15	11	11	14	3	6	88

City

	Years of Service							
Age	**0-4**	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30+**	**Total**
< 25	5							5
25-29	22	1						23
30-34	9	9	3					21
35-39	9	9	7	2				27
40-44	9	8	13	10	1			41
45-49	14	7	8	13	13		1	56
50-54	10	10	7	10	23	5	9	74
55-59	5	6	13	23	12	3	19	81
60-64	8	8	13	8	15	3	16	71
65+	5	2	5	5	14	1	14	46
Total	96	60	69	71	78	12	59	445

WPCA

	Years of Service							
Age	**0-4**	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30+**	**Total**
< 25								0
25-29								0
30-34		1						1
35-39			2					2
40-44			1					1
45-49								0
50-54	2	4	1			1		8
55-59		1		1	1	1		4
60-64	2			1	1		1	5
65+			1		1		4	6
Total	4	6	5	2	3	2	5	27

Section IV - Membership Data
D. Statistics of Inactive Membership

	As of July 1, 2019	As of July 1, 2018
Terminated Vested Members		
Number	145	141
Total Annual Benefit	$1,966,410	$1,917,818
Average Annual Benefit	13,561	13,602
Average Age	51.7	52.3
Nonvested Members Due Refunds		
Number	16	14
Service Retirees		
Number	606	599
Total Annual Benefit	$14,282,013	$13,639,341
Average Annual Benefit	23,568	22,770
Average Age	75.0	75.3
Disabled Retirees		
Number	19	22
Total Annual Benefit	$421,650	$477,122
Average Annual Benefit	22,192	21,687
Average Age	62.9	63.3
Beneficiaries		
Number	85	87
Total Annual Benefit	$1,118,586	$1,165,250
Average Annual Benefit	13,160	13,394
Average Age	82.6	82.3

Section IV - Membership Data
E. Distribution of Inactive Members as of July 1, 2019

	Age	Number	Annual Benefits
Terminated Vested Members	< 50	46	$556,855
	50 - 59	80	1,147,871
	60 - 69	19	261,684
	70 - 79	0	0
	80 - 89	0	0
	90 +	0	0
	Total	145	1,966,410
Service Retirees	< 50	0	$0
	50 - 59	21	799,806
	60 - 69	188	5,055,198
	70 - 79	223	5,546,229
	80 - 89	120	2,098,132
	90 +	54	772,817
	Total	606	14,272,183
Disabled Retirees	< 50	1	$22,524
	50 - 59	10	242,548
	60 - 69	3	53,730
	70 - 79	4	90,031
	80 - 89	0	0
	90 +	1	12,818
	Total	19	421,650
Beneficiaries	< 50	0	$0
	50 - 59	2	34,985
	60 - 69	6	81,860
	70 - 79	23	357,741
	80 - 89	32	387,560
	90 +	22	256,439
	Total	85	1,118,586

Section V - Analysis of Risk
A. Introduction

The results of this actuarial valuation are based on one set of reasonable assumptions. However, it is almost certain that future experience will not exactly match these assumptions. As an example, the plan's investments may perform better or worse than assumed in any single year and over any longer time horizon. It is therefore important to consider the potential impacts of these likely differences when making decisions that may affect the future financial health of the plan, or of the plan's members.

In addition, as plans mature they accumulate larger pools of assets and liabilities. The increase in size in turn increases the potential magnitude of adverse experience. As an example, the dollar impact of a 10% investment loss on a plan with $1 billion in assets and liabilities is much greater than the dollar impact for a plan with $1 million in assets and liabilities. Since pension plans make long-term promises and rely on long-term funding, it is important to consider how mature the plan is today, and how mature it may become in the future.

Actuarial Standard of Practice No. 51 (ASOP 51) directs actuaries to provide pension plan sponsors with information concerning the risks associated with the plan:

- Identify risks that may be significant to the plan.
- Assess the risks identified as significant to the plan. The assessment does not need to include numerical calculations.
- Disclose plan maturity measures and historical information that are significant to understanding the plan's risks.

This section of the report uses the framework of ASOP 51 to communicate important information about significant risks to the plan, the plan's maturity, and relevant historical plan data.

