January 1, 2019

Actuarial Valuation Report

MHFA Employees' Retirement System

Lawrence B. Stone

stoneconsulting,inc
5 West Mill Street, Suite 4
Medfield, Massachusetts 02052
T: 508.359.9600 F: 508.359.0190
Lstone@stoneconsult.com

stoneconsulting,inc

June 27, 2019

Massachusetts Housing Finance Agency Employees' Retirement System
One Beacon Street
Boston, MA 02108

To the Massachusetts Housing Finance Agency Retirement Board:

Stone Consulting, Inc. has performed a January 1, 2019 actuarial valuation of the Massachusetts Housing Finance Agency Retirement System. This valuation and report were prepared using generally accepted actuarial principles and practices. To the best of our knowledge, this report is complete and accurate, and the assumptions used represent our best estimate of anticipated experience of the system except where noted in the text.

Stone Consulting, Inc. is completely independent of the Massachusetts Housing Finance Agency and the Massachusetts Housing Finance Agency Retirement System. This includes any of its officers and key personnel. Neither we or anyone else closely associated with us has any relationship with the Agency of Massachusetts Housing Finance Agency or the Massachusetts Housing Finance Agency Retirement System that would impair our independence, other than this or related assignments.

We are pleased to present the results of this valuation. If the Retirement Board has any questions on the content of this report, we would be glad to respond. Please note that this report is meant to be used in its entirety. Use of excerpts of this report may result in inaccurate or misleading understanding of the results. The use of these results may not be appropriate for all circumstances.

I, Lawrence Stone, am a consultant for Stone Consulting, Inc. I am a member of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Respectfully submitted,
STONE CONSULTING, INC.
Actuaries for the Plan

Lawrence B. Stone
Member, American Academy of Actuaries

5 West Mill Street, Suite 4 • Medfield, Massachusetts 02052 • T: 508.359.9600 • Lstone@stoneconsult.com

TABLE OF CONTENTS

Report Summary

This report presents the results of the actuarial valuation of the Massachusetts Housing Finance Agency Retirement System as of January 1, 2019. The valuation was performed at the request of the Retirement Board for the purpose of determining the contribution requirements for Fiscal Year 2020 and beyond.

Summary of Results and Experience

- Funding progress

  The contribution is $3,466,662 greater than the projected FY2020 contribution from the prior valuation. The schedule follows a 7-year level amortization of the unfunded liability, finishing in FY2026, consistent with the planned funding schedule from the 2017 valuation.

  The increase to the required amount of funding is partly due to adverse asset experience in calendar year 2018 and to assumption changes. The funding ratio based on Actuarial Value of Assets decreased from 77% to 74% as a result.

- Assumptions/methodology:

  Assumption changes increased the liability by $7.2 million (3.8%).

  $5.0 million of this increase was due to a reduction in the discount rate, from 7.50% to 7.25%. $1.4 million of the increase was due to a change in the COLA Base from $13,000 to $15,000.

  Assumptions and valuation methodology are discussed in Appendix A, on page 18.

Contribution requirements are based on the financial condition of the system as of December 31, 2018, as well as actuarial liability results, which are based on:

- The benefit provisions of M.G.L. Chapter 32 and related statutes;
- The demographics of members in the system (i.e., active and inactive participants, retirees and beneficiaries as of January 1, 2019);
- Economic assumptions regarding salary increases and investment earnings; and
- Other actuarial assumptions (e.g., withdrawals, retirement, death, etc.)

Format of the Report

- The funding schedule is shown on page 3, followed by an explanation of the actuarial results, funding schedule components, and a history of the funding schedules used by the Retirement System.
- Full actuarial valuation results are shown on page 17, with prior results included for comparison. The Massachusetts Housing Finance Agency Retirement Board conducted their previous actuarial valuation effective January 1, 2017.

Development of Funding Schedule

The funding contribution consists of three parts:

- Net Normal Cost: this is the amount of liability generated by active employees earning another year of service, and includes administrative expense.
- Amortization: this is the amount of the Unfunded Liability that will be paid off by this contribution.
- Net 3(8)(c) Payments: these are benefit payments made to other systems for service earned as a member of the Massachusetts Housing Finance Agency Retirement System.

The appropriation for Fiscal 2020 is as follows:

Net Employer Normal Cost for Fiscal 2020 (including admin. expenses)	$	1,256,062
Net 3(8)(c) Payments		(383,402)
Amortization		9,158,007
Timing Adjustment*		0
Total Appropriation required for Fiscal 2020	$	10,030,667

* Contributions are assumed to be made at the beginning of the fiscal year.

NOTE: for all tables in this report, totals may not sum due to rounding.

- Massachusetts Housing Finance Agency's funding schedule was developed by setting the length equal to the seven years remaining from the existing funding schedule, amortizing the unfunded liability in level amounts each year.
- The maximum funding schedule length allowed by Section 22D of Chapter 32 of the Massachusetts General Laws is eleven years to Fiscal 2030.

The schedule is shown on the following page.

MASSACHUSETTS HOUSING FINANCE AGENCY RETIREMENT SYSTEM

FUNDING SCHEDULE with 3(8)(C) - 7 years: 0 % amortization

7.25% Discount Rate

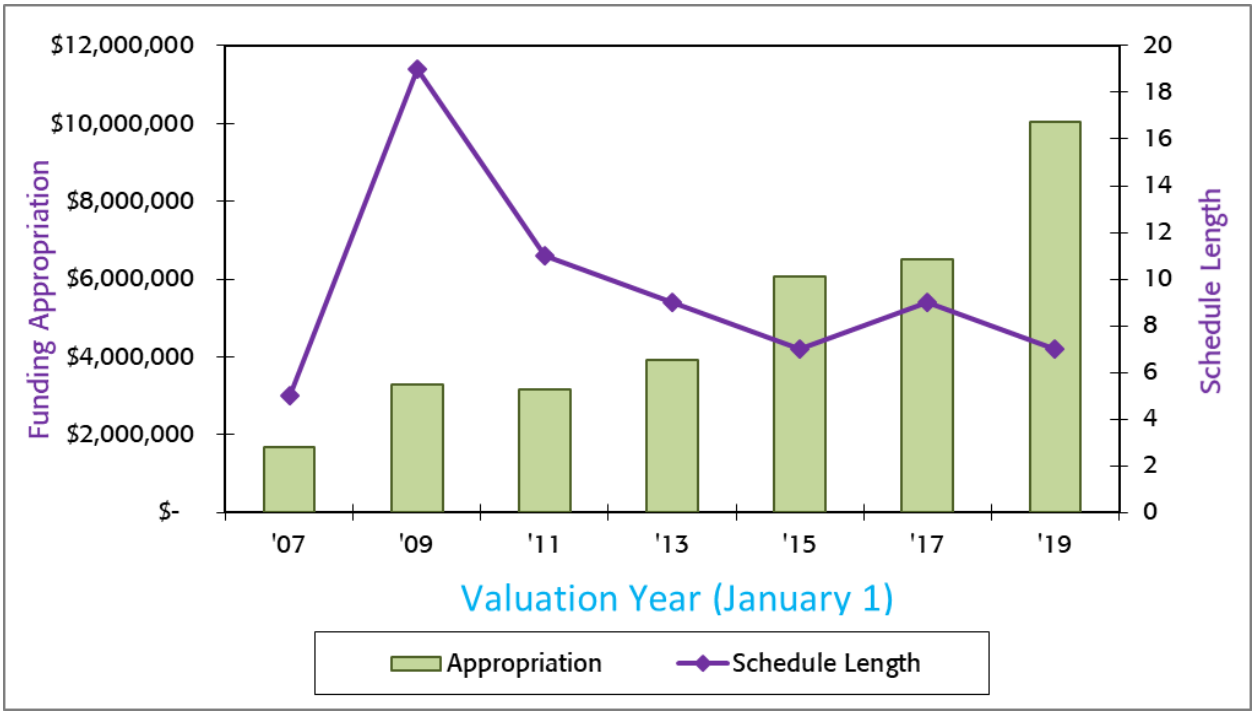
Fiscal Year	Normal Cost	Unfunded Liability	Funding Amortization of UAAL	Net 3(8)(c) Payments	Schedule Contribution
2020	1,256,062	52,475,138	9,158,007	(383,402)	10,030,667
2021	1,306,304	46,457,624	9,158,007	(383,402)	10,080,909
2022	1,358,557	40,003,839	9,158,007	(383,402)	10,133,162
2023	1,412,899	33,082,156	9,158,007	(383,402)	10,187,504
2024	1,469,415	25,658,650	9,158,007	(383,402)	10,244,020
2025	1,528,191	17,696,940	9,158,007	(383,402)	10,302,796
2026	1,589,319	9,158,007	9,158,007	(383,402)	10,363,924
2027	1,652,892	-	-	(383,402)	1,269,490

