LAWRENCE CONTRIBUTORY RETIREMENT SYSTEM

ACTUARIAL VALUATION
as of
January 1, 2022

KMS Actuaries, LLC
52 Hunt Road
Kingston, NH 03848

November, 2022

KMS
ACTUARIES
LLC

November 21, 2022

Lawrence Contributory Retirement Board
354 Merrimack Street
Entry C, 3rd Floor
Lawrence, MA 01843

Dear Board Members:

We are pleased to present the enclosed report providing the results of our actuarial valuation of the Lawrence Contributory Retirement System as of January 1, 2022. Our valuation was performed in accordance with the provisions contained in Chapter 32 of the Massachusetts General Laws, "M.G.L.", as of January 1, 2022. Disclosures under GASB Statement No. 67, Financial Reporting for Pension Plans (GASB 67) and GASB Statement No. 68, Accounting and Financial Reporting for Pensions (GASB 68) are provided in a separate report.

The principal results of our valuation are summarized in Section 2. The Summary of Plan Provisions and Actuarial Assumptions and Methods are shown in Sections 5 and 6, respectively. Section 7 summarizes the demographic profile of active members, retired plan members and beneficiaries and disabled plan members. Asset information and actuarial liabilities are presented in Section 2. The development of the required appropriations pursuant to Chapter 32 of the M.G.L. is shown in Section 3, including a 30-year forecast of the required appropriations and projected cash flows. Section 4 includes a summary of valuation information for PERAC as well as information relating to the primary risks to the System and an assessment of those risks.

This valuation is based upon member data provided by the Lawrence Contributory Retirement Board and asset information reported to the Public Employee Retirement Administration Commission (PERAC) by the Retirement Board. Although we did not audit the data used in the valuation, we believe that the information is complete and reliable.

Liabilities presented in this report are based on a long-term investment return rate assumption of 7%, net of investment expense, compounded annually.

This report was completed in accordance with generally accepted actuarial standards and procedures, and conforms to the Code of Professional Conduct of the American Academy of Actuaries. The actuarial assumptions used in the determination of costs are reasonably related to the experience of the System and to reasonable expectations, and represent our best estimate of anticipated long-term experience under the System.

Future actuarial valuation results may differ significantly from the current results presented in this report. Examples of potential sources of volatility include plan experience differing from that anticipated by the economic or demographic assumptions, the effect of new entrants, changes in economic or demographic assumptions, the effect of law changes and the delayed effect of smoothing techniques.

Our valuation follows generally accepted actuarial methods and we perform such tests as we consider necessary to assure the accuracy of the results. The amounts presented in this report have been appropriately determined according to the actuarial assumptions and methods stated herein.

This report is intended for the sole use of the Lawrence Contributory Retirement Board and is intended to provide information to comply with the stated purpose of the report. It may not be appropriate for other purposes.

The undersigned credentialed actuaries are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries necessary to render the actuarial opinion contained herein. They are available to answer any questions with regard to this report.

Respectfully submitted,

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SECTION 1 - EXECUTIVE SUMMARY

Background

We have completed the Actuarial Valuation of the Lawrence Contributory Retirement System as of January 1, 2022. This valuation is based upon census data provided by the Retirement Board and asset information reported to the Public Employee Retirement Administration Commission (PERAC) by the Lawrence Contributory Retirement Board. Information for the prior valuation completed as of January 1, 2020 was obtained from the valuation report prepared by Stone Consulting, Inc..

Massachusetts General Laws

The valuation was prepared in accordance with Chapter 32 of the Massachusetts General Laws ("M.G.L."). The results are based on the active, inactive and retired members and beneficiaries as of December 31, 2021, the assets as of December 31, 2021 and assumptions regarding investment returns, salary increases, mortality, turnover, disability and retirement.

The valuation does not take into consideration:

- Changes in the law after the valuation date,
- Transfers between retirement systems pursuant to Section 3(8)(c) of Chapter 32,
- State-mandated benefits and
- Cost-of-living increases granted to members in pay status between 1982 and 1997.

GASB Statement Numbers 67 and 68

In June 2012, the GASB approved two related Statements that significantly changed the way pension plans and governments account and report pension liabilities. Effective for plans with fiscal years beginning after June 15, 2013, GASB Statement No. 67, Financial Reporting for Pension Plans, replaced the requirements of Statement No. 25 and effective for employers with fiscal years beginning after June 15, 2014, GASB Statement No. 68, Accounting and Financial Reporting for Pensions, replaced the requirements of Statement No. 27.

The pension standards reflect changes from those previously in place regarding how governments calculate total pension liability and pension expense. Further, the standards contain requirements for disclosing information in the notes to financial statements and presenting required supplementary information following the notes.

The required disclosures and notes under GASB Statement Number 67 and 68 for the fiscal year ending December 31, 2021 are provided in a separate report.

Assets

This valuation is based upon asset information reported to the Public Employee Retirement Administration Commission (PERAC) by the Lawrence Contributory Retirement Board. The market value of assets increased from $255,358,705 as of December 31, 2019 to $342,659,255 as of December 31, 2021. During the plan years ended 2020 and 2021, the market value rates of return were 12.45% and 20.30%, respectively.

The actuarial value of assets increased from $255,358,705 as of January 1, 2020 to $306,931,298 as of January 1, 2022. During the plan years ended 2020 and 2021, the rates of return on the actuarial value of assets were 8.21% and 10.96%, respectively. In order to mitigate contribution volatility, a smoothing method for the actuarial value of assets was incorporated in this valuation. This smoothing method uses a 5-year period to phase in asset gains and losses (due to the implementation in this valuation, only 2020 and 2021 gains and losses were included in the actuarial value of assets as of January 1, 2022) and constrains the actuarial value of assets to be within 20% of the market value of assets.

Changes Since the Last Valuation

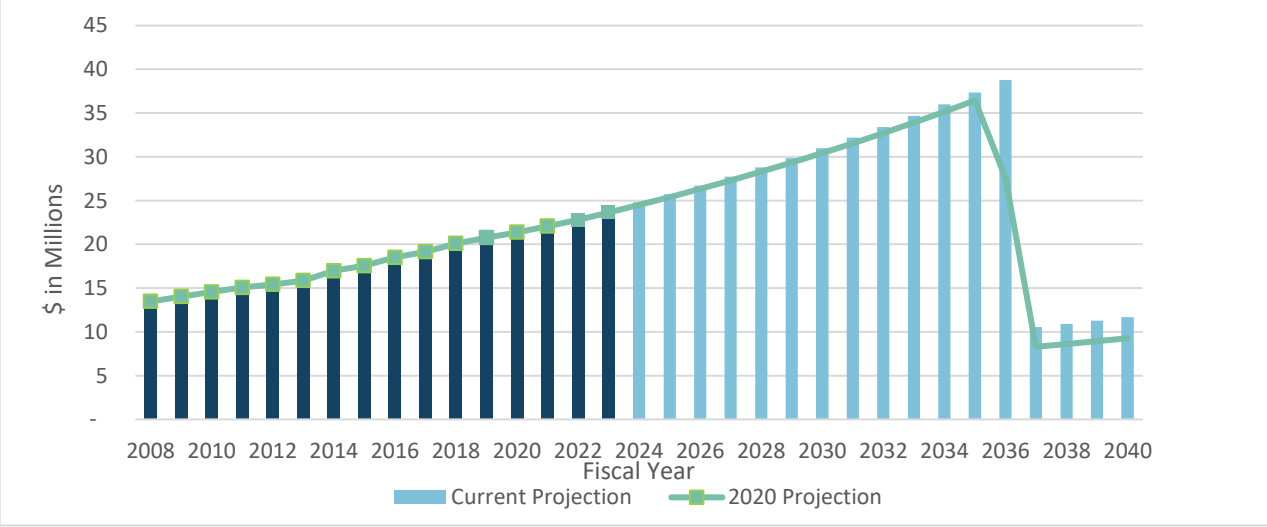
Since the last valuation, the total unfunded actuarial accrued liability of the System was expected to decrease from $205,897,265 as of January 1, 2020 to $194,503,407 as of January 1, 2022, for a total decrease of $11,393,858. The actual unfunded actuarial accrued liability, before any assumption or plan changes, was $145,240,861, resulting in an actuarial gain of $49,262,546. The actuarial gain was primarily due to an asset gain of approximately $48,626,000 and a demographic experience gain of approximately $637,000. The details of the gain and loss analysis are provided in Section 2, Actuarial Experience.

Appropriations

The funding appropriation for each year is computed as the sum of the normal cost, net 3(8)(c) transfers and an amortization payment to pay off the Unfunded Actuarial Liability, adjusted for annual payments of the appropriation made July 1. The appropriation calculated as of the January 1, 2022 valuation is $23,653,809, and is made up of a normal cost payment of $5,521,414, net 3(8)(c) transfers of $966,736, and an amortization payment of $17,165,659. The amortization method is an increasing amortization of the unfunded actuarial accrued liability at 4% over 14 years and is expected to fully pay the unfunded actuarial accrued liability by the year 2036. The development of the appropriation as of January 1, 2022 is presented in Section 3, Annual Appropriations.

For fiscal year 2023, we show the actual appropriation developed under the previous funding schedule and reported on the PERAC "Required Fiscal Year 2023 Appropriation" letter dated October 26, 2021 of $23,639,335. For fiscal year 2024, we developed an annual appropriation of $24,789,033, which is made up of a normal cost of $5,925,572, net 3(8)(c) transfers of $1,000,000 and payment toward the unfunded actuarial accrued liability of $17,863,461. The unfunded actuarial accrued liability is expected to be fully paid by 2036. The current funding schedule is shown in Section 3, Exhibit 3.1.

The chart below shows the historical (navy bars) and projected (blue bars) annual appropriations compared to the projected amounts shown in the prior valuation and funding schedule (green line).



Plan Provisions

The maximum amount of pension benefit subject to a cost-of-living adjustment (COLA) will increase from $12,000 to $14,000 effective July 1, 2023. All other Plan provisions used in this valuation are the same as those used in the prior valuation and are summarized in Section 5, Summary of Plan Provisions.

Actuarial Assumptions and Methods

Some Actuarial Assumptions and Methods used in this valuation have changed since the last valuation, including updating the retirement rates and mortality and mortality improvement rates, reducing the investment return rate from 7.25% to 7%, and incorporating an asset smoothing method for the actuarial value of assets. Changing these assumptions resulted in a net decrease in the unfunded actuarial accrued liability of $ and an increase in the employer normal cost of $106,938. The Actuarial Assumptions and Methods utilized in this valuation are detailed in Section 6, Actuarial Assumptions and Methods.