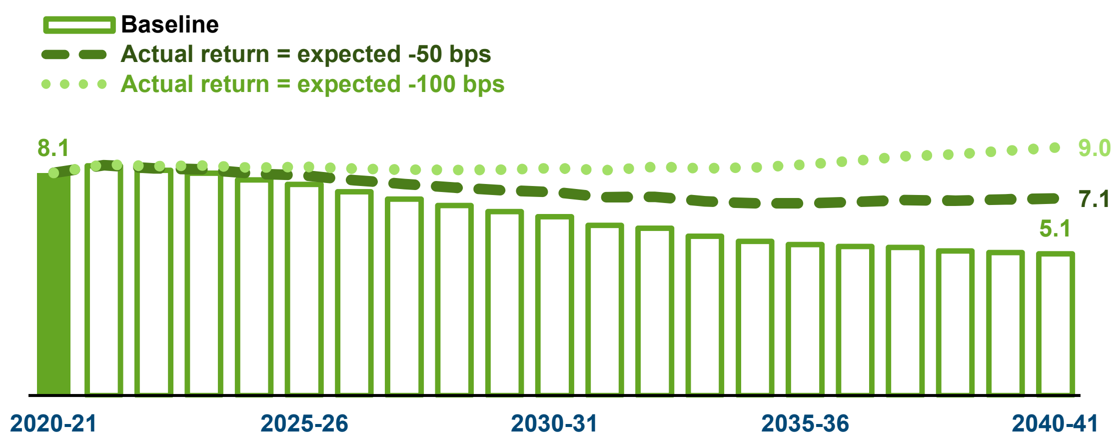
Please see Section III C for more information on the basis for the projected results shown on the following pages.

Section V - Analysis of Risk
B. Risk Identification and Assessment

Investment Risk

Definition: This is the potential that investment returns will be different than expected.

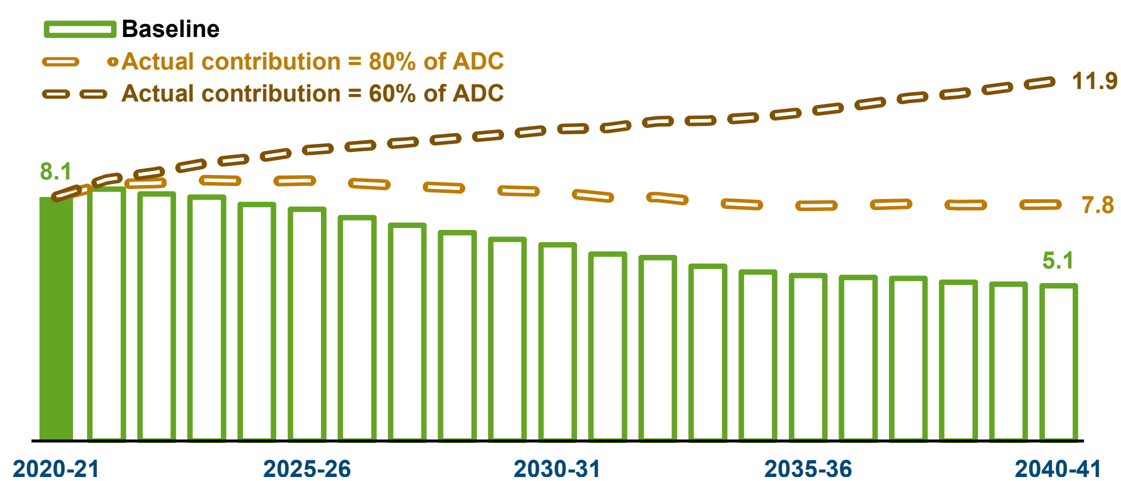
Identification: To the extent that actual investment returns differ from the assumed investment return, the plan's future assets, Actuarially Determined Contributions, and funded status may differ significantly from those presented in this valuation. The consequences of persistent underperformance on future Actuarially Determined Contribution levels are illustrated below:



Contribution Risk

Definition: This is the potential that actual future contributions will be less than the Actuarially Determined Contribution.

Identification: Over the past 8 years, actual contributions have been 100.0% of the Actuarially Determined Contribution in total. The consequences of persistent underfunding on future Actuarially Determined Contribution levels are illustrated below:



Section V - Analysis of Risk
B. Risk Identification and Assessment

Liquidity Risk

Definition: This is the potential that assets must be liquidated at a loss earlier than planned in order to pay for the plan's benefits and operating costs. This risk is heightened for plans with negative cash flows, in which contributions are not sufficient to cover benefit payments plus expenses.