Amortization of Unfunded Liability as of July 1, 2019

Year	Type	Original Amort. Amount	Percentage Increasing	Original # of Years	Current Amort. Amount	Years Remaining
2020	Fresh Start	9,158,007	0.00%	7	9,158,007	7

History of Funding Effort

Below is a history of the length of funding schedule used by the Massachusetts Housing Finance Agency Retirement System, and the amount of the initial contribution for each funding schedule.

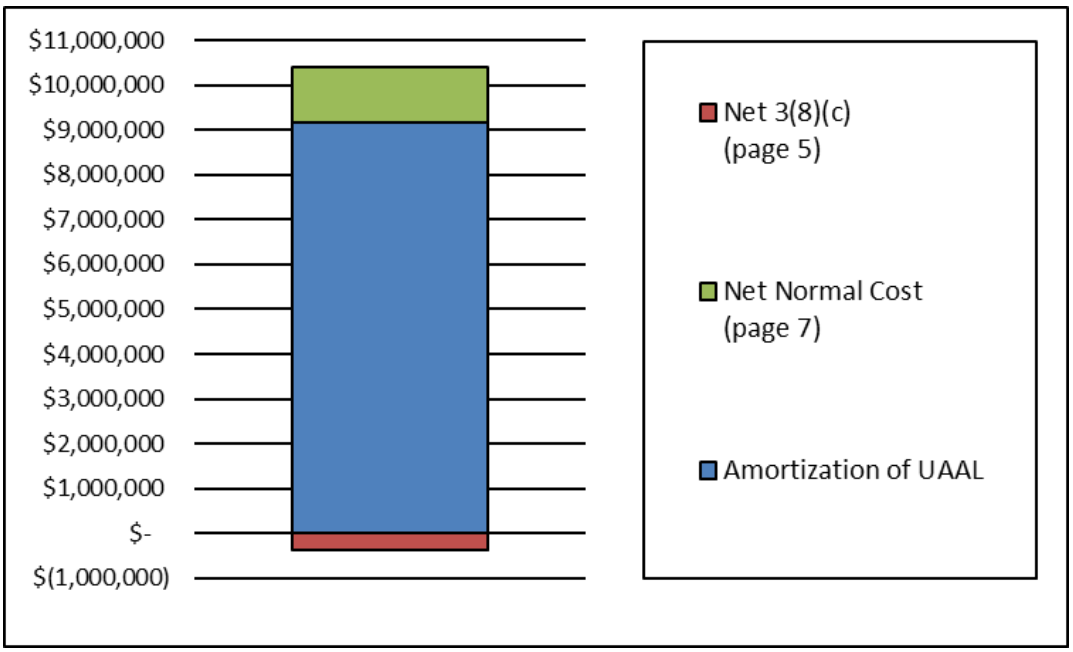


The funding objective of the plan is to fully fund the system while attempting to maintain a stable contribution amount for the upcoming fiscal year that is consistent with prior funding schedules or if employer finances allow it, to increase the contribution amount. This funding objective is being met.

The following pages discuss the components that make up the contribution, and how they are calculated from the actuarial results.

Components of Funding Appropriation

Components of the funding contribution are compared below, and discussed on the following pages.



Net 3(8)(c) Payments

- 3(8)(c) payments are benefits which the Massachusetts Housing Finance Agency Retirement System pays to or receives from other retirement boards for service that a retiree had with a different retirement system.

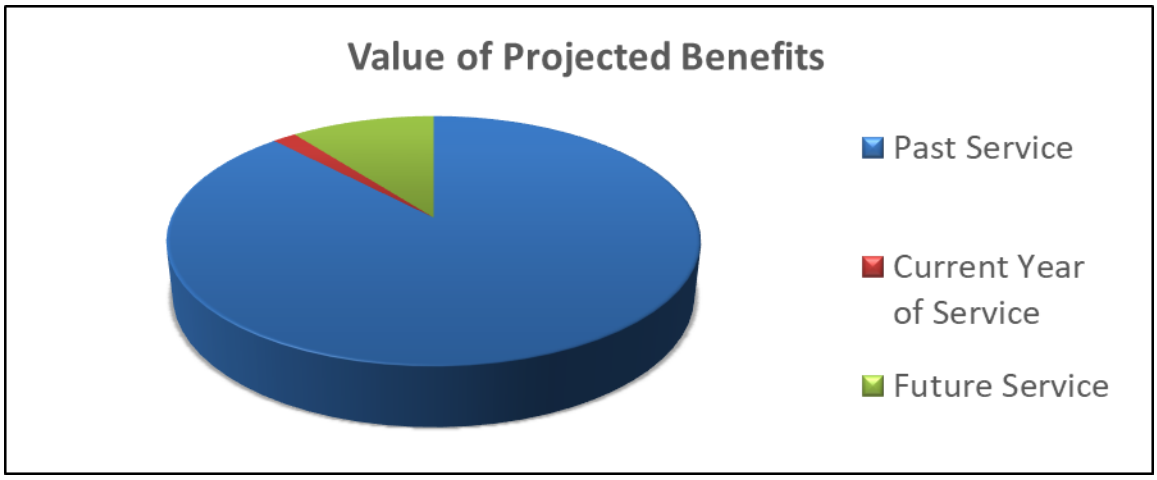
- The net amount is equal to what Massachusetts Housing Finance Agency pays out, less what Massachusetts Housing Finance Agency receives from other systems, based on the most recent PERAC annual statement:

3(8)(c) payments made to other systems	$	98,500
3(8)(c) payments received from other systems		(481,901)
Net payments	$	(383,402)

- For the funding schedule, the amount of net payments is assumed to remain level in future years.

Development of Actuarial Results

Actuarial liabilities are calculated based on benefits that members are projected to receive in the future. The value of projected benefits is divided between past service, future service, and the current year of service.



The actuarial funding method (in this case, entry age normal), assigns values to each of these periods of service.

- Past service: The Actuarial Accrued Liability (AAL), is the portion of the benefit value that is associated with past service; this can be thought of as the "price" of benefits already earned by members of the system.