Census Data

As of January 1, 2022, there are 1,554 active members who may be eligible for benefits in the future, 790 retirees and beneficiaries, 795 inactives and 122 disabled retirees. Summaries of the active, retired and disabled employees are included in Section 7, Plan Member Information.

COVID-19 Pandemic

The assumptions in this report do not reflect the potential impacts of the COVID-19 pandemic on the System. Especially in the short range, the pandemic is likely to materially affect the economic and demographic experience, in a way not anticipated by the assumptions on which the projections are based.

SECTION 1 - EXECUTIVE SUMMARY

A summary of principal valuation results from the current valuation and the prior valuation follows.

Valuation Date	January 1, 2022	January 1, 2020	% Change
Census Data			
Active Members	1,554	1,633	(4.8%)
Valuation Salary	$83,668,626	$75,849,815	10.3%
Average Salary	$53,841	$46,448	15.9%
Retired Members and Beneficiaries	790	800	(1.3%)
Total Annual Retirement Allowance	$23,007,870	$21,592,427	6.6%
Average Annual Retirement Allowance	$29,124	$26,991	7.9%
Disabled Members	122	124	(1.6%)
Total Annual Retirement Allowance	$4,891,044	$4,795,260	2.0%
Average Annual Retirement Allowance	$40,091	$38,671	3.7%
Inactive Members	795	612	29.9%
Annuity Savings Fund	$8,154,403	$6,542,672	24.6%
Funded Status			
Actuarial Accrued Liability (AAL)	$501,159,239	$461,255,970	8.7%
Market Value of Assets (MVA)	$342,659,255	$255,358,705	34.2%
Unfunded Accrued Liability on MVA	$158,499,984	$205,897,265	(23.0%)
Funded Status on MVA	68.4%	55.4%	23.5%
Actuarial Value of Assets (AVA)	$306,931,298	$255,358,705	20.2%
Unfunded Accrued Liability on AVA	$194,227,941	$205,897,265	(5.7%)
Funded Status on AVA	61.2%	55.4%	10.5%
Appropriations			
Fiscal Year 2022	N/A	$22,801,808	N/A
Fiscal Year 2023	$23,639,335	$23,639,335	0.0%
Fiscal Year 2024	$24,789,033	$24,507,626	1.1%
Fiscal Year 2025	$25,728,538	$25,407,809	1.3%

Market Value of Assets

Asset information is reported annually to the Public Employee Retirement Administration Commission by the Lawrence Contributory Retirement Board. The Market Value of Assets for the three most recent calendar years are as follows:

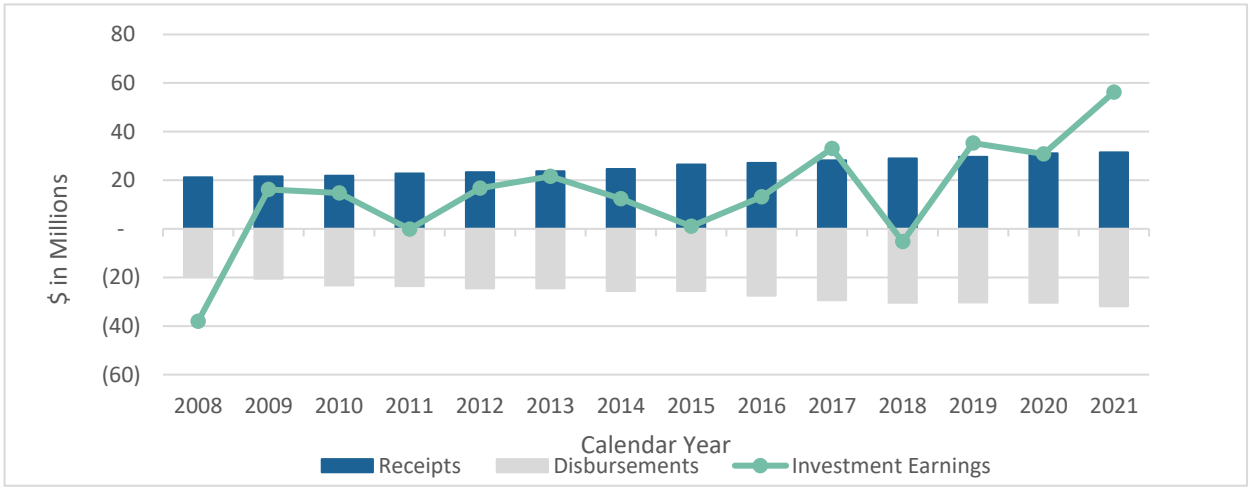
Calendar Year	2021	2020	2019
Trust Fund Composition at Year-End			
Cash	$956,461	$1,089,600	$1,040,656
Short-Term Investments	0	0	0
Fixed Income Securities	0	0	0
Equities	0	0	0
Pooled Short Term Funds	0	0	0
Pooled Domestic Equity Funds	0	0	0
Pooled International Equity Funds	0	0	0
Pooled Global Equity Funds	0	0	0
Pooled Domestic Fixed Income Funds	0	0	0
Pooled International Fixed Income Funds	0	0	0
Pooled Global Fixed Income Funds	0	0	0
Pooled Alternative Investments	0	0	0
Pooled Real Estate Funds	0	0	0
Pooled Domestic Balanced Funds	0	0	0
Pooled International Balanced Funds	0	0	0
Hedge Funds	0	0	0
PRIT Cash	1,400,163	1,100,195	1,003,574
PRIT Fund	341,383,859	285,714,353	254,078,313
Interest Due & Accrued	0	0	0
Prepaid Expenses	12,663	12,187	11,733
Accounts Receivable	555,902	584,439	535,883
Land	0	0	0
Buildings	0	0	0
Accumulated Depreciation - Buildings	0	0	0
Accounts Payable	(1,649,793)	(1,649,124)	(1,311,454)
Total Market Value of Assets	**$342,659,255**	**$286,851,650**	**$255,358,705**

SECTION 2 - PRINCIPAL VALUATION RESULTS

Market Value of Assets

Calendar Year	2021	2020	2019
Funds			
Annuity Savings Fund	$78,970,818	$77,359,845	$74,093,540
Annuity Reserve Fund	18,364,805	18,384,892	18,530,086
Special Military Service Fund	5,302	5,297	5,292
Pension Fund	0	(55,874)	0
Expense Fund	0	0	0
Pension Reserve Fund	245,318,330	191,157,490	162,729,787
Total Market Value of Assets	**$342,659,255**	**$286,851,650**	**$255,358,705**
Asset Activity			
Market Value as of Beginning of Year	$286,851,650	$255,358,705	$220,661,489
Contributions and Receipts	31,479,470	31,114,784	29,702,738
Benefit Payments and Expenses	(31,890,546)	(30,456,679)	(30,312,153)
Investment Return	56,218,681	30,834,840	35,306,631
Total Market Value of Assets	**$342,659,255**	**$286,851,650**	**$255,358,705**
Rate of Return	20.30%	12.45%	16.88%

Below are the receipts and disbursements during the last 14 years. The green line reflects investment earnings, which vacillate as investment markets fluctuate. Blue bars indicate contributions, from employees and employers, and grey bars show benefit payments and administrative expenses.



Actuarial Value of Assets

The Actuarial Value of Assets is the market value of assets as of the valuation date adjusted to phase in investment gains and losses over a 5-year period, further constrained to be within 20% of the market value of assets. Investment gains and losses are the excess or deficiency of the expected returns over the actual returns. For 2022, we phased-in the asset smoothing method by only recognizing the 2020 and 2021 gains. Prior to this valuation, the actuarial value of assets was equal to the market value of assets.

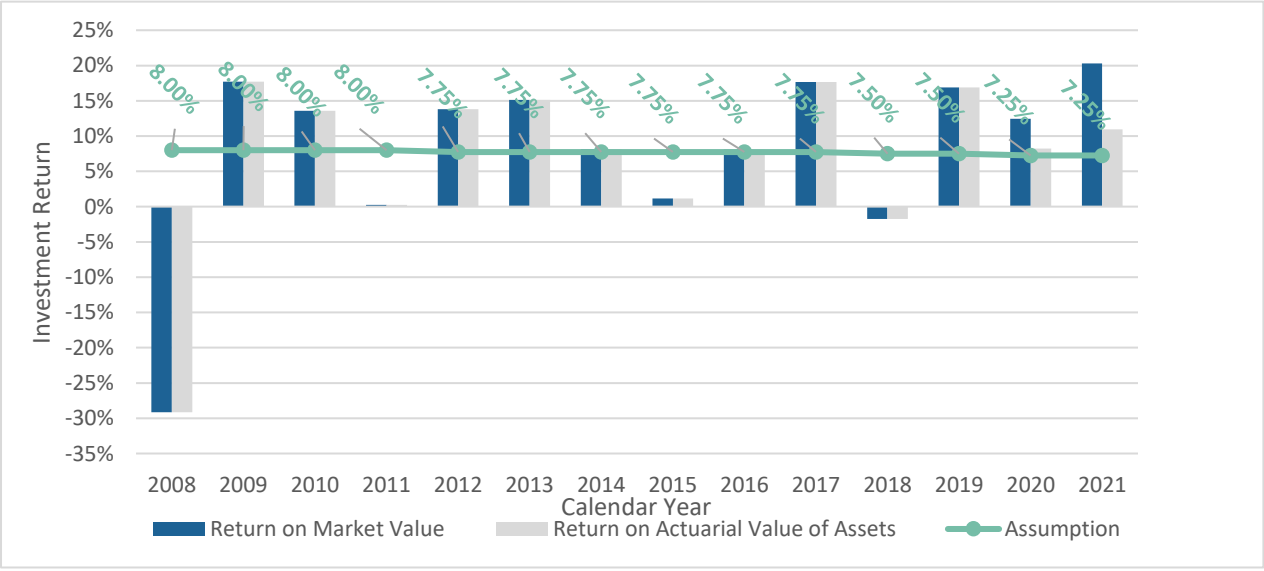
Valuation Date	January 1, 2022	January 1, 2021
1. Expected Market Value of Assets		
a. Market Value of Assets as of prior January 1	$286,851,650	$255,358,705
b. Prior Year Contributions and Receipts	31,479,470	31,114,784
c. Prior Year Benefit Payments and Expenses	(31,890,546)	(30,456,679)
d. Expected Investment Return Rate	7.25%	7.25%
e. Expected Investment Return	20,781,843	18,537,362
f. Expected Market Value of Assets	$307,222,417	$274,554,172
2. Prior Year Gain/(Loss)		
a. Market Value of Assets as of January 1	$342,659,255	$286,851,650
b. Expected Market Value of Assets	307,222,417	274,554,172
c. Prior Year Gain /(Loss)	$35,436,838	$12,297,478
3. Phase-In of Asset Gains and Losses		