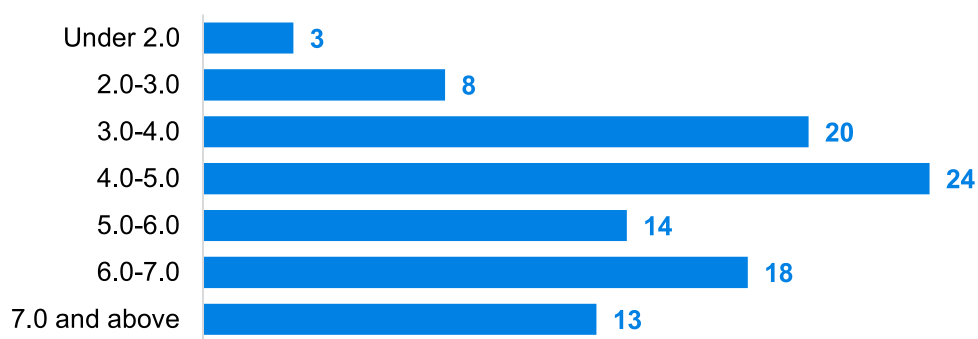
Identification: In 2018-19, the plan had negative cash flow, with city and member contributions to the plan of $9,929,475 compared to $16,687,697 of benefit payments and administrative expenses paid out of the plan. We suggest that you consult with your investment advisors with respect to the liquidity characteristics of the plan's investment holdings.

Maturity Risk

Definition: This is the potential for total plan liabilities to become more heavily weighted toward inactive liabilities over time, and for plan assets and/or liabilities to become larger relative to the active member liability.

Identification: The plan is subject to maturity risk because as plan assets and liabilities continue to grow, the dollar impact of any gains or losses on the assets or liabilities also becomes larger.

Assessment: As of July 1, 2019, the plan's Asset Voliatility Ratio (the ratio of the market value of plan assets to payroll) is 5.4. According to Milliman's 2018 Public Pension Funding Study, the 100 largest US public pension plans have the following range of Asset Volatility Ratios:



Inflation Risk

Definition: This is the potential for a pension to lose purchasing power over time due to inflation.

Identification: The members of pension plans without fully inflation-indexed benefits are subject to the risk that their purchasing power will be reduced over time due to inflation.

Assessment: This plan does not contain a mechanism to regularly increase benefits after retirement, so members bear all of the inflation risk.

Section V - Analysis of Risk
B. Risk Identification and Assessment

Insolvency Risk

Definition: This is the potential that a plan will become insolvent; that is, assets will be fully depleted.

Identification: If a plan becomes insolvent, contractually required benefits must be paid from the plan sponsor's other remaining assets.

Assessment: Under the GASB 68 depletion date methodology, the plan is not projected to become insolvent. Please see the GASB 68 report for more details on the underlying analysis.

Demographic Risks

Definition: This is the potential that mortality, turnover, retirement, or other demographic experience will be different than expected.

Identification: The pension liabilities reported herein have been calculated by assuming that members will follow patterns of demographic experience as described in Appendix B. If actual demographic experience or future demographic assumptions are different from what is assumed to occur in this valuation, future pension liabilities, Actuarially Determined Contributions, and funded status may differ significantly from those presented in this valuation. Formal Experience Studies performed on a regular basis are helpful in ensuring that the demographic assumptions reflect emerging plan experience.

Retirement Risk

Definition: This is the potential for members to retire and receive subsidized benefits that are more valuable than expected.

Identification: This plan permits members to retire with unreduced benefits at young ages. If members retire at earlier ages than are anticipated by the actuarial assumptions, this will put upward pressure on subsequent Actuarially Determined Contributions.

Additional Pension Credit Risk

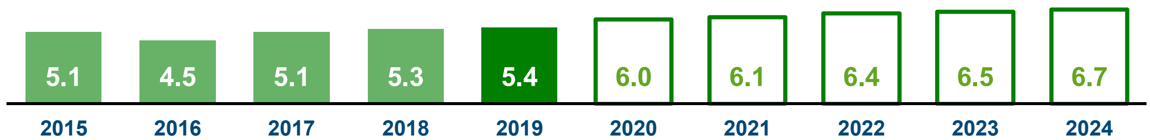
Definition: This is the potential for active members to trade in unused sick and/or vacation days and receive pension benefits that are higher than expected.