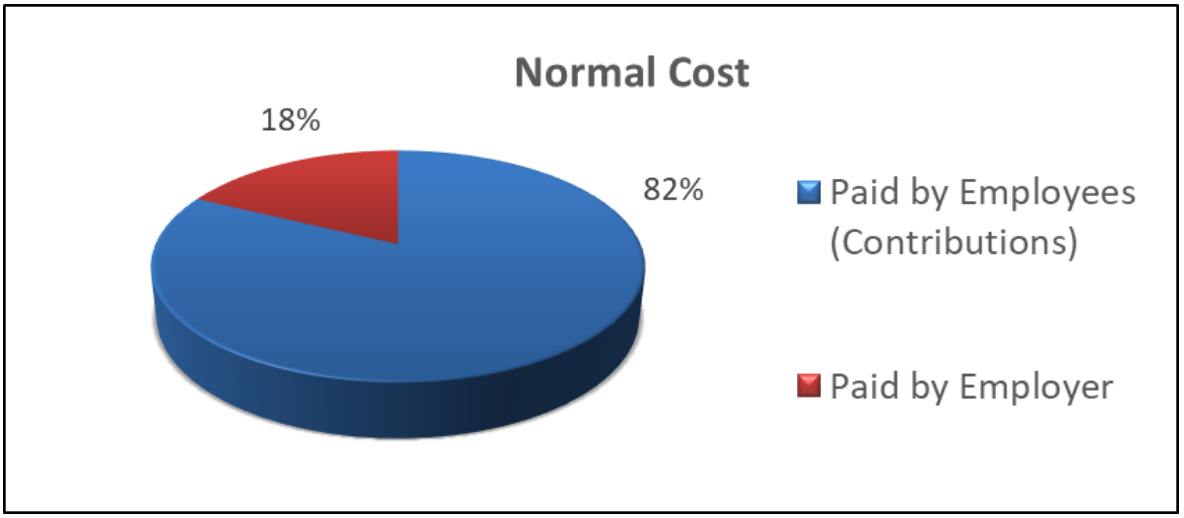
- Current year: The "price" of benefits being earned during the current year is referred to as the Normal Cost (NC). This includes only the actives, as neither inactives nor retirees are earning any additional service.

- Future service: The amount for future service is not included in the liability, as those years of service have not yet been earned.

For retirees, the "past service" amount accounts for the entire value of their benefits; they have completed their careers, and will earn no more service during the current year or any future years.

Net Normal Cost

The entire Normal Cost is not borne by the System; a significant portion is paid by employee contributions. The portion of the Normal Cost not covered by employee contributions is the amount that must be paid through funding appropriations; this is the Net Normal Cost.



The Net Normal Cost as seen in the funding schedule is calculated by adjusting for timing, and adding in the administrative expense. The calculation is shown below, and compared to the covered payroll:

	January 1, 2019	% of Payroll*
Gross Normal Cost (GNC)	$ 3,712,025	11.2%
Employees Contribution	3,052,796	9.2%
Net Normal Cost (NNC)	$ 659,229	2.0%
Adjustment to beginning of Fiscal Year 2020**	13,055	
Administrative Expense	583,778	1.8%
Adjusted Net Normal Cost With Admin. Expense	$ 1,256,062	

* Payroll paid in 2018 for employees as of January 1, 2019 is $33,018,170. Payroll for new hires in 2018 was annualized.

** The NNC is adjusted from January 1, 2019 to Fiscal 2020 by rolling it forward with a salary increase factor of 4.00%.

Unfunded Liability

The Unfunded Actuarial Accrued Liability (UAAL) is the portion of the AAL that is not covered by the value of the plan assets.

This is adjusted from the date of the valuation to the date of the contribution (July 1, 2019) to produce the Unfunded Liability seen in Fiscal Year 2020 in the funding schedule.

The liability results were as follows:

	January 1, 2019
Actuarial Accrued Liability	
a. Active Members	$ 109,255,076
b. Inactive Members	3,808,787
c. Retired Members and Beneficiaries	83,396,142
d. Total	$ 196,460,005
Unfunded Actuarial Accrued Liability	
a. Actuarial Accrued Liability	$ 196,460,005
b. Less Actuarial Value of Assets	146,119,148
c. Unfunded Actuarial Accrued Liability	$ 50,340,856
d. Adjustment to FY2020	2,134,282
e. Unfunded Actuarial Accrued Liability as of FY2020	$ 52,475,138

In developing the funding schedule, we used a "fresh start" approach in which the UAAL (not counting Early Retirement Incentives, if any) is amortized from scratch instead of maintaining the existing amortization amount and separately amortizing gains and losses. This can result in a schedule in which the changes in contribution amounts from year to year are more consistent.

The UAAL and funding ratio are measures of the plan's funded status, which reflect the plan's position as of January 1, 2019. We believe these measures, by themselves, are not appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations. However, we believe these measures, in conjunction with the plan's funding schedule, are appropriate for assessing the amount of future contributions.

Active Liability by Decrement

An active member can incur liabilities for the Retirement System in one of four ways:

- They can retire (if eligible),
- They can become disabled and collect a disability benefit,
- They can die, or
- They can terminate service and withdraw their ASF balance or receive a deferred retirement benefit

Active members have a portion of their liability associated with each of these four outcomes. The Accrued Liability for active members is divided as follows:

Active Actuarial Accrued Liability	
Superannuation Retirement	$ 106,603,459
Death	1,283,467
Disability	667,470
Withdrawal	700,680
TOTAL	$ 109,255,076

Demographic Results

Actives	
a. Number	323
b. Annual Compensation	$33,018,170
c. Average Annual Compensation	$102,223
d. Average Attained Age	51.0
e. Average Past Service	15.5
Retired, Disabled and Beneficiaries	
a. Number	168
b. Total Benefits (excluding State COLA)	$7,853,669
c. Average Benefits	$46,748
d. Average Age	71.2
Inactives	
a. Number	52

- Total compensation changed by 3.1% over the prior valuation
  - Average annual compensation changed by 8.5%
  - Salary loss of $2.6 million compared to projected experience

History of Demographic Statistics

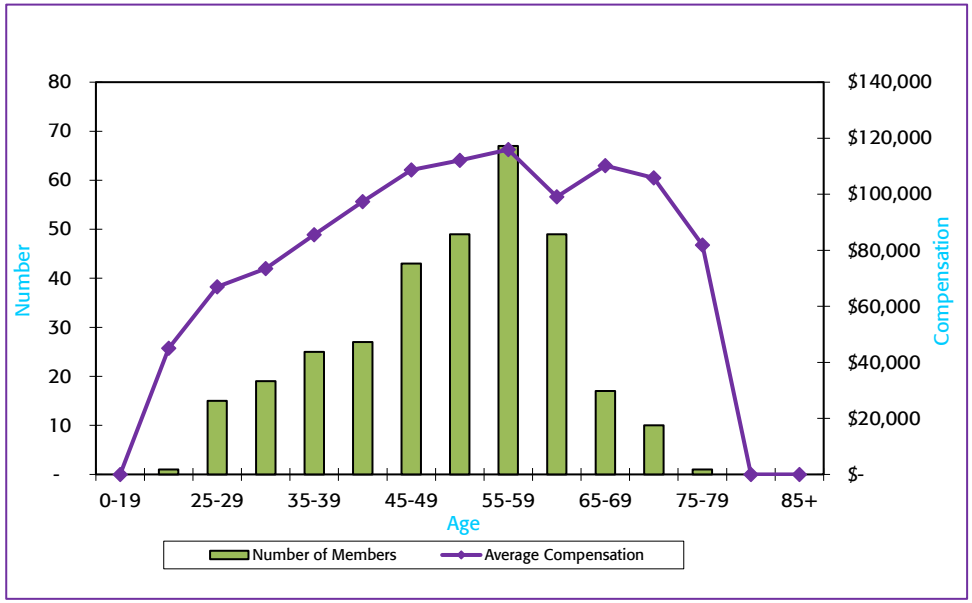
Valuation Year	Actives	Average Age	Average Past Service	Average Ann'l Pay
2019	323	51.0	15.5	$102,223
2017	340	50.3	14.3	$94,181
2015	337	50.5	14.9	$92,701
2013	328	50.0	15.0	$85,501
2011	354	48.3	13.7	$84,023
2009	349	46.7	10.5	$81,592
2007	334	45.8	9.9	$76,532
2005	315	43.8	8.5	$71,966
2002	312	43.6	7.9	$65,134