	Calendar Year	Gain / (Loss)	Unrecognized Gain / (Loss)	Unrecognized Gain / (Loss)
a.	2021	$35,436,838	$28,349,470	$0
b.	2020	12,297,478	7,378,487	9,837,982
c.	2019	0	0	0
d.	2018	0	0	0
e.	2017	0	0	0
f.	2016	0	0	0
g.	Total Deferred Gains/(Losses)		$35,727,957	$9,837,982

Actuarial Value of Assets

Valuation Date	January 1, 2022	January 1, 2021
4. Actuarial Value of Assets		
a. Market Value of Assets	$342,659,255	$286,851,650
b. Deferred Gains/(Losses)	35,727,957	9,837,982
c. Market Value of Assets Less Deferred Gains/(Losses)	$306,931,298	$277,013,668
d. 80% of Market Value of Assets	274,127,404	229,481,320
e. 120% of Market Value of Assets	411,191,106	344,221,980
f. Actuarial Value of Assets, c., but not less than d. and not greater than e.	$306,931,298	$277,013,668
g. Ratio of Actuarial Value of Assets to Market Value of Assets	89.6%	96.6%
5. Rate of Return on Actuarial Value of Assets for Prior Calendar Year	10.96%	8.21%

Below are the investment returns during the last 14 years. The green line reflects the investment return actuarial assumption. Blue bars indicate investment return rates on market value of assets, and grey bars show investment return rates on actuarial value of assets.



Actuarial Liabilities

The **Actuarial Present Value of Future Benefits** is the present value of the cost to finance all benefits payable in the future, discounted to reflect the probability of payment and the time value of money. Below is the Actuarial Present Value of Future Benefits from the current valuation and the prior valuation:

Valuation Date	January 1, 2022	January 1, 2020
Actives	$326,809,202	Not Available
Retired Members and Beneficiaries	230,466,629	
Disabled Members	52,941,265	
Inactive Members	8,154,403	
Total Present Value of Future Benefits	**$618,371,499**	

The **Actuarial Accrued Liability** is the portion of the Actuarial Present Value of Future Benefits which is allocated to all periods prior to a valuation year and therefore is not provided for by future Normal Costs. Below is the Actuarial Accrued Liability from the current valuation and the prior valuation:

Valuation Date	January 1, 2022	January 1, 2020
Actives	$209,596,942	$193,186,423
Retired Members and Beneficiaries	230,466,629	261,526,875
Disabled Members[1]	52,941,265	-
Inactive Members	8,154,403	6,542,672
Total Actuarial Accrued Liability	**$501,159,239**	**$461,255,970**

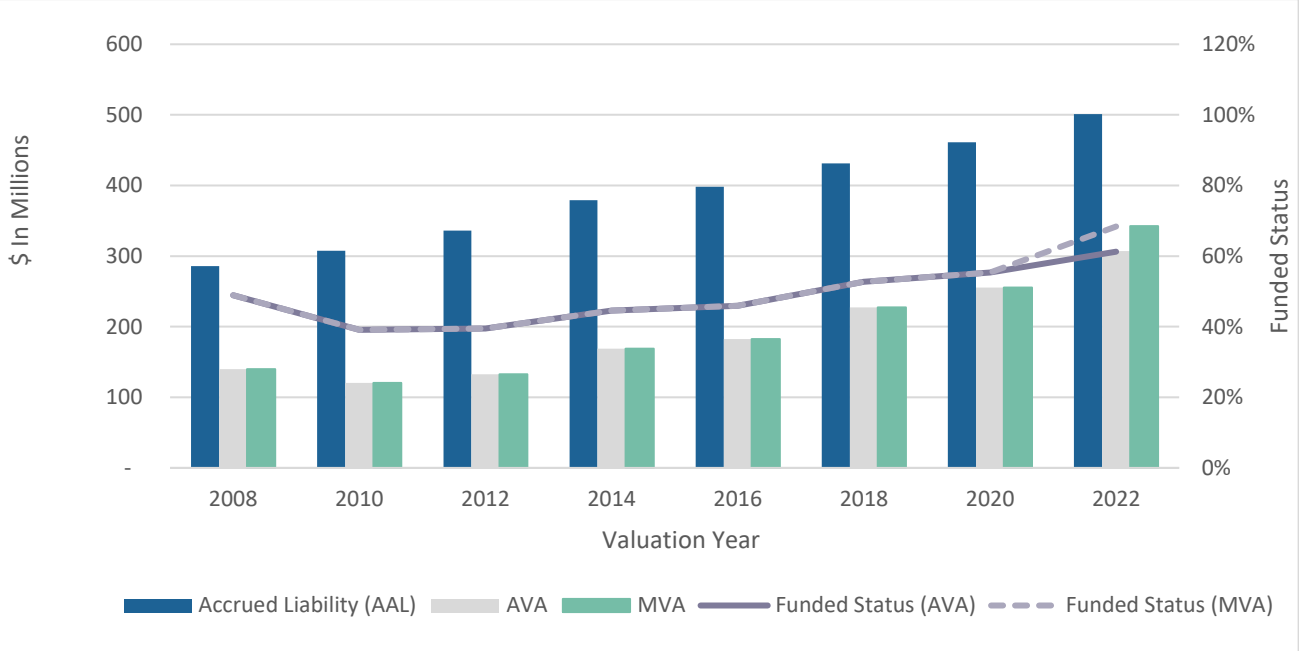
[1] Included in Retired Members and Beneficiaries for 2020 valuation.

The **Unfunded Actuarial Accrued Liability** is the difference between the Actuarial Accrued Liability and the Actuarial Value of Assets as of the valuation date. The **Funded Status** is the Actuarial Value of Assets divided by the Actuarial Accrued Liability and is a point-in-time measurement of the amount of assets set aside to cover actuarial accrued liabilities. Below is the Unfunded Actuarial Accrued Liability and Funded Status from the current valuation and the prior valuation:

Valuation Date	January 1, 2022	January 1, 2020
Unfunded Actuarial Accrued Liability		
a. Actuarial Accrued Liability	$501,159,239	$461,255,970
b. Actuarial Value of Assets	306,931,298	255,358,705
c. Unfunded Actuarial Accrued Liability (a. - b.)	$194,227,941	$205,897,265
d. Funded Status (b. divided by a.)	61.2%	55.4%

Actuarial Liabilities

Below are the accrued liabilities, asset values (actuarial and market) and funded status for each of the last 8 valuations. The purple solid line reflects the funded status on an actuarial value of assets (AVA) basis and the purple dotted line reflects the funded status on a market value (MVA) basis. Blue bars indicate actuarial accrued liabilities, grey bars indicate actuarial value of assets and green bars indicate market value of assets.



The **Normal Cost** is the portion of the Actuarial Present Value of Future Benefits which is allocated to a valuation year. Only active employees who have not reached Normal Retirement Age incur a Normal Cost. Below is the Normal Cost from the current valuation and the prior valuation:

Valuation Date	January 1, 2022	January 1, 2020
Total Normal Cost	$12,477,353	$10,232,118
As of Percentage of Salary	14.9%	13.5%
Employee Normal Cost	$7,463,476	$7,076,889
As of Percentage of Salary	8.9%	9.3%
Administrative Expenses	$507,537	$539,130
As a Percentage of Salary	0.6%	0.7%
Net Employer Normal Cost	$5,521,414	$3,694,359
As a Percentage of Salary	6.6%	4.9%

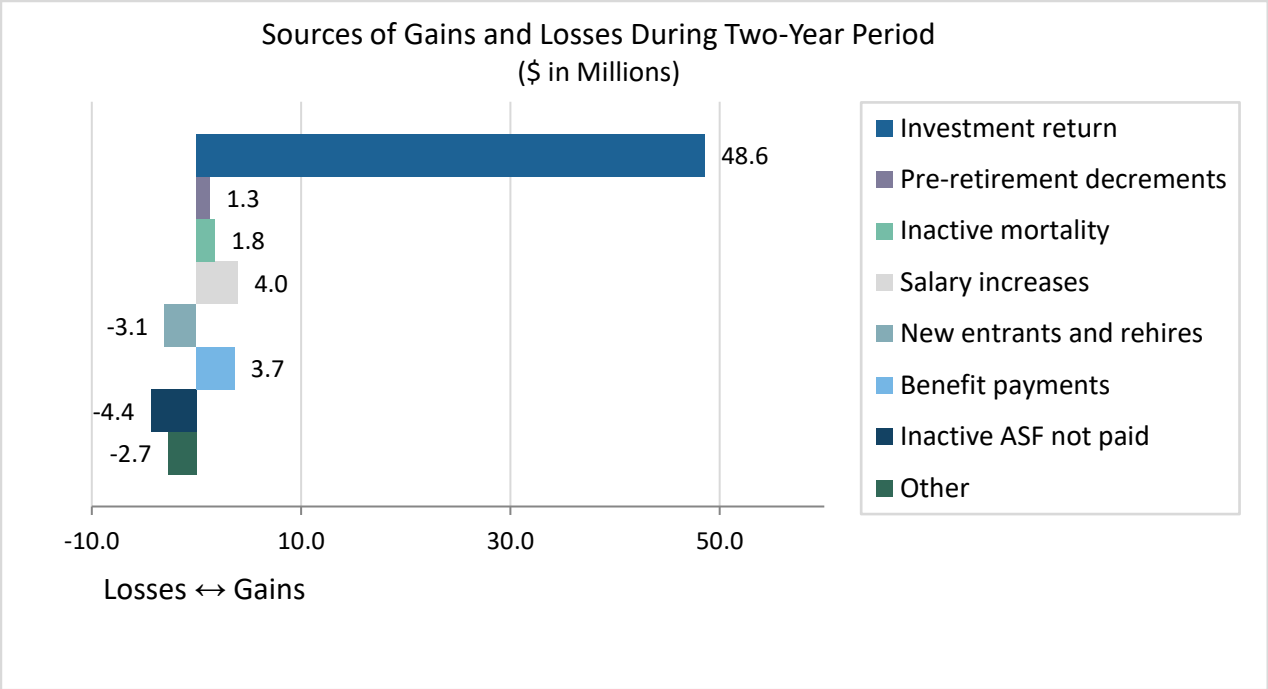
Actuarial Experience

In performing the actuarial valuation, various assumptions are made regarding mortality, retirement, disability and withdrawal rates as well as salary increases and investment returns. A comparison of the results of the current valuation and the prior valuation is made to determine how closely actual experience relates to expected. During the two years since the last valuation, the total unfunded actuarial accrued liability of the System was expected to decrease by $11,393,858. Below is the development of the Actuarial Gain for the current 2-year period:

Calendar Year Ending		December 31, 2021	December 31, 2020
Expected Unfunded Actuarial Accrued Liability			
1.	Unfunded Actuarial Accrued Liability, Beginning of Year	$199,556,068	$205,897,265
2.	Normal Cost, Beginning of Year	12,214,568	10,232,118
3.	Total Contributions	31,479,470	31,114,784
4.	Interest (full year on 1. and 2., one-half year on 3.)	14,212,240	14,541,469
5.	Expected Unfunded Actuarial Accrued Liability	$194,503,407	$199,556,068
6.	Unfunded Actuarial Accrued Liability (before changes)	145,240,861	
7.	(Gain)/Loss (6. - 5.)	($49,262,546)	
Asset Gain/(Loss)			
1.	Actuarial Value of Assets, Beginning of Year	$286,851,650	$255,358,705
2.	Contributions and Receipts	31,479,470	31,114,784
3.	Benefit Payments and Expenses	(31,890,546)	(30,456,679)
4.	Assumed Rate of Return (prior valuation)	7.25%	7.25%
5.	Expected Return	20,781,843	18,537,362
6.	Actuarial Value of Assets, End of Year	$342,659,255	$286,851,650
7.	Actual Return	56,218,681	30,834,840
8.	Actual Rate of Return	20.30%	12.45%
9.	Asset Gain/(Loss) (7. - 5.)	35,436,838	12,297,478
10.	Total Asset Gain/(Loss), 2-Year Period	$48,625,883	

Actuarial Experience

Below are the various sources of gains and losses over the 2-year period. The asset gain during the period was $48,625,883, and the total demographic gain during the period was $636,663, which totals to an overall gain of $49,262,546.



*"Other" includes a 845k loss that is attributable to the change in actuarial firms.

Unfunded Actuarial Accrued Liability

1.	Changes due to:	
	a. Asset Gain	(48,625,883)
	b. Demographic Experience Gain	(636,663)
	c. Total Gain Prior to Changes	(49,262,546)
	d. Plan Change - increase COLA base to $14,000	4,762,549
	e. Assumption and Method Changes	
	Mortality and Mortality Improvement Rates and Retirement Rates	(2,389,080)
	Investment Return Rate	10,885,654
	Implementation of Actuarial Value of Assets Smoothing Method	35,727,957
	Total	44,224,531
	f. Total Decrease (including changes)	(275,466)
2.	Unfunded Actuarial Accrued Liability, End of Year	$194,227,941

SECTION 3 - CHAPTER 32 OF M.G.L. APPROPRIATIONS

Annual Appropriations

The Annual Appropriation is determined in accordance with the requirements set forth in Sections 22D and 22F of Chapter 32 of the Massachusetts General Laws ("M.G.L."). The appropriation is comprised of the annual employer normal cost and amortization payments to pay the unfunded actuarial accrued liability. Below are the details of the annual appropriations for the current valuation, adjusted for annual payments made July 1. The appropriations shown are based on the results of the valuation and do not account for any adjustments made to appropriations in the selected funding schedule.

	Valuation Date	January 1, 2022
1.	Early Retirement Incentive Plan (2002 Housing Authority)	
	Fully Funded Year	2028
	Investment Return Rate	7.00%
	Balance as of Valuation Date	33,909
	Amortization Amount	$5,991
	Increasing Rate	4.50%
	Remaining Payment Period from Valuation Date	6
2.	Early Retirement Incentive Plan (2002 VOC and City)	
	Fully Funded Year	2028
	Investment Return Rate	7.00%
	Balance as of Valuation Date	4,732,406
	Amortization Amount	$845,853
	Increasing Rate	4.00%
	Remaining Payment Period from Valuation Date	6
3.	Early Retirement Incentive Plan (2003 VOC and City)	
	Fully Funded Year	2028
	Investment Return Rate	7.00%
	Balance as of valuation date	1,495,982
	Amortization Amount	$267,386
	Increasing Rate	4.00%
	Remaining Payment Period (from Valuation date)	6
4.	Unfunded Actuarial Accrued Liability	
	Fully Funded Year	2036
	Balance as of Valuation Date	$187,965,644
	Amortization Amount	$16,046,429
	Increasing Rate	4.00%
	Remaining Payment Period from Valuation Date	14

Annual Appropriations

5.	Total Amortization Payments	$17,165,659
6.	Normal Cost	$5,521,414
7.	Net 3(8)(c) Transfers	$966,736
8.	Total Appropriation as of January 1	$23,653,809
9.	**Adjusted for Annual Payments as of July 1**	**$24,467,691**

Exhibit 3.1 - 30-Year Forecast of Annual Appropriations

Fiscal Year Ending	Employer Normal Cost	Amortization Payment of UAL	Amortization Payment of ERI 2002 (Housing Authority)	Amortization Payment of ERI 2002 (VOC and City)	Amortization Payment of ERI 2003 (VOC and City)	Net 3(8)(c) Transfers	Total Employer Cost	Increase over Prior Year	Unfunded Actuarial Accrued Liability
2023	$5,744,075	$15,727,574	$6,197	$874,957	$276,587	$1,009,945	$23,639,335		$194,227,941
2024	5,925,572	16,659,381	6,475	909,955	287,650	1,000,000	24,789,033	4.86%	190,357,592
2025	6,147,781	17,328,481	6,767	946,353	299,156	1,000,000	25,728,538	3.79%	185,204,516
2026	6,378,322	18,025,498	7,072	984,207	311,122	1,000,000	26,706,221	3.80%	178,948,748
2027	6,617,510	18,749,016	7,390	1,023,576	323,567	1,000,000	27,721,059	3.80%	171,482,226
2028	6,865,667	19,500,039	7,723	1,064,520	336,509	1,000,000	28,774,458	3.80%	162,690,709
2029	7,123,129	21,744,758	-	-	-	1,000,000	29,867,887	3.80%	152,450,837
2030	7,390,247	22,612,620	-	-	-	1,000,000	31,002,867	3.80%	140,629,443
2031	7,667,380	23,513,596	-	-	-	1,000,000	32,180,976	3.80%	127,082,828
2032	7,954,907	24,448,946	-	-	-	1,000,000	33,403,853	3.80%	111,655,973
2033	8,253,216	25,419,983	-	-	-	1,000,000	34,673,199	3.80%	94,181,705
2034	8,562,712	26,428,069	-	-	-	1,000,000	35,990,781	3.80%	74,479,790
2035	8,883,814	27,474,617	-	-	-	1,000,000	37,358,431	3.80%	52,355,968
2036	9,216,957	28,550,615	-	-	-	1,000,000	38,767,572	3.77%	27,600,921
2037	9,562,593	-	-	-	-	1,000,000	10,562,593	-72.75%	-
2038	9,921,191	-	-	-	-	1,000,000	10,921,191	3.39%	-
2039	10,293,236	-	-	-	-	1,000,000	11,293,236	3.41%	-
2040	10,679,233	-	-	-	-	1,000,000	11,679,233	3.42%	-
2041	11,079,705	-	-	-	-	1,000,000	12,079,705	3.43%	-
2042	11,495,193	-	-	-	-	1,000,000	12,495,193	3.44%	-
2043	11,926,262	-	-	-	-	1,000,000	12,926,262	3.45%	-
2044	12,373,497	-	-	-	-	1,000,000	13,373,497	3.46%	-
2045	12,837,503	-	-	-	-	1,000,000	13,837,503	3.47%	-
2046	13,318,910	-	-	-	-	1,000,000	14,318,910	3.48%	-
2047	13,818,368	-	-	-	-	1,000,000	14,818,368	3.49%	-
2048	14,336,557	-	-	-	-	1,000,000	15,336,557	3.50%	-
2049	14,874,178	-	-	-	-	1,000,000	15,874,178	3.51%	-
2050	15,431,960	-	-	-	-	1,000,000	16,431,960	3.51%	-
2051	16,010,659	-	-	-	-	1,000,000	17,010,659	3.52%	-
2052	16,611,058	-	-	-	-	1,000,000	17,611,058	3.53%	-