Identification: This plan permits some members to trade in unused sick and/or vacation days and increase their total pension mulitiplier. We asume that on average members elect to receive 100% of the maximum additional pension credit based on their current bank. If eligible members elect to recieve more than the assumed amount of pension credit, then the plan costs will rise over time.

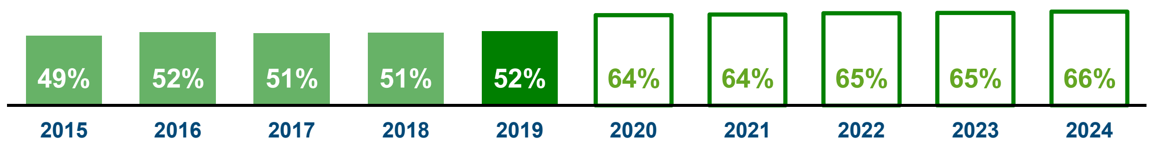
Section V - Analysis of Risk
C. Maturity Measures

The metrics presented below are different ways of understanding the plan's maturity level, both in the past and as it is expected to change in the coming years.

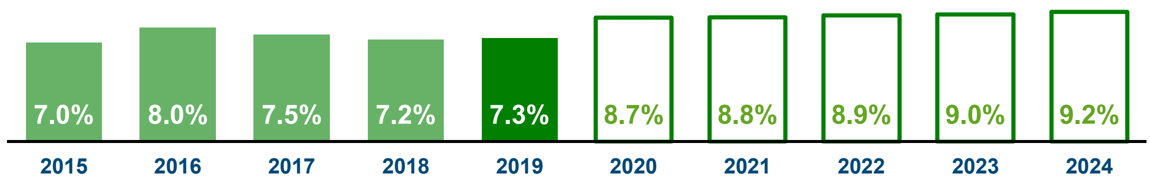
Asset Volatility Ratio: Market Value of Assets compared to Payroll



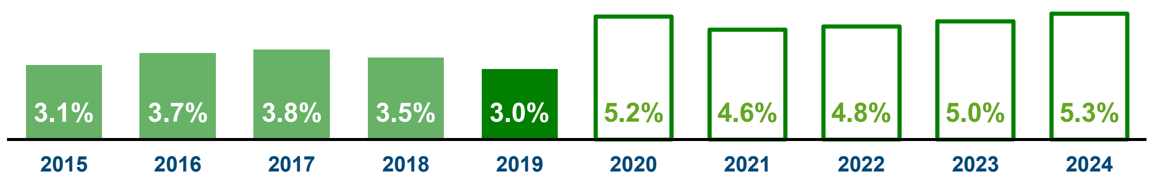
Accrued Liability for members in pay status compared to total Accrued Liability



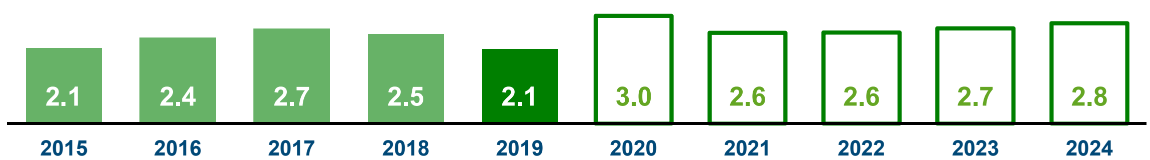
Benefit Payments compared to Market Value of Assets



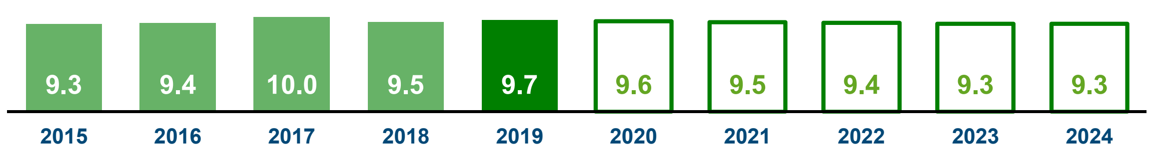
Net Cash Flows compared to Market Value of Assets