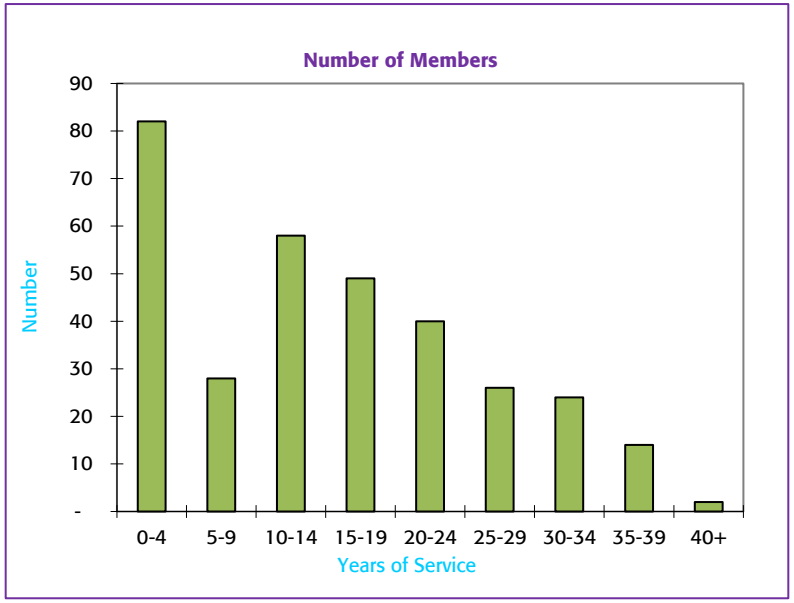
- Both employee age and service have continued to increase in recent years. This has started to change for many other Chapter 32 systems; however, the MHFA demographics and structure are significantly different from the typical city or town in Massachusetts. Average annual compensation has grown by 56.9% (2.7% annually) over the past seventeen years.

Distribution of Plan Members as of January 1, 2019

ACTIVE MEMBERS

AGE	0-4 Years	5-9 Years	10-14 Years	15-19 Years	20-24 Years	25-29 Years	30-34 Years	35-39 Years	40 + Years	Total	Total Compensation	Average Compensation
0-19	-	-	-	-	-	-	-	-	-	-	$ -	$ -
20-24	1	-	-	-	-	-	-	-	-	1	$ 45,035	$ 45,035
25-29	14	1	-	-	-	-	-	-	-	15	$ 1,004,848	$ 66,990
30-34	16	1	2	-	-	-	-	-	-	19	$ 1,396,525	$ 73,501
35-39	12	4	7	2	-	-	-	-	-	25	$ 2,138,906	$ 85,556
40-44	8	7	6	4	2	-	-	-	-	27	$ 2,629,553	$ 97,391
45-49	13	3	13	9	3	2	-	-	-	43	$ 4,671,703	$ 108,644
50-54	3	2	8	12	7	10	7	-	-	49	$ 5,494,048	$ 112,123
55-59	10	5	12	11	11	5	8	5	-	67	$ 7,768,244	$ 115,944
60-64	4	3	5	9	11	7	3	6	1	49	$ 4,854,857	$ 99,079
65-69	1	-	4	-	5	1	5	1	-	17	$ 1,873,801	$ 110,224
70-74	-	1	1	2	1	1	1	2	1	10	$ 1,058,822	$ 105,882
75-79	-	1	-	-	-	-	-	-	-	1	$ 81,828	$ 81,828
80-84	-	-	-	-	-	-	-	-	-	-	$ -	$ -
85+	-	-	-	-	-	-	-	-	-	-	$ -	$ -
TOTAL	82	28	58	49	40	26	24	14	2	323	$ 33,018,170	$ 102,223





stoneconsulting,inc

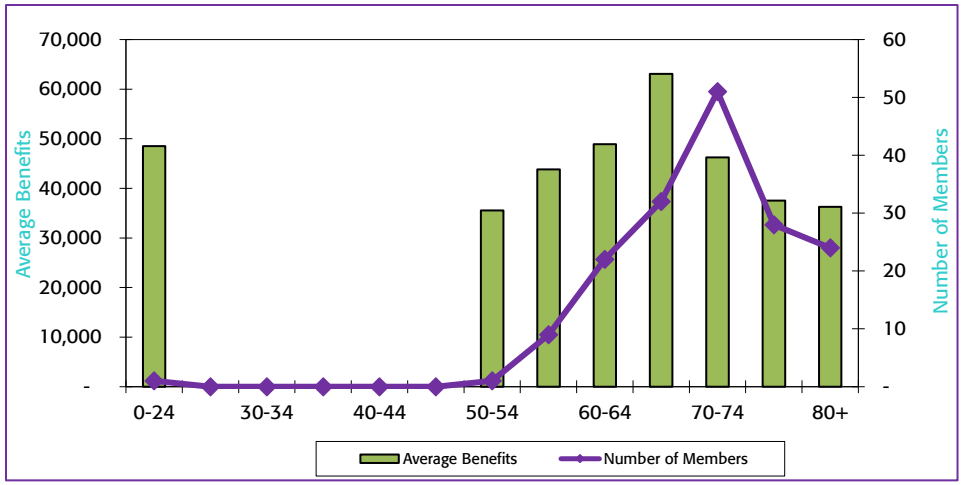
Distribution of Plan Members as of January 1, 2019

RETIRED MEMBERS

Retired Members and Beneficiaries			
Age	Number	Average Benefit	Total Benefit
0-24	1	48,493	48,493
25-29	-	-	-
30-34	-	-	-
35-39	-	-	-
40-44	-	-	-
45-49	-	-	-
50-54	1	35,525	35,525
55-59	8	44,779	358,232
60-64	22	48,918	1,076,187
65-69	32	63,073	2,018,326
70-74	51	46,266	2,359,548
75-79	27	37,621	1,015,771
80+	23	35,721	821,592
TOTAL	**165**	**$ 46,871**	**$ 7,733,676**

Disabled Members			
Age	Number	Average Benefit	Total Benefit
0-24	-	-	-
25-29	-	-	-
30-34	-	-	-
35-39	-	-	-
40-44	-	-	-
45-49	-	-	-
50-54	-	-	-
55-59	1	36,218	36,218
60-64	-	-	-
65-69	-	-	-
70-74	-	-	-
75-79	1	34,916	34,916
80+	1	48,859	48,859
TOTAL	**3**	**$ 39,998**	**$ 119,993**