Exhibit 3.2 - 30-Year Forecast of Cash Flow

Calendar Year	Market Value of Assets, BOY	Benefit Payments	Employee Contributions	Employer Contributions	Investment Return	Market Value of Assets, EOY
2022	$342,659,255	$38,752,671	$7,463,476	$22,886,602	$24,754,310	$359,010,972
2023	359,010,972	31,954,027	7,743,356	24,007,672	26,234,949	385,042,922
2024	385,042,922	33,239,608	8,033,732	24,905,980	28,095,398	412,838,424
2025	412,838,424	34,548,422	8,334,997	25,851,143	30,082,525	442,558,667
2026	442,558,667	35,948,439	8,647,559	26,832,222	32,204,496	474,294,505
2027	474,294,505	37,315,866	8,971,842	27,850,582	34,472,130	508,273,193
2028	508,273,193	38,579,281	9,308,286	28,907,640	36,903,963	544,813,801
2029	544,813,801	39,793,752	9,657,347	30,004,866	39,520,540	584,202,802
2030	584,202,802	40,945,000	10,019,498	31,143,787	42,342,551	626,763,638
2031	626,763,638	42,128,051	10,395,229	32,325,987	45,389,458	672,746,261
2032	672,746,261	43,146,348	10,785,050	33,553,110	48,685,787	722,623,860
2033	722,623,860	45,087,934	11,189,489	34,826,865	52,226,737	775,779,017
2034	775,779,017	47,116,891	11,609,095	36,149,022	55,998,508	832,418,751
2035	832,418,751	49,237,151	12,044,436	37,511,290	60,014,913	892,752,239
2036	892,752,239	51,452,823	12,496,102	10,244,508	62,283,651	926,323,677
2037	926,323,677	53,768,200	12,964,706	10,591,177	64,609,682	960,721,042
2038	960,721,042	56,187,769	13,450,882	10,950,847	66,992,022	995,927,024
2039	995,927,024	58,716,219	13,955,290	11,324,004	69,429,375	1,031,919,474
2040	1,031,919,474	61,358,449	14,478,613	11,711,155	71,920,101	1,068,670,894
2041	1,068,670,894	64,119,579	15,021,561	12,112,823	74,462,184	1,106,147,883
2042	1,106,147,883	67,004,960	15,584,870	12,529,553	77,053,188	1,144,310,534
2043	1,144,310,534	70,020,183	16,169,303	12,961,911	79,690,216	1,183,111,781
2044	1,183,111,781	73,171,091	16,775,652	13,410,483	82,369,866	1,222,496,691
2045	1,222,496,691	76,463,790	17,404,739	13,875,876	85,088,179	1,262,401,695
2046	1,262,401,695	79,904,661	18,057,417	14,358,721	87,840,585	1,302,753,757
2047	1,302,753,757	83,500,371	18,734,570	14,859,673	90,621,847	1,343,469,476
2048	1,343,469,476	87,257,888	19,437,116	15,379,411	93,425,994	1,384,454,109
2049	1,384,454,109	91,184,493	20,166,008	15,918,639	96,246,256	1,425,600,519
2050	1,425,600,519	95,287,795	20,922,233	16,478,088	99,074,986	1,466,788,031
2051	1,466,788,031	99,575,746	21,706,817	17,058,516	101,903,584	1,507,881,202

Forecast Notes

Exhibit 3.1:

- The Employer Normal Cost is expected to increase 3.75% per year.
- The Unfunded Actuarial Accrued Liability ("UAL") is computed as of January 1 of each year assuming no future gains or losses.
- The Amortization Payment of UAL is an increasing payment at 4% paid over 14 years through 2036.
- The Amortization Payment of the Early Retirement Incentive Plan (2002 Housing Authority) is an increasing payment at 4.5% paid over 6 year(s) through 2028.
- The Amortization Payment of the Early Retirement Incentive Plan (2002 VOC and City) is an increasing payment at 4% paid over 6 year(s) through 2028.
- The Amortization Payment of the Early Retirement Incentive Plan (2003 VOC and City) is an increasing payment at 4% to be paid over 6 years through 2028.
- Net 3(8)(c) transfers are a level dollar amount based on the net transfers expected to be paid by the Lawrence Contributory Retirement Board during the current year offset by the amount received during the same period.
- Total Employer Cost is the sum of the Employer Normal Cost, net 3(8)(c) transfers and the Amortization of the UAL, all computed as of January 1 of each year and adjusted for annual payments made on July 1.
- For fiscal year 2023, we show the actual appropriation developed under the previous funding schedule of $23,639,335. For fiscal years 2024 and later, the Board has selected a funding schedule that fully amortizes the unfunded actuarial accrued liability by 2036.

Exhibit 3.2:

- Expected benefit payments include payments expected to be made to retired members, beneficiaries, disabled members and active members expected to retire. In addition, expected benefit payments include distribution of the annuity savings fund attributed to inactive members.
- Benefit payments exclude cost-of-living increases granted to members in pay status between 1982 and 1997. In addition, benefit payments are as expected for the first ten years of the forecast, then increase by the greater of 4.5% per year thereafter or the expected future payments for the current population projected by our computer model.
- Calendar year cash flow entries are developed as of each January 1.

SECTION 4 - DISCLOSURES

4.1 - GASB 67 and GASB 68 Disclosures

In June 2012, the GASB approved two related Statements that significantly changed the way pension plans and governments account and report pension liabilities. Effective for plans with fiscal years beginning after June 15, 2013, GASB Statement No. 67, *Financial Reporting for Pension Plans* , replaced the requirements of Statement No. 25 and effective for employers with fiscal years beginning after June 15, 2014, GASB Statement No. 68, *Accounting and Financial Reporting for Pensions* , replaced the requirements of Statement No. 27.

The pension standards reflect changes from those previously in place regarding how governments calculate total pension liability and pension expense. Further, the standards contain requirements for disclosing information in the notes to financial statements and presenting required supplementary information following the notes.

GASB 67 requires defined benefit pension plans, such as the Lawrence Contributory Retirement System, to present a statement of fiduciary net position (pension plan assets) and a statement of changes in fiduciary net position. Further, the statement requires that notes to financial statements include descriptive information such as the types of benefits provided, the classes of plan members covered and the composition of the pension plan's retirement board. Finally, GASB 67 requires pension plans to present in required supplementary information the sources of the changes in the net pension liability and information about the actuarially determined contributions compared with the actual contributions made to the plan and related ratios.

GASB 67 and GASB 68 require projected benefit payments be discounted to their actuarial present value using the single rate that reflects:

(1) a long-term expected rate of return on pension plan investments *to the extent that the pension plan's assets are sufficient to pay benefits and pension plan assets are expected to be invested using a strategy to achieve that return* and

(2) a tax-exempt, high-quality municipal bond rate *to the extent that the conditions for use of the long-term expected rate of return are not met.*

GASB 68 establishes standards for measuring and recognizing liabilities, deferred outflows of resources, deferred inflows of resources and pension expense by state and local governments.

The effective date for GASB 67 is for plan years beginning after June 15, 2013, which is the fiscal year ending December 31, 2014 for the Lawrence Contributory Retirement System. The effective date for GASB 68 is for employers' fiscal years beginning after June 15, 2014. The GASB report, submitted under separate cover and prepared as of December 31, 2021 (the measurement date), presents information to assist the Lawrence Contributory Retirement Board in providing the required information under GASB 68 to participating employers.

4.2 - PERAC Disclosure Information

The most recent actuarial valuation of the System was prepared by KMS Actuaries, LLC as of January 1, 2022.

Normal Cost - Employees	$7,463,476	8.9% of payroll
Normal Cost - Employers	$5,521,414	6.6% of payroll
Actuarial Liability - Active Members	$209,596,942	42% of total AAL
Actuarial Liability - Retired and Inactive Members	291,562,297	58% of total AAL
Total Actuarial Liability (AAL)	$501,159,239	
System Assets	$306,931,298	
Unfunded Actuarial Accrued Liability	$194,227,941	
Funded Status	61.2%	

Principal actuarial assumptions used in the valuation:

Investment Return	7.00%
Rate of Salary Increase	Based on service, 7.75% for 0-4 years of service, 3.75% thereafter for all groups

4.3 - Risk Measures

The Lawrence Contributory Retirement System is subject to certain risks that could affect the plan's future financial condition. Here we identify the primary risks to the System, provide some background information about those risks, and provide an assessment of those risks in accordance with Actuarial Standards of Practice (ASOP) 51.

Risk is the potential of actual future measurements deviating from expected future measurements resulting from actual future experience deviating from actuarially assumed experience. Examples of potential risks that may be reasonably anticipated to significantly affect the future financial condition of the plan include the following:

- **Investment Risk** - the potential that investment returns will be different than expected.
- **Asset/Liability Mismatch Risk** - the potential that changes in asset values are not matched by changes in the value of liabilities.
- **Interest Rate Risk** - the potential that interest rates will be different than expected.
- **Longevity and Other Demographic Risks** - the potential that mortality or other demographic experience will be different than expected.
- **Contribution Risk** - the potential of actual future contributions deviating from expected future contributions. For example, that actual contributions are not made in accordance with the plan's funding policy, that other anticipated payments to the plan are not made, or that material changes occur in the anticipated number of covered employees, covered payroll, or other relevant contribution base.

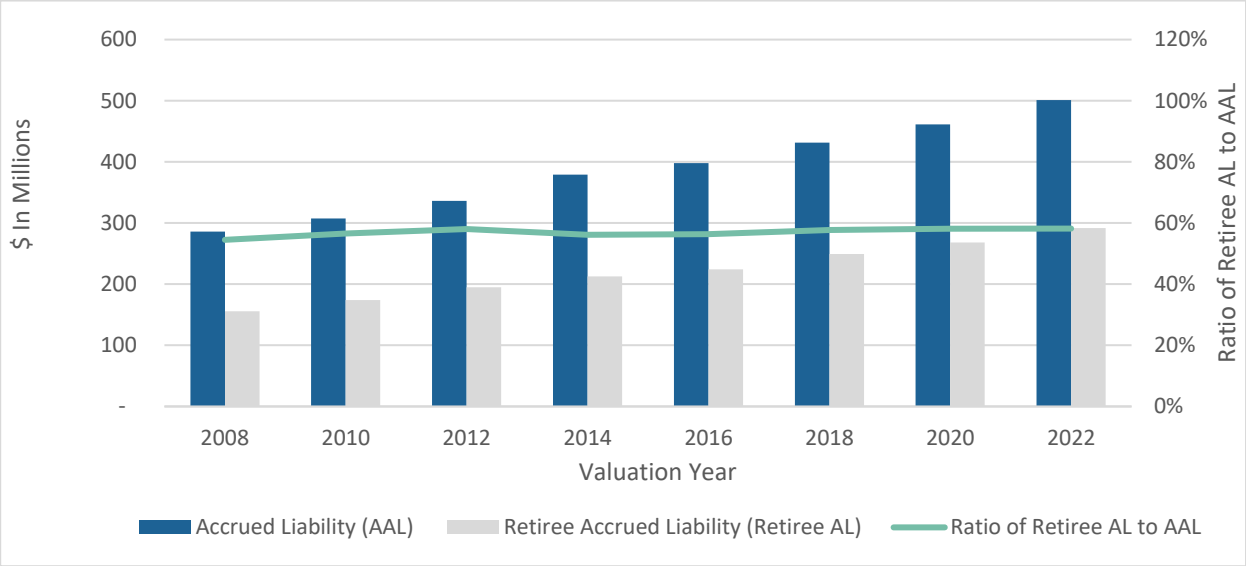
We have provided several risk measures in this section that we believe are most significant for the plan. However, we believe that a more rigorous assessment of risk would be beneficial to the Board to understand the risks identified above, such as:

- Scenario Test - a process for assessing the impact of one possible event, or several simultaneous or sequentially occurring possible events, on a plan's financial condition.
- Sensitivity Test - a process for assessing the impact of a change in an actuarial assumption on an actuarial measurement.
- Stochastic Modeling - a process for generating numerous potential outcomes by allowing for random variations in one or more inputs over time for the purpose of assessing the distribution of those outcomes.
- Stress Test - a process for assessing the impact of adverse changes in one or relatively few factors affecting a plan's financial condition.