Benefit Payments compared to City Contributions



Duration of Accrued Liability (based on GASB 68 sensitivity disclosures)



Appendix A - Actuarial Funding Method

The actuarial funding method used in the valuation of this Plan is known as the Projected Unit Credit Cost Method. The Actuarially Determined Contribution consists of three pieces: Normal Cost plus a Past Service Cost payment to gradually eliminate the Unfunded Accrued Liability plus a Timing Adjustment to reflect the timing of the contribution relative to the valuation date.

Under this cost method a projected retirement benefit at assumed retirement age is computed for each member. The Normal Cost for each member is computed as the present value of the pro-rata portion of the member's projected benefit which is accrued or earned during the plan year being valued. The normal cost of the plan is the total of the individually computed normal costs for all members. The Accrued Liability at any point in time for an active member is the present value of that portion of the projected benefit which has been accrued up to the valuation date. For members receiving benefits or entitled to a deferred benefit, the accrued liability is equal to the present value of their future benefit payments. The accrued liability for the plan is the total of individually computed accrued liability amounts for all members.

The funding cost of the Plan is derived by making certain specific assumptions as to rates of interest, mortality, turnover, etc. which are assumed to hold for many years into the future. Since actual experience may differ somewhat from the assumptions, the costs determined by the valuation must be regarded as estimates of the true costs of the Plan.

The Unfunded Accrued Liability is the excess of the Accrued Liability over the assets which have been accumulated for the plan. This Unfunded Accrued Liability is amortized as a level dollar amount over an open period of 15 years.

The Actuarial Value of Assets is determined by recognizing market gains and losses asymptotically over a five year period; the result is constrained to within +/- 30% of the market value of assets as of the valuation date.

The long-range forecasts included in this report have been developed by assuming that members will terminate, retire, become disabled, and die according to the actuarial assumptions with respect to these causes of decrement, and that pay increases, cost of living adjustments, and so forth will likewise occur according to the actuarial assumptions. For those unions whose new employees are eligible to participate in this plan, members who are projected to leave active employment are assumed to be replaced by new active members with the same age, service, gender, and pay characteristics as those hired in the past few years, as well as incorporating the characteristics of the current active employees as a whole.

Appendix B - Actuarial Assumptions

Each of the assumptions used in this valuation was set based on industry standard published tables and data, the particular characteristics of the plan, relevant information from the plan sponsor or other sources about future expectations, and our professional judgment regarding future plan experience. We believe the assumptions are reasonable for the contingencies they are measuring, and are not anticipated to produce significant cumulative actuarial gains or losses over the measurement period.

Interest Rate 7.05% (prior: 7.10%)

Inflation Rate 2.60%

Expenses The average of the prior year two year's administrative expenses, rounded to the nearest $1.

Salary Scale

Age	Rate
20	6.10%
25	6.10%
30	5.45%
35	4.80%
40	4.15%
45	3.50%
50	2.85%
55+	2.60%

Turnover

Age	Rate
20	10.6%
25	7.9%
30	5.8%
35	4.2%
40	3.1%
45	2.1%
50	1.3%
55	0.5%
60	0.5%

Appendix B - Actuarial Assumptions

Retirement

Age	Rate
50-61	5%
62-65	100%

Retirements are assumed to occur after the earliest of 1) age 50 with 25 years of service, 2) age 55 with 15 years of service, or 3) age 60 with 10 years of service.

Disability

Age	Rate
20	0.05%
25	0.05%
30	0.05%
35	0.06%
40	0.09%
45	0.18%
50	0.40%
55	0.85%
60	0.85%

All disabilities are assumed to be non-service related.

Mortality

PubG-2010 Mortality Table with generational projection per the MP Ultimate scale, with employee rates before benefit commencement and healthy, disabled and contingent annuitant rates after benefit commencement. This assumption includes a margin for mortality improvement beyond the valuation date. (Prior: 50/50 blend of the RP-2000 No Collar Combined Healthy Table and the RP-2000 Blue Collar Combined Table, with separate tables for males and females and generational projection per Scale BB.)

All preretirement deaths are assumed to be non-service related.