Total			
Age	Number	Average Benefit	Total Benefit
0-24	1	48,493	48,493
25-29	-	-	-
30-34	-	-	-
35-39	-	-	-
40-44	-	-	-
45-49	-	-	-
50-54	1	35,525	35,525
55-59	9	43,828	394,451
60-64	22	48,918	1,076,187
65-69	32	63,073	2,018,326
70-74	51	46,266	2,359,548
75-79	28	37,525	1,050,687
80+	24	36,269	870,451
TOTAL	**168**	**$ 46,748**	**$ 7,853,669**



Benefits shown are net of State reimbursed COLA.

stoneconsulting,inc

Assets

	Cash	$	4,899,929.23
	Fixed Income Securities		20,147,491.10
	Pooled Domestic Equity Funds		42,666,490.46
	Pooled Global Equity Funds		16,496,467.37
	Pooled Domestic Fixed Income Funds		17,671,506.89
	Pooled International Fixed Income Funds		7,647,241.14
	Pooled Alternative Investments		20,099,371.39
	Pooled Real Estate Funds		16,593,558.00
A	Sub-Total:	$	146,222,055.58
	Interest Due and Accrued	$	132,106.45
	Accounts Receivable		67,157.00
	Accounts Payable		-302,170.59
B	Sub-Total:	$	-102,907.14
	Market Value of Assets [(A) + (B)]	$	146,119,148.44

- The asset allocation is approximately 34% fixed income, cash, receivables and payables and 66% equities, alternative investments, hedge funds and similar types of investments.

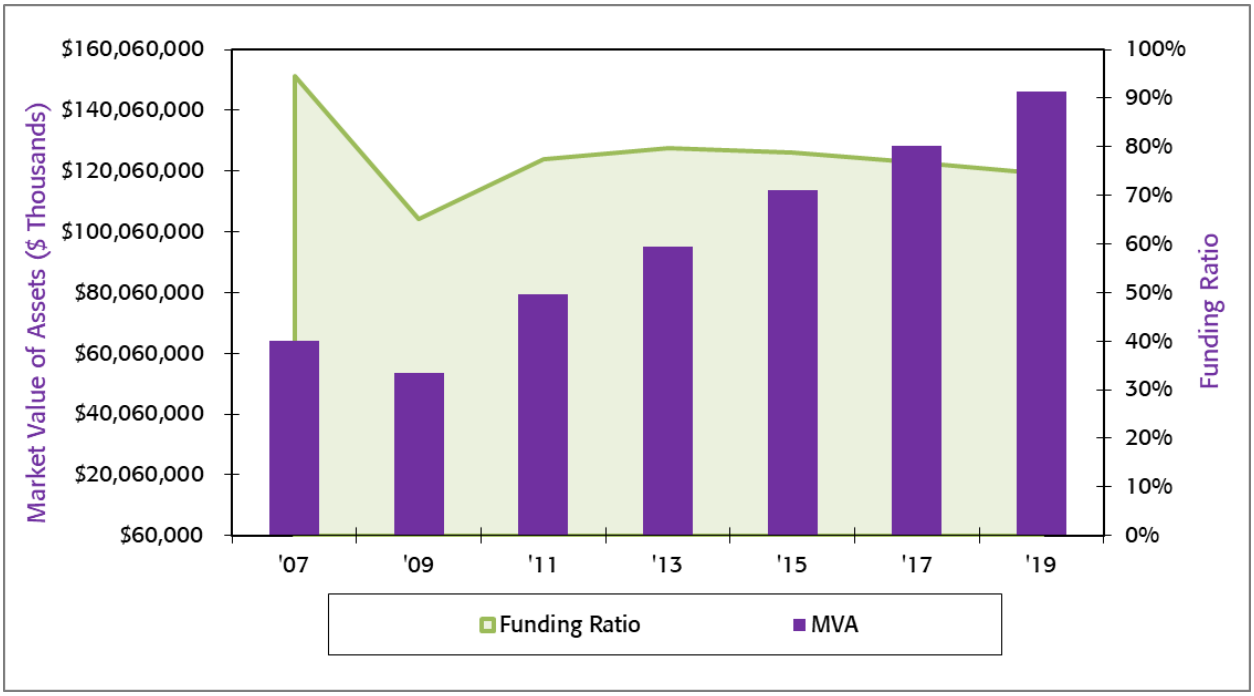
- Annual return in calendar 2018: 4.76% vs. a 7.50% assumption.
  - $8,254,015 net actuarial asset loss in calendar years 2017 and 2018

Actuarial Value of Assets

For its Actuarial Value of Assets (AVA), Massachusetts Housing Finance Agency uses the Market Value of Assets, adjusted for payables and receivables.

Funding Ratio

The following displays the history of the funding ratio for the past seven valuations, based on Market Value of Assets. The Market Value for each year is shown to accompany the funding ratio. We show the market value of assets as that is the amount of assets actually available to pay for benefits.



Risk

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as:

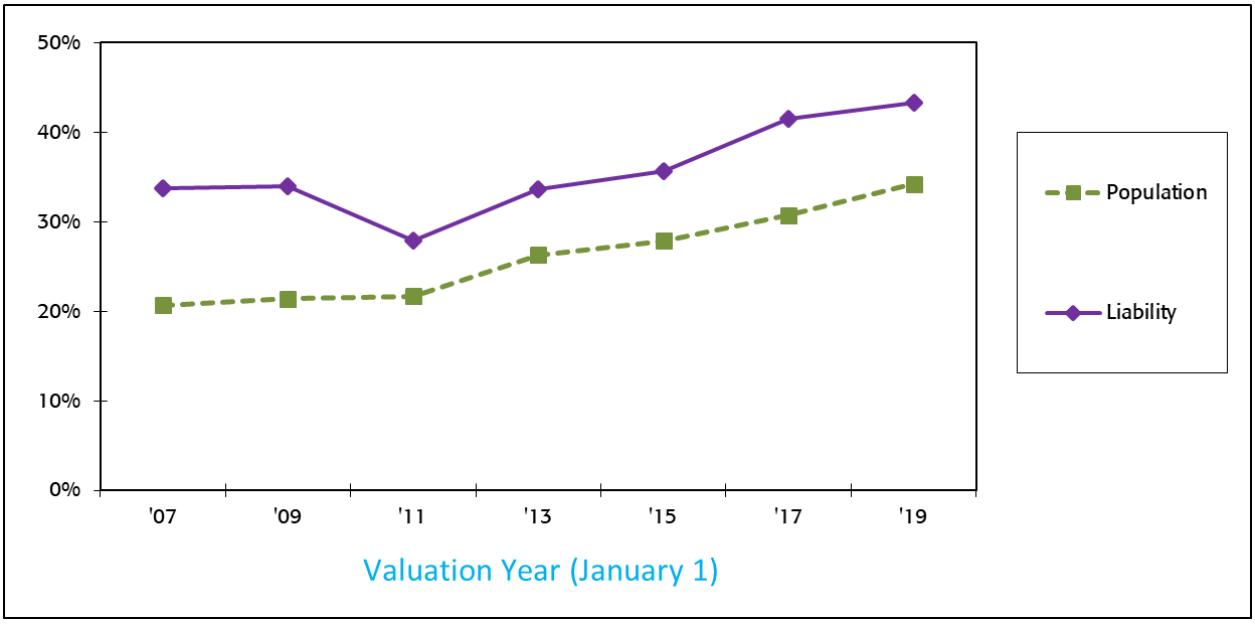
- Plan experience differing from that anticipated by the economic or demographic assumptions,
- Changes in economic or demographic assumptions,
- Increases or decreases expected as part of natural operation of the methodology used for these measurements such as additional contribution requirements based on the plan's funded status,
- Changes in plan provisions or applicable law.