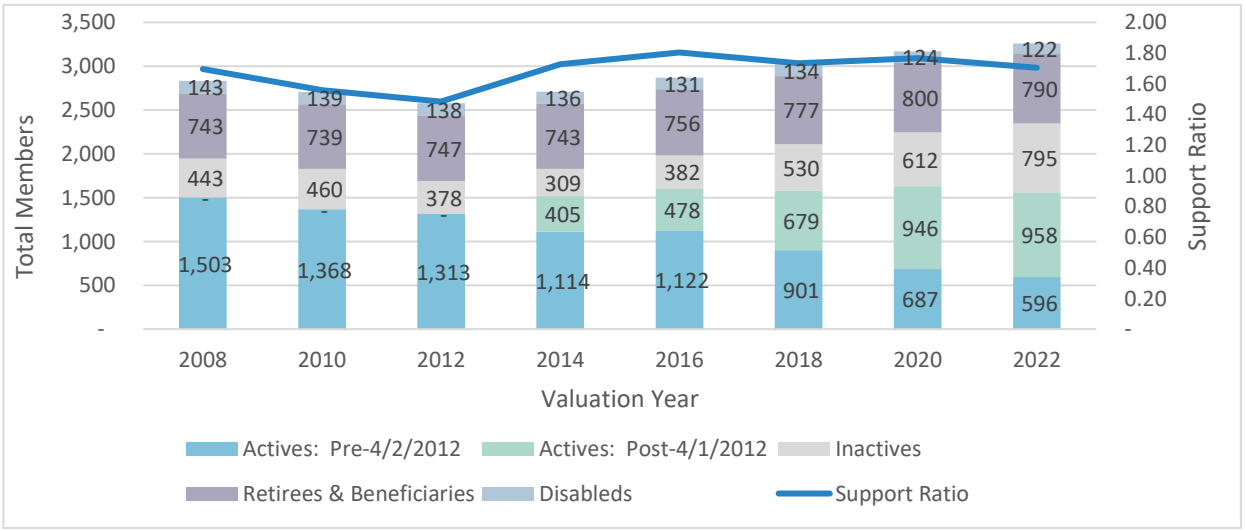
4.3 - Risk Measures

Maturity Measures

As retirement systems mature they become much more sensitive to risks. This is because a higher proportion of the actuarial liability is attributable to participants who are no longer active. Plan maturity measures are helpful in understanding the risks associated with a plan. One such maturity measure is the ratio of the system's retiree liability to its total liabiity. A retirement system in its infancy will have a very low ratio of retiree liability to total liability. As the system matures, the ratio starts increasing. A mature plan will often have a ratio above 60%. For the Lawrence Contributory Retirement System this ratio has been fairly steady around 60% in recent years.



Another maturity measure is the ratio of actives to retirees, or support ratio. A retirement system in its infancy will have a very high ratio of active to retired members. As the system matures, and members retire, the support ratio starts declining. A mature system will often have a support ratio near or below one.



4.3 - Risk Measures

Volatility Indices

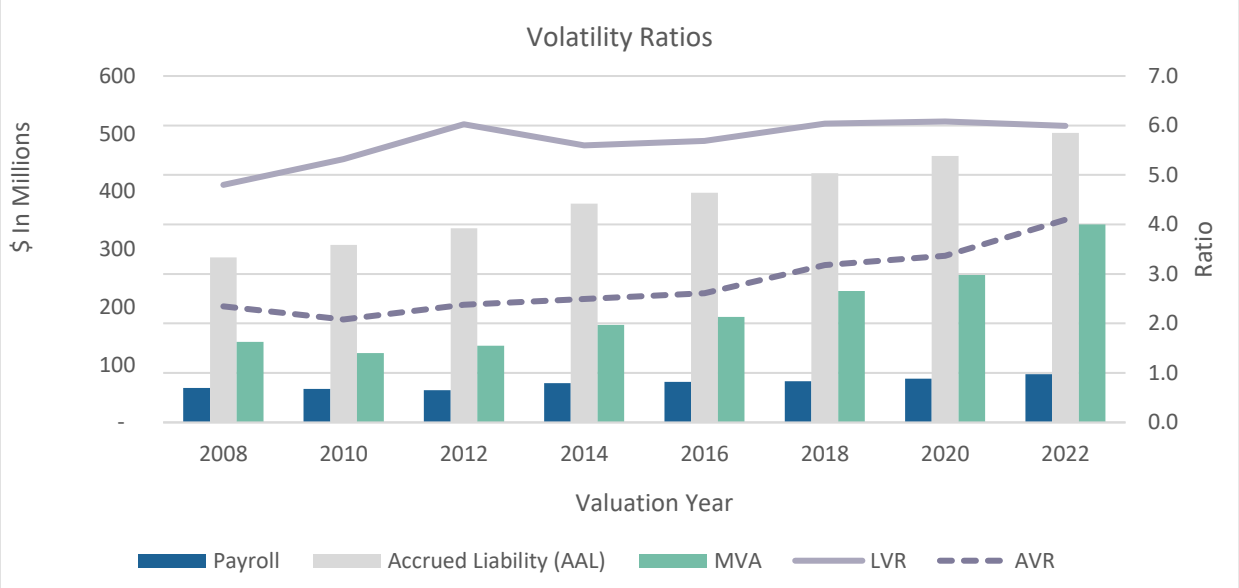
Volatility indices are measures of the relative sensitivity of employer contributions to changes in assets or liabilities. Below we present two such indices - the Asset Volatility Ratio (AVR) and the Liability Volatility Ratio (LVR):

Asset Volatility Ratio (AVR)

The Asset Volatility Ratio (AVR) is the ratio of the Market Value of Assets (MVA) to Payroll. Systems with a higher AVR experience more volatile employer contributions (as a percentage of payroll) due to investment return. This ratio indicates a measure of the system's current contribution volatility. The AVR increases over time but generally tends to stabilize as the system matures.

Liability Volatility Ratio (LVR)

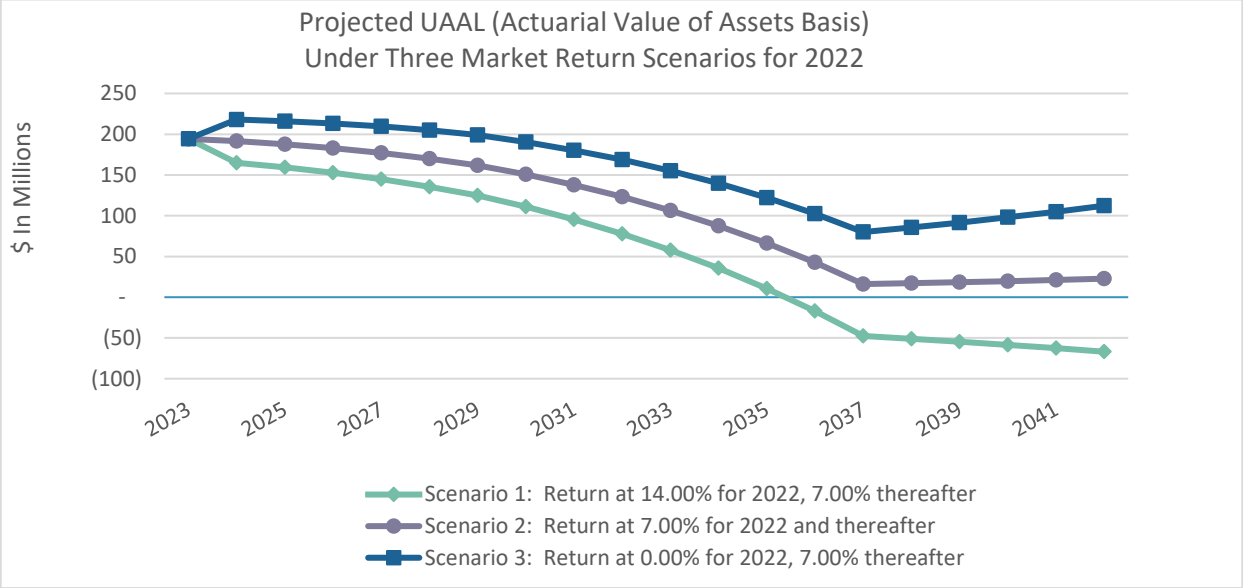
The Liability Volatility Ratio (LVR) is the ratio of the Actuarial Accrued Liability (AAL) to Payroll. Systems with a higher LVR experience more volatile employer contributions (as a percentage of payroll) due to the investment return assumption and changes in liability. This ratio indicates a longer-term potential for contribution volatility. The AVR, described above, will tend to move close to the LVR as the system matures.



4.3 - Risk Measures

Market Return Scenarios

Below we illustrate the projected effect on funding levels of a single year of investment return above or below the assumed investment return. Scenario 1 assumes a one-year return of 2 times the assumed return and the expected return thereafter, Scenario 2 assumes assets earn the expected return every year and Scenario 3 assumes a one-year return of 0% and the expected return thereafter.