Marital Status

80% of active participants are assumed to be married. Female spouses are assumed to be 4 years younger than male spouses.

Pension Service Exchange and Payout Bank

100% of retiring members are assumed to elect the maximum exchange (based on their current bank).

Appendix C - Summary of Plan Provisions

This exhibit summarizes the major provisions of the Plan. It is not intended to be, nor should it be interpreted as a complete statement of all plan provisions. All eligibility requirements and benefit amounts shall be determined in strict accordance with the plan document itself. To the extent that this summary does not accurately reflect the plan provisions, then the results of this valuation may not be accurate.

Eligibility

Members of the UAW are eligible to participate upon hire. Members of the other unions hired after a certain date (varies by union) are not eligible to participate in the Plan.

Pension Earnings

LAW, UAW and TEA: the average of the highest 3 out of the last 10 years of salary.

All others: salary in the final year of employment.

Normal Retirement Eligibility

Generally: age 58 with 15 years of service, or age 60 with 10 years of service.

MAA: also any age with 25 years of service.

UE hired or or after 7/1/2012: age 58 with 15 years does not apply.

UAW: age 58 with 15 years only applies to those with 25 years of service on 1/1/2015.

TEA: age 58 with 15 years does not apply.

Normal Retirement Benefit

Equal to a percentage of Pension Earnings multiplied by years of service with a cap on years of service and/or a cap on the overall benefit.

Group	Multiplier	Service Cap	Benefit Cap
Generally	2.00%	33	66%
UE hired or or after 7/1/2012		30	
UAW			70%
UAW with <25 years on 1/1/2015	1.75%*		
UAW hired or or after 1/1/2015	1.50%		
TEA			66%
TEA with <20 years on 1/1/2015	1.75%*		
TEA hired on or after 1/1/2015	1.50%		

* applies only to service after 1/1/2015

Appendix C - Summary of Plan Provisions

Normal Retirement Benefit (continued)	For members promoted to MAA after 6/16/2018, the multiplier immediately prior to promotion will be used for service after promotion. These members also have three options regarding what pay will be used for their pension calculation (their new pay, their new pay with phase in, or the salary for their pre-promotion position). Minimum benefit with 25 years of service is $1,000.
Early Retirement Eligibility	Age 50 with 25 years of service.
Early Retirement Benefit	Accrued retirement benefit reduced .25% for each of the first 36 months prior to age 58 and .55% for each month in excess of 36; no reduction for MAA with 25+ years of service.
Non-Service Disability Eligibility	UAW, Nurses, and Dental: 15 years of service. All others: 10 years of service.
Non-Service Disability Benefit	TEA: 50% of Pension Earnings if less than 20 years of service; accrued retirement benefit if more than 20 years of service. All others: 50% of Pension Earnings if less than 25 years of service; accrued retirement benefit if more than 25 years of service.
Service Disability Eligibility	No service requirement.
Service Disability Benefit	50% of Pension Earnings.
Non-Service Preretirement Death Eligibility	No service requirement.
Non-Service Preretirement Death Benefit	Less than 15 years of service: refund of contributions. 15+ years of service but not eligible for retirement: $166.67 per month less Social Security benefit. Eligible to retire: retirement benefit payable as a 100% Joint & Survivor annuity.
Service Preretirement Death Eligibility	No service requirement.
Service Preretirement Death Benefit	50% of Pension Earnings less Worker's Compensation payments, minimum $83.33 per month.

Appendix C - Summary of Plan Provisions

Postretirement Death Benefit	Lump sum equal to the excess, if any, of accumulated contributions over the total benefits paid to the member or survivors.
Postretirement Life Insurance	UAW: none. All others: $6,000 lump sum.
Vesting	TEA and UE: 100% after 10 years of service. All others: 100% after 5 years of service.
Termination Benefit	If the member is vested, the accrued benefit is payable at age 60, or at age 58 if the member has 15+ years of vesting services and is eligible for Normal Retirement at age 58 with 15 years of service. If the member is not vested, the member is paid a refund of their accumulated contributions.
Employee Contributions	Active members contribute a percentage of salary: 1199: 3.00% LAW, TEA, DEN, UE, MAA, NUR, NSH and NHE: 6.00% UAW with multiplier < 2.00%: 4.50% UAW with 2% multiplier: 5.00% No member contributions are made by: MAA and Teamsters with 33+ years of service on 7/1/2012. UAW with 35+ years or who have reached the maximum total multiplier.