As part of the valuation, we have not performed an analysis of the potential range of future measurements. GASB Statement 67 and 68 reports for the Massachusetts Housing Finance Agency Retirement System contain alternate results to measure the impact of increases or decreases in the discount rate.

Maturity

One important concern is the maturity of the system. Systems with a greater portion of their liability stemming from current retirees whose benefits already being paid are likely to experience greater impact from short-term asset experience, as high payouts in the near future leave less of the current assets will be available to benefit from investment returns further in the future.

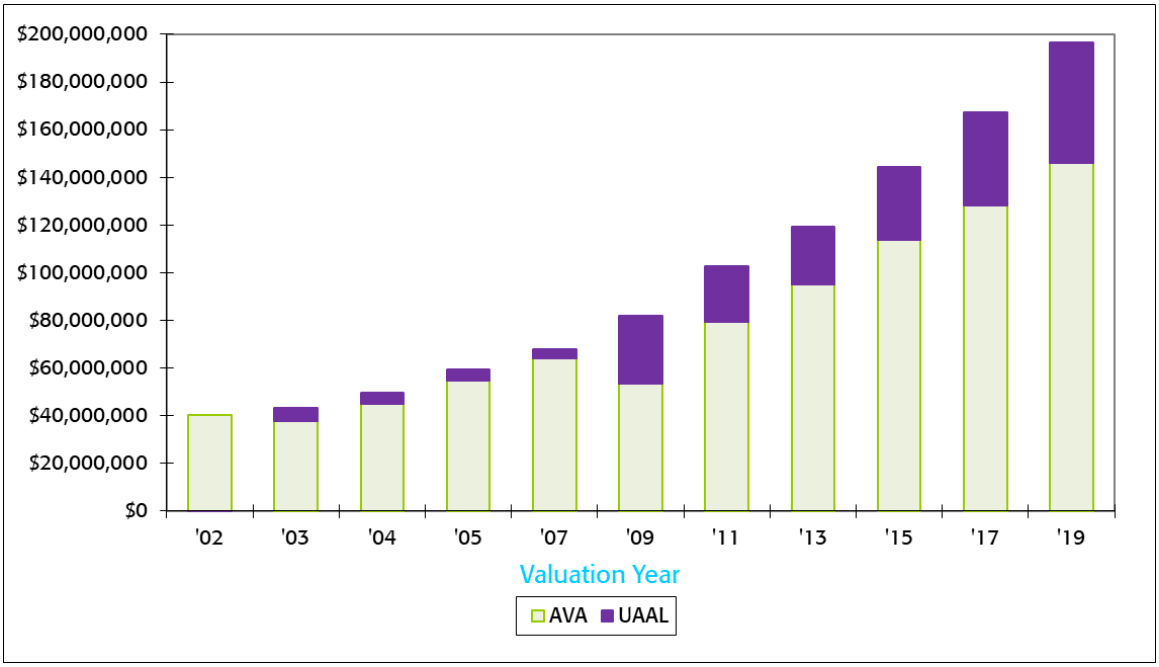
Below is a history of the retiree's percentage of the covered population and liability. The retiree percentage of both liability and population have steadily increased over the past seven valuations.



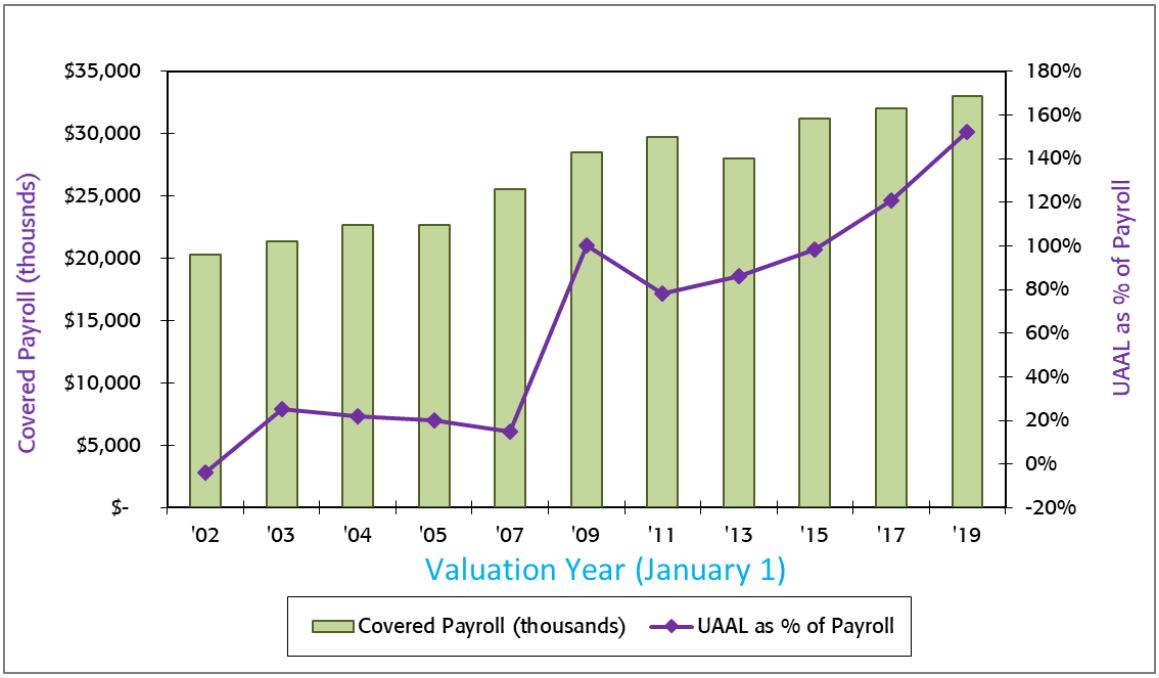
Historical Experience

The following charts display Massachusetts Housing Finance Agency's history of Actuarial Assets and Unfunded Liability; the second chart compares the unfunded liability to covered payroll.

History of Assets and Unfunded Liability



History of Unfunded Liability and Covered Payroll



Comparative Results

	January 1, 2019	January 1, 2017	Percentage Change
Funding			
Contribution for Fiscal 2020	$10,030,667	$6,564,005	52.8%
Members			
▪ Actives			
a. Number	323	340	-5.0%
b. Annual Compensation	$33,018,170	$32,021,634	3.1%
c. Average Annual Compensation	$102,223	$94,181	8.5%
d. Average Attained Age	51.0	50.3	1.4%
e. Average Past Service	15.5	14.3	7.8%
▪ Retired, Disabled and Beneficiaries			
a. Number	168	151	11.3%
b. Total Benefits*	$7,853,669	$6,511,424	20.6%
c. Average Benefits*	$46,748	$43,122	8.4%
d. Average Age	71.2	70.6	0.9%
▪ Inactives			
a. Number	52	57	-8.8%
Normal Cost			
a. Total Normal Cost as of January 1, 2019	$3,712,025	$3,437,119	8.0%
b. Less Expected Members' Contributions	3,052,796	2,979,548	2.5%
c. Normal Cost to be funded by the Municipality	$659,229	$457,571	44.1%
d. Adjustment to July 1, 2019	13,055	8,501	53.6%
e. Administrative Expense Assumption	583,778	493,427	18.3%
f. Normal Cost Adjusted to July 1, 2019	$1,256,062	$959,499	30.9%
Actuarial Accrued Liability			
a. Active Members	$109,255,076	$95,678,968	14.2%
b. Inactive Members	3,808,787	3,535,319	7.7%
c. Retired Members and Beneficiaries	83,396,142	67,930,858	22.8%
d. Total	$196,460,005	$167,145,145	17.5%
Unfunded Actuarial Accrued Liability			
a. Actuarial Accrued Liability	$196,460,005	$167,145,145	17.5%
b. Less Actuarial Value of Assets	146,119,148	128,396,579	13.8%
c. Unfunded Actuarial Accrued Liability	$50,340,856	$38,748,565	29.9%
d. Adjustment to FY2020	2,134,282	1,664,012	
e. Unfunded Actuarial Accrued Liability as of FY2020	$52,475,138	$40,412,577	