Sensitivity Analysis

The following presents the Actuarial Accrued Liability and Funded Status calculated using the investment return rate of 7%, as well as what the Actuarial Accrued Liability and Funded Status would be if it were calculated using an investment return rate 1-percentage point lower (6%) or 1-percentage point higher (8%) than the assumed investment return rate:

	1% Decrease (6.00%)	Current Investment Return Rate (7.00%)	1% Increase (8.00%)
Actuarial Accrued Liability	$558,001,850	$501,159,239	$453,148,994
% Change	11%		-10%
Actuarial Value of Assets	$306,931,298	$306,931,298	$306,931,298
Unfunded Actuarial Accrued Liability	251,070,552	194,227,941	146,217,696
% Change	29%	N/A	-25%
Funded Status	55.0%	61.2%	67.7%

4.3 - Risk Measures

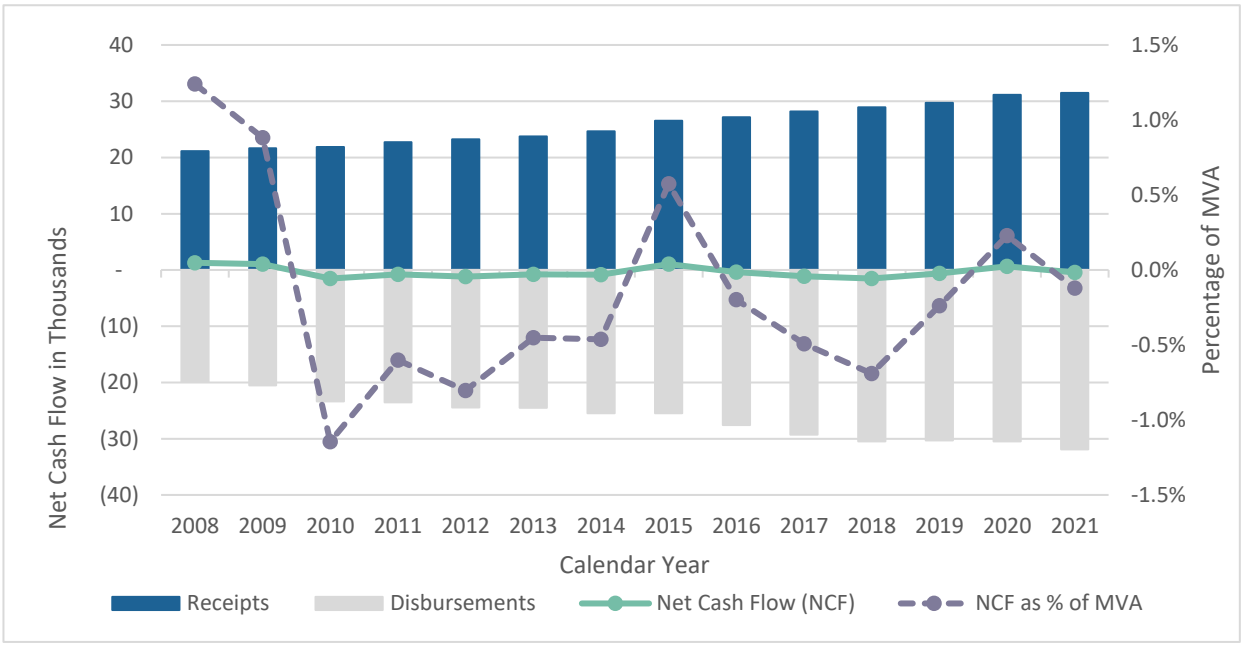
Duration

Duration is another measure that is used to describe how the present value of a cash flow series changes when small changes are made to the underlying interest rates. The duration of the Lawrence Contributory Retirement System is 10, and this represents an approximate percentage change in the Actuarial Accrued Liability for each 1% change to the investment return rate.

Net Cash Flow (NCF)

Net cash flow (NCF) during a year is the difference between contributions, both employer and employee, paid into the System and benefit payments and expenses paid from the System. If the level of benefit payments plus expenses is greater than contributions, then the System has negative NCF. Mature plans generally have a negative NCF as the number of retirees grows. When a System has negative NCF, then additional cash from existing assets are needed to pay the pension benefits.

Historical NCF since 2008 is shown in the next graph. Blue bars indicate contributions, from employees and employers, and grey bars show benefit payments and administrative expenses. The NCF is represented by the green line. The dashed purple line (which corresponds to the right-hand axis) provides the NCF as a percentage of the Market Value of Assets. As of December 31, 2021, the NCF was negative $0.4 million, which represents 0.1% of the Market Value of Assets. The NCF falls within the range of -1.1% to 1.2% of total assets over the 14-year period.



SECTION 5 - SUMMARY OF PLAN PROVISIONS

Administration

There are 104 contributory retirement systems for public employees in Massachusetts. Each system is governed by a retirement board and all boards, although operating independently, are governed by Chapter 32 of the Massachusetts General Laws and other applicable statutes. This law in general provides uniform benefits, uniform contribution requirements and a uniform accounting and funds structure for all systems.

Participation

Participation is mandatory for all full-time employees. Eligibility with respect to part-time, provisional, temporary, seasonal or intermittent employment is governed by regulations promulgated by the local retirement board, and approved by PERAC. Membership is optional for certain elected officials.

Membership Groups

There are four membership groups in the Retirement System:

Group 1	General employees, including clerical, administrative, technical and all other employees not otherwise classified.
Group 2	Certain specified hazardous duty positions.
Group 3	State police officers and inspectors.
Group 4	Local police officers, firefighters and other specified hazardous positions.

For members in more than one group, participation will be proportional.

Member Contributions

Member contributions vary depending on the most recent date of membership:

Prior to 1975	5% of Salary
1975 – 1983	7% of Salary
1984 – June 30, 1996	8% of Salary
July 1, 1996 – present	9% of Salary
1979 – present	An additional 2% of Salary in excess of $30,000.
Group 1 members hired on or after April 2, 2012	6% of Salary with 30 or more years of creditable service.

Rate of Interest

Interest on regular deductions made after January 1, 1984 is a rate established by PERAC in consultation with the Commissioner of Banks. The rate is obtained from the average rates paid on individual savings accounts by a representative sample of at least ten financial institutions.

Retirement Age

The mandatory retirement age for some Group 2 and Group 4 members is age 65. Most Group 2 and Group 4 members may remain in service after reaching age 65. Group 4 members who are employed in certain public safety positions are required to retire at age 65. There is no mandatory retirement age for members in Group 1.

Salary

Gross regular compensation. This does not include bonuses, overtime, severance pay, unused sick leave credit or other similar compensation. For employees who became members after January 1, 2011, regular compensation is limited to 64% of the federal limit found in 26 U.S.C. 401(a)(17). For 2022, the limit is 64% of $305,000, or $195,200.

Average Salary

Membership before April 2, 2012

- Average annual rate of regular compensation received during the three consecutive years that produce the highest average, or, if greater, during the last three years (whether or not consecutive) preceding retirement.

Membership on or after April 2, 2012

- Average annual rate of regular compensation received during the five consecutive years that produce the highest average, or, if greater, during the last five years (whether or not consecutive) preceding retirement.

Creditable Service

The period during which a member contributes to the retirement system plus certain periods of military service and "purchased" service.

Benefit Rate

The benefit rate varies with the member's retirement age, Group, membership date and years of creditable service at retirement. Each year a member retires prior to the age at which the 2.5% maximum benefit rate applies, a reduction is applied to each year of age under the maximum age. The maximum age and reduction for each Group and membership date is as follows:

	Group 1	Group 2	Group 4
2.5% for Membership before April 2, 2012:			
Maximum age:	65	60	55
Reduction:	0.1%	0.1%	0.1%
2.5% for Membership on or after April 2, 2012 (less than 30 years of service):			
Maximum age:	67	62	57
Reduction:	0.15%	0.15%	0.15%
2.5% for Membership on or after April 2, 2012 (30+ years of service):			
Maximum age:	67	62	57
Reduction:	0.125%	0.125%	0.125%

Superannuation Retirement	Eligibility if membership before April 2, 2012	♦ completion of 20 years of Creditable Service, or ♦ attainment of age 55 if hired prior to 1978, or ♦ attainment of age 55 with 10 years of Creditable Service, if hired after 1978.
	Eligibility if membership on or after April 2, 2012	♦ attainment of age 60 with 10 years of Creditable Service if classified in Group 1 ♦ attainment of age 55 with 10 years of Creditable Service if classified in Group 2 ♦ attainment of age 55 if classified in Group 4
	Benefit Amount	Product of the member's Benefit Rate, Average Salary and Creditable Service.
	Maximum Benefit	80% of the member's Average Salary.
	Veteran's Benefit	Additional benefit of $15 per year of Creditable Service, up to a maximum of $300.
Deferred Vested	Eligibility	♦ completion of ten or more years of Creditable Service. ♦ elected officials hired prior to 1978, completion of six years of Creditable Service.
	Benefit Amount	Accrued benefit payable commencing at age 55, or the completion of 20 years of Creditable Service, or may be deferred until later at the participant's option.
Withdrawal of Contributions		Contributions may be withdrawn upon termination of employment. ♦ Members hired on or after January 1, 1984 who terminate with less than ten years of Creditable Service receive contributions plus interest on the Annuity Savings Account at an annual rate of 3%. ♦ All other withdrawals receive contributions plus 100% of the regular interest that has accrued to the Annuity Savings Account.

Ordinary Disability Retirement	Eligibility	Non-job related disability after completion of ten years of Creditable Service.
	Benefit Amount for Group 1 membership before April 2, 2012 or Group 2 or Group 4	Superannuation benefit determined if the member is age 55, up to a maximum of 80% of Average Salary over three years. If the member is a veteran, 50% of final rate of salary (final year) plus an annuity based on the accumulated member contributions plus credited interest, up to a maximum of 80% of Average Salary over five years.
	Benefit Amount for Group 1 membership on or after April 2, 2012	Superannuation benefit determined if the member is age 60, up to a maximum of 80% of Average Salary over three years. If the member is a veteran, 50% of final rate of salary (final year) plus an annuity based on the accumulated member contributions plus credited interest, up to a maximum of 80% of Average Salary over five years.
Accidental Disability Retirement	Eligibility	Disabled as a result of an accident in the performance of duties. There is no minimum age or service requirement.
	Benefit Amount	72% of Salary plus an annuity based on accumulated member contributions plus credited interest.
	Maximum Benefit	100% of Salary if hired before January 1, 1988, otherwise 75% of Salary.
	Veteran's Benefit	Additional allowance of $15 per year of Creditable Service, up to a maximum of $300.
	Supplemental Dependent Allowance	Additional allowance of $1,010.28 per year for each child until age 18 (or age 22 if a full-time student).
Non-Occupational Death	Eligibility	For members with at least two years of creditable service who die while in active service, but not due to occupational injury.
	Benefit Amount	Benefit as if Option C had been elected. Minimum benefit of $500 per month for surviving spouse, $120 per month for first child and $90 per month for each additional child.

Accidental Death	Eligibility	For members who die as a result of an occupational injury.
	Benefit Amount	72% of Salary plus an annuity based on accumulated member contributions plus credited interest.
	Maximum Benefit	100% of Salary if hired before January 1, 1988, otherwise 75% of Salary.
	Veteran's Benefit	Additional allowance of $15 per year of creditable service, up to a maximum of $300.
	Supplemental Dependent Allowance	Additional allowance of $1,010.28 per year for each child until age 18 (or age 22 if a full-time student).