Appendix C - Summary of Plan Provisions

Vacation / Sick Leave Banks

	Payout Bank	Additional Pension Credits Available		Eligibility Cutoff Date For	
Union	Source	Vacation	Sick	Vacation	Sick
1199	Operating Budget	Yes-payout only	Yes-payout only	--	07/01/1998
Dental	Operating Budget	No	Yes	--	07/01/1997
Law	Operating Budget	Yes-payout only	Yes-payout only	--	--
MAA	Operating Budget	Yes	Yes	--	07/01/1997
Nurses	Operating Budget	Yes	Yes	--	07/01/1997
Teamsters	Operating Budget	Yes	Yes	--	07/01/1997
UAW	Operating Budget	Yes	Yes	01/01/2015	07/01/1988
UE	Operating Budget	Yes	Yes	07/01/2012	07/01/2012

UE hired on or after 7/1/2012: not eligible for exchange.

UAW and TEA hired on or after 1/1/2015: not eligible for exchange.

The amount of the exchange/payout bank is equal to 50% of sick days subject to a 75 day maximum, plus vacation days. Employees can trade in up to 100 days of eligible time for additional pension credit. Each 25 days grants an additional 1% of salary up to a maxmimum of 4%. The remainder of the bank is paid out in a lump sum.

Additional Provisions

MAA, UAW, and Dental Hygenists: can pay 3% of 2011-2012 base salary for one additional year of service credit. The additional benefit is paid at age 65+. Such payment must be made by 6/30/2013 or 6/30/2014, depending on the union.

CERF plan participant promoted into MAA may choose: (1) to use the salary of the new position to calculate the member's pension (member must buy back value of higher pension); or (2) to use a graded 6 year schedule for the increase in salary to be used; or (3) Freeze pension salary at pre-promotion position.

Appendix D - Glossary

Actuarial Cost Method - This is a procedure for determining the Actuarial Present Value of Benefits and allocating it to time periods to produce the Actuarial Accrued Liability and the Normal Cost.

Accrued Liability - This is the portion of the Actuarial Present Value of Benefits attributable to periods prior to the valuation date by the Actuarial Cost Method (i.e., that portion not provided by future Normal Costs).

Actuarial Assumptions - With any valuation of future benefits, assumptions of anticipated future events are required. If actual events differ from the assumptions made, the actual cost of the plan will vary as well. Some examples of key assumptions include the interest rate, salary scale, and rates of mortality, turnover and retirement.

Actuarial Present Value of Benefits - This is the present value, as of the valuation date, of future payments for benefits and expenses under the Plan, where each payment is: a) multiplied by the probability of the event occurring on which the payment is conditioned, such as the probability of survival, death, disability, termination of employment, etc.; and b) discounted at the assumed interest rate.

Actuarial Value of Assets - This is the value of cash, investments and other property belonging to the plan, typically adjusted to recognize investment gains or losses over a period of years to dampen the impact of market volatility on the Actuarially Determined Contribution.

Actuarially Determined Contribution ("ADC") - This is the employer's periodic contributions to a defined benefit plan, calculated in accordance with actuarial standards of practice.

Attribution Period - The period of an employee's service to which the expected benefit obligation for that employee is assigned. The beginning of the attribution period is the employee's date of hire and costs are spread across all employment.

Interest Rate - This is the long-term expected rate of return on any investments set aside to pay for the benefits. In a financial reporting context (e.g., GASB 68) this is termed the Discount Rate.

Normal Cost - This is the portion of the Actuarial Present Value of Benefits allocated to a valuation year by the Actuarial Cost Method.

Past Service Cost - This is a catch-up payment to fund the Unfunded Accrued Liability over time (generally 10 to 30 years). A closed amortization period is a specific number of years counted from one date and reducing to zero with the passage of time; an open amortization period is one that begins again or is recalculated at each valuation date. Also known as the Amortization Payment.

Return on Plan Assets - This is the actual investment return on plan assets during the fiscal year.

Unfunded Accrued Liability - This is the excess of the Accrued Liability over the Actuarial Value of Assets.