* Excluding State reimbursed COLA

APPENDICES

Appendix A – Actuarial Methods and Assumptions

All assumptions and methodologies were either set by statute or selected by the Massachusetts Housing Finance Agency Retirement Board in conjunction with guidance provided by Stone Consulting, Inc.

Stone Consulting, Inc. was furnished member and financial data by the Massachusetts Housing Finance Agency Retirement System's administrative staff. Although examined under broad parameters for reasonableness, the data was not audited by the actuary. With the assistance of the staff of the Massachusetts Housing Finance Agency Retirement Board, we were able to develop a database sufficient for valuation purposes.

ASSUMPTION AND METHODOLOGY CHANGES SINCE PRIOR VALUATION

- The COLA Base was increased from $13,000 to $15,000, which increased the liability by $1.4 million.
- The discount rate was reduced from 7.50% to 7.25%, increasing the liability by $5.0 million.
- The salary increase assumption (shown in full on following page) was reduced by 0.25% in all years, increasing the liability by $721 thousand. This seemingly anomalous result is due to the mathematics of the entry age normal funding method; although the accrued liability and Present Value of Benefits went up, the normal cost went down.
- All non-economic assumptions are consistent with the prior valuation.

ACTUARIAL METHODS

Actuarial Cost Method

The Entry Age Normal Actuarial Cost Method has been used in this valuation. Under this method, the normal cost is the amount calculated as the level percentage of compensation necessary to fully fund the prospective benefits from each member's entry age to retirement age.

The actuarial accrued liability represents the theoretical accumulation of all prior years' normal costs for the plan members as if the program had always been in effect. The unfunded actuarial accrued liability is the excess of the actuarial accrued liability over plan assets. The use of the Entry Age Normal actuarial funding method is consistent with the requirements of Chapter 32 of the Massachusetts General Laws.

Actuarial Methods and Assumptions (Continued)

Asset Valuation Method

Market Value of Assets, adjusted for payables and receivable.

Fiscal Year Adjustment

The actuarial results are adjusted by the valuation interest rate and salary scale to the beginning of Fiscal Year 2020. The unfunded actuarial accrued liability is rolled forward with normal cost and further adjusted by anticipated contributions and interest.

ACTUARIAL ASSUMPTIONS

Valuation Date

January 1, 2019.

Investment Return

7.25% per year net of investment expenses (previously 7.50%).

The investment return assumption is a long-term assumption and is based on capital market expectations by asset class, historical returns, and professional judgement.

Salary Increases

Members are assumed to receive the following increases, based on years of service:

- Year 1: 5.25%
- Years 2 and 3: 5.00%
- Years 4 and 5: 4.75%
- Years 6 and 7: 4.50%
- Years 8 and 9: 4.25%
- All other years: 3.75%

In the 2017 valuation, these increases were all 0.25% higher. The total payroll is assumed to increase at 4.00% per year. The salary increase assumption reflects prior experience including PERAC's 2002 local experience study, current expectations, and professional judgement.

Actuarial Methods and Assumptions (Continued)

Regular Interest Rate Credited to Annuity Savings Account

2% per year.

Credited Service

All service is assumed to be due to employment with the municipality.

Family Composition

Members assumed married with 2 dependent children – one male and one female both age 15; age difference between member and spouse assumed to be 3 years (the male being the older).

Administrative Expenses

Estimated budgeted amount of $583,778 for the Fiscal Year 2020 is added to the Normal Cost. The administrative expense does not include investment manager and custodial fees. These fees are considered part of the discount rate assumption that is net of fees.

Net 3(8)(c)

Net 3(8)(c) payments are assumed to be the same level as the past calendar year for all future years.

Contribution Timing

Contributions are assumed to be made at the beginning of the fiscal year.

In-Service Disability and Death

Both Disability and In-Service Death are assumed to be 75% ordinary and 25% accidental.

Cost-of-Living Increases

A 3% COLA on the first $15,000 of a member's retirement allowance is assumed to be granted every year (previously $13,000).

Actuarial Methods and Assumptions (Continued)

Withdrawal Prior to Retirement

The rates shown at the following sample ages illustrate the withdrawal assumption. Withdrawal rates are set to zero if the retirement rate at that age is nonzero.

Service	Rate of Withdrawal
0	15%
1	12%
2	10%
3	9%
4	8%
5	7.6%
10	5.4%
15	3.3%
20	2.0%
25	1.0%
30+	0.0%

Disability Prior to Retirement

The rates shown at the following sample ages illustrate the assumption regarding the incidence of disability:

Age	Rate of Disability
20	0.01%
25	0.02%
30	0.03%
35	0.06%
40	0.10%
45	0.15%
50	0.19%
55	0.24%
60	0.28%

Actuarial Methods and Assumptions (Continued)

Rates of Retirement

The rates shown at the following ages illustrate the assumption regarding the incidence of retirement, once the member has achieved 10 years of service:

Age	Male	Female	Hired after 4/1/2012	
			Male	Female
50	1%	1.5%	0%	0%
51	1%	1.5%	0%	0%
52	1%	2.0%	0%	0%
53	1%	2.5%	0%	0%
54	2%	2.5%	0%	0%
55	2%	5.5%	0%	0%
56	2.5%	6.5%	0%	0%
57	2.5%	6.5%	0%	0%
58	5%	6.5%	0%	0%
59	6.5%	6.5%	0%	0%
60	12%	5%	25%	30%
61	20%	13%	20%	13%
62	30%	15%	30%	15%
63	25%	12.5%	25%	12.5%
64	22%	18%	22%	18%
65	40%	15%	40%	15%
66	25%	20%	25%	20%
67	25%	20%	25%	20%
68	30%	25%	30%	25%
69	30%	20%	30%	20%
70	100%	100%	100%	100%

Mortality

RP-2014 White Collar Mortality Table projected generationally from the year 2006 using MP-2016 (sex-distinct). During employment the healthy employee mortality table is used. Post-employment the healthy annuitant table is used.

Mortality for disabled retirees follows the same table as non-disabled retirees, set forward 2 years. Death is assumed to be due to the same cause as the disability 40% of the time.

Appendix B – Summary of Principal Provisions

1. PARTICIPANT

Participation is mandatory for all full-time employees whose employment commences before age 65.

2. MEMBER CONTRIBUTIONS

Member contributions vary depending upon date hired as follows:

Date of Hire	Member Contribution Rate
Prior to 1975	5% of Pay
1975 – 1983	7% of Pay
1984 – June 30, 1996	8% of Pay
After June 30, 1996	9% of Pay

Members hired after 1978 contribute an additional 2% of pay over $30,000.