Cost-of-Living Adjustment (COLA)

In accordance with the adoption of Chapter 17 of the Acts of 1997, the granting of a Cost-of-Living Adjustment will be determined by an annual vote by the Retirement Board. The amount of increase will be based upon the Consumer Price Index, limited to a maximum of 3.0%, beginning on July 1. All retirees, disabled retirees and beneficiaries who have been receiving benefit payments for at least one year as of July 1 are eligible for the adjustment. The maximum amount of pension benefit subject to a COLA is $12,000, increasing to $14,000 effective July 1, 2023. All COLAs granted to members after 1981 and prior to July 1, 1998 are deemed to be an obligation of the Commonwealth of Massachusetts and are not the liability of the Retirement System.

Optional Forms of Payment

A member may elect to receive his or her retirement allowance, payable in monthly installments, in one of three forms of payment:

- Option A – Total annual allowance commencing at retirement and terminating at member's death.

- Option B – A reduced annual allowance commencing at retirement with death benefit equal to excess of member contributions plus credited interest to retirement over annuity benefit paid to member.

- Option C – A reduced annual allowance commencing at retirement with 66⅔% of benefit continued to designated beneficiary upon death of member. For members who retired on or after January 12, 1988, if the beneficiary pre-deceases the retiree, the benefit payable increases based on the factor used to determine the Option C benefit at retirement. For members who retired prior to January 12, 1988, if the System has accepted Section 288 of Chapter 194 of the Acts of 1998 and the beneficiary pre-deceases the retiree, the benefit payable increases based on the factor used to determine the Option C benefit at retirement.

SECTION 6 - ACTUARIAL ASSUMPTIONS AND METHODS

Valuation Date

January 1, 2022

Investment Return

7.00% per year. Previously, 7.25% per year.

The investment return assumption is a long-term assumption based on capital market expectations by asset class, historical returns and professional judgment. We considered analysis prepared by Andover's investment consultant Dahab Associates and other reliable sources using a building block approach and using the target asset allocation, expected returns by asset class and risk analysis to determine a long-term expected average annual rate of return.

Annuity Savings Fund Interest Rate

2.00% per year

Amortization Method

Unfunded Actuarial Accrued Liability (UAL):

Increasing dollar amount at 4% to reduce the Unfunded Actuarial Accrued Liability to zero on or before June 30, 2036.

Early Retirement Incentive Program (ERI) for 2002 (Housing Authority):

Increasing dollar amount at 4.5% to reduce the Unfunded Actuarial Accrued Liability attributable to the 2002 ERI for the Housing Authority to zero on or before June 30, 2028.

Early Retirement Incentive Programs (ERI) for 2002 (VOC and City):

Increasing dollar amount at 4% to reduce the Unfunded Actuarial Accrued Liability attributable to the 2002 ERI for VOC and City to zero on or before June 30, 2028.

Early Retirement Incentive Program (ERI) for 2003 (VOC and City):

Increasing dollar amount at 4% to reduce the Unfunded Actuarial Accrued Liability attributable to the 2003 ERI for VOC and City to zero on or before June 30, 2028.

Salary Scale

The assumed annual rates for salary increases including longevity are illustrated by the following rates:

Years of Service	All Groups
0-4	7.75%
5+	3.75%

The salary scale assumption is a long-term estimate derived from historical data, current and recent market expectations and professional judgment.

Cost-of-Living Allowance

Cost-of-Living Allowances (COLA) are assumed to be 3% of the pension amount, capped at $420 per year.

Inflation

2.4% per year, based on current economic data, analyses from economists and other experts, and professional judgment.

Payroll Growth

3.75% per year, based on historical data, current and recent market expectations and professional judgment.

Mortality Rates

RP-2014 Blue Collar Mortality Table with full generational mortality improvement using Scale MP-2020. For disabled members, RP-2014 Blue Collar Mortality Table set forward one year with full generational mortality improvement using Scale MP-2020.

General Employees: 55% of deaths are job-related.
Police and Fire: 90% of deaths are job-related.

PERAC completed a local system retiree mortality study in 2019 and selected the RP-2014 Blue Collar Mortality Table with full generational mortality improvement using Scale MP-2018 and subsequently updated the mortality improvement scale to MP-2020 in 2022. The underlying tables with generational mortality improvement selected reasonably reflect the mortality experience of the System as of the valuation date based on historical and current demographic data as well as professional judgement.

Turnover Rates

Illustrative turnover rates are shown below:

Creditable Service	Groups 1 and 2	Group 4
0	0.1500	0.0150
10	0.0540	0.0150
20	0.0200	0.0000
30	0.0000	0.0000

Disability Rates

Illustrative disability rates are shown below:

Attained Age	Groups 1 and 2	Group 4
20	0.0001	0.0010
30	0.0003	0.0030
40	0.0010	0.0030
50	0.0019	0.0125
60	0.0028	0.0085

General Employees: 55% of disabilities are accidental and 45% are ordinary.
Police and Fire: 90% of disabilities are accidental and 10% are ordinary.

Retirement Rates

Illustrative retirement rates are shown below:

Attained Age	Groups 1 and 2		Group 4
	Male	Female	Male & Female
50	0.0100	0.0150	0.0200
51	0.0100	0.0150	0.0200
52	0.0100	0.0200	0.0200
53	0.0100	0.0250	0.0500
54	0.0200	0.0250	0.0750
55	0.0200	0.0550	0.1500
56	0.0250	0.0650	0.1000
57	0.0250	0.0650	0.1000
58	0.0500	0.0650	0.1000
59	0.0650	0.0650	0.1500
60	0.1200	0.0500	0.2000
61	0.2000	0.1300	0.2000
62	0.3000	0.1500	0.2500
63	0.2500	0.1250	0.2500
64	0.2200	0.1800	0.3000
65	0.4000	0.1500	1.0000
66	0.2500	0.2000	1.0000
67	0.2500	0.2000	1.0000
68	0.3000	0.2500	1.0000
69	0.3000	0.2000	1.0000
70	1.0000	1.0000	1.0000

The turnover, disability and retirement rates are based on PERAC's most recent experience analysis of local retirement systems which reviewed age, gender and job group. The assumptions reflect this analysis as well as professional judgment.

Actuarial Cost Method

Individual Entry Age Normal.

Actuarial Asset Method

The Actuarial Value of Assets is the market value of assets as of the valuation date reduced by the sum of:

a) 80% of gains and losses of the prior year,
b) 60% of gains and losses of the second prior year,
c) 40% of gains and losses of the third prior year,
d) 20% of gains and losses of the fourth prior year.

Investment gains and losses are determined by the excess or deficiency of the expected return over the actual return on the market value. The actuarial valuation of assets is further constrained to be not less than 80% or more than 120% of market value. For 2022, we phased-in the asset smoothing method by only recognizing the 2020 and 2021 gains. Prior to this valuation, the actuarial value of assets was equal to the market value of assets.

SECTION 6 - ACTUARIAL ASSUMPTIONS AND METHODS

Census Data

Census data as of the valuation date were submitted by the Retirement Board.

Asset Data

Asset information is reported annually to the Public Employee Retirement Administration Commission by the Lawrence Contributory Retirement Board.

Dependents

80% of all members will be survived by a spouse. Age assumption for spouses is that males are assumed to be three years older than females.

Net Section 3(8)(c) Transfers

Reimbursements paid to and received from other retirement systems for that portion of a retiree's pension that is based on service earned in another retirement system. Net 3(8)(c) transfers are assumed to be $1,009,945 for FY2023 and $1,000,000 per year thereafter.

Administrative Expenses

The anticipated administrative expenses for the fiscal year. For Fiscal Year 2023, the administrative expenses were assumed to be $525,000 and are anticipated to increase 3.75% per year.

The administrative expense assumption is based on information relating to the System's administrative expenses provided by the Retirement System.

SECTION 7 - PLAN MEMBER INFORMATION

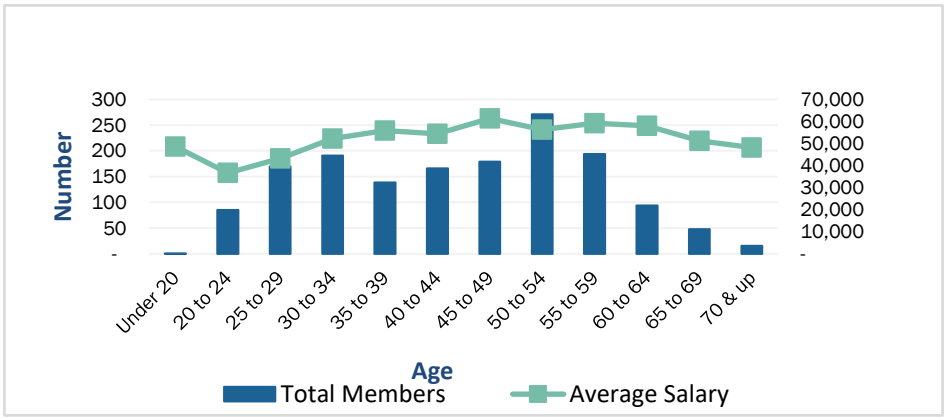
Exhibit 7.1 - Summary of Census Data as of January 1, 2022

Census data as of December 31, 2021 was provided to us by the Retirement Board. We performed edits on the data to ensure that it is reasonable and complete and made certain assumptions regarding any missing or invalid data so that results are not materially affected. Presented on the following pages are summaries of the demographic profile of active members (Exhibit 7.2) and retired plan members and beneficiaries and disabled plan members (Exhibit 7.3). Below, we present a comparison of the census data from the current and prior valuations:

Valuation Date	January 1, 2022	January 1, 2020	% Change
Census Data			
Active Members	1,554	1,633	(4.8%)
Average Age	44.6	43.6	2.2%
Average Service	10.4	10.0	3.9%
Valuation Salary	$83,668,626	$75,849,815	10.3%
Average Salary	$53,841	$46,448	15.9%
Retired Members and Beneficiaries	790	800	(1.3%)
Average Age	73.5	Not available	
Total Annual Retirement Allowance	$23,007,870	Not available	
State Reimbursed COLAs	$97,440	Not available	
Total System-Funded Retirement Allowance	$22,910,430	$21,592,427	6.1%
Average System-Funded Retirement Allowance	$29,001	$26,991	7.4%
Disabled Members	122	124	(1.6%)
Average Age	68.7	Not available	
Total Annual Retirement Allowance	$4,891,044	Not available	
State Reimbursed COLAs	$32,610	Not available	
Total System