3. PAY

a. Pay

Gross regular compensation excluding bonuses, overtime, severance pay, unused sick pay, and other similar compensation.

b. Average Pay

The average of pay during the three consecutive years that produce the highest average or, if greater, during the last three years (whether or not consecutive) preceding retirement. For members hired after April 1, 2012, five-year averages will be used.

4. CREDITED SERVICE

Period during which an employee contributes to the retirement system plus certain periods of military service and "purchased" service.

Summary of Principal Provisions (Continued)

5. SERVICE RETIREMENT

a. Eligibility

Hired prior to April 2, 2012:

- Attainment of age 55 and completion of ten years of credited service,
- or at any age with completion of 20 years of service.
- If hired prior to 1978 or a member of Group 4, the completion of ten years of service is not required.

Hired after April 1, 2012:

- Group 1 – Age 60 and Completion of 10 years of credited service;
- Group 2 – Age 55 and completion of 10 years of service;
- Group 4 – Age 55.

b. Retirement Allowance

Determined as the product of the member's benefit percentage, average pay and credited service, where the benefit percentage is shown below (maximum allowance of 80% of average pay):

Benefit Percentage	Hired before April 2, 2012
2.5%	65+
2.4	64
2.3	63
2.2	62
2.1	61
2.0	60
1.9	59
1.8	58
1.7	57
1.6	56
1.5	55
	Hired after April 1, 2012*
2.5%	67+
2.35	66
2.20	65
2.05	64
1.90	63
1.75	62
1.60	61
1.45	60

Summary of Principal Provisions (Continued)

6. DEFERRED VESTED RETIREMENT

a. Eligibility

Completion of 10 years of credited service (for elected and appointed members, 6 years in the event of involuntary termination).

b. Retirement Allowance

Determined in the same manner as "Service Retirement" section above with the member eligible to start collecting a benefit at age 55, (or age 57 for post-April 1, 2012 hires) or defer until later at his or her discretion. If a member chooses, his or her contributions with interest may be withdrawn. The amount of interest he or she will receive depends on length of service and whether or not the termination of employment was voluntary.

7. ORDINARY DISABILITY RETIREMENT

a. Eligibility

Non-job related disability after completion of 10 years of credited service.

b. Retirement Allowance

Determined in the same manner as "Service Retirement" section and calculated as if the member had attained age 55 (or age 57 for those hired after April 1, 2012), if younger. Veterans receive 50% of pay (during final year) plus an annuity based on accumulated member contributions with interest.

8. ACCIDENTAL DISABILITY RETIREMENT

a. Eligibility

Disabled as a result of an accident in the performance of duties. No age or service requirement.

b. Retirement Allowance

72% of pay plus an annuity based on accumulated member contributions with interest. Also, a dependent's allowance per year for each child. Total allowance not to exceed 100% of pay (75% for members hired after 1987).

Summary of Principal Provisions (Continued)

9. NON-OCCUPATIONAL DEATH

a. Eligibility

Dies while in active service, but not due to occupational injury. 2 years of service.

b. Retirement Allowance

Benefit as if Option C had been elected (see below) and member had attained age 55 (or age 57 for those hired after April 1, 2012) if younger.

Minimum monthly benefits provided as follows:

- spouse - $500,
- first child - $120,
- each additional child - $90

10. OCCUPATIONAL DEATH

a. Eligibility

Dies as a result of an occupational injury.

b. Benefit Amount

72% of pay plus refund of annuity savings fund balance. In the case of an accidental disability retiree who dies of the same cause, the beneficiary receives 72% of the last 12 months salary or the current pension amount, whichever is greater.

11. COST-OF-LIVING INCREASES

An increase of up to 3% applied to the first $15,000 of annual benefit. Funded by the Employer from Fiscal Year 1999. Percentage increase is voted on each year by the Retirement Board. Cost-of-living increases granted during Fiscal Year 1982 through Fiscal 1998 are reimbursed by the Commonwealth.

12. OPTIONAL FORMS OF PAYMENT

- Option A: Allowance payable monthly for the life of the member.
- Option B: Allowance payable monthly for the life of the member with a guarantee of remaining member contributions with interest.
- Option C: Allowance payable monthly for the life of the member with 66-2/3% continuing to the member's beneficiary upon the member's death. If the beneficiary predeceases the member, the allowance amount "pops up" to the non-reduced amount.

Appendix C – Glossary of Terms

- **Actuarial Accrued Liability**
  The portion of the Present Value of Benefits that is attributable to past service.

- **Actuarial Value of Assets**
  The value of assets based on the asset valuation method shown in the Actuarial Methods and Assumptions section of this report.

- **Actuarial Assumptions**
  Estimates are made as to the occurrence of certain events that determine the level of benefits to be paid and how long they will be provided. The more important actuarial assumptions include the investment return on assets, salary increases and the rates of turnover, disability, retirement and mortality.

- **Actuarial Cost Method**
  The procedure that is used to allocate the present value of benefits between the liability that is attributable to past service (Actuarial Accrued Liability) and that attributable to future service.

- **Funding Ratio**
  The percentage of the accrued liability that is covered by the Actuarial Value of Assets.

- **GASB**
  Government Accounting Standards Board (issues guidance for disclosure of retirement system liabilities).

- **Normal Cost**
  The portion of the Present Value of Benefits that is attributable to benefits to be earned in the coming year.

- **PERAC**
  Public Employee Retirement Administration Commission, a division of the State government which has regulatory authority over the administration of the retirement system.

- **Present Value of Benefits**
  Represents the dollar value today of all benefits expected to be earned by current members if all actuarial assumptions are exactly realized.

- **PRIT**
  Pension Reserves Investment Trust Fund is the state controlled and administered fund for the investment of assets for members of the retirement system.

- **Unfunded Actuarial Accrued Liability**
  That portion of the Actuarial Accrued Liability not covered by System Assets.

PERAC Information Disclosure

The most recent actuarial valuation of the System was prepared by Stone Consulting, Inc. as of January 1, 2019

The normal cost for employees on that date was:	$3,052,796	9.2% of payroll
The normal cost for the employer was:	$659,229	2.0% of payroll

The actuarial liability for active members was:	$109,255,076
The actuarial liability for retired members was (includes inactives):	$87,204,929
Total actuarial accrued liability:	$196,460,005
System assets as of that date ($146,119,148.44 Market Value):	$146,119,148
Unfunded actuarial accrued liability:	$50,340,856

The ratio of system's assets to total actuarial liability was:	74%

As of that date the total covered employee payroll was:	$33,018,170

The principal actuarial assumptions used in the valuation are as follows:

Investment Return:	7.25% per annum
Rate of Salary Increase:	Select and ultimate rate (3.75% ultimate rate)

SCHEDULE OF FUNDING PROGRESS (Dollars in $000's)

Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL) (b)	Unfunded AAL (UAAL) (b-a)	Funded Ratio (a/b)	Covered Payroll (c)	UAAL as a % of Covered Payroll ((b-a)/c)
1/1/2019	$146,119	$196,460	$50,341	74%	$33,018	152%
1/1/2017	$128,397	$167,145	$38,749	77%	$32,022	121%
1/1/2015	$113,875	$144,536	$30,661	79%	$31,240	98%
1/1/2013	$94,976	$119,096	$24,120	80%	$28,044	86%
1/1/2011	$79,406	$102,618	$23,213	77%	$29,744	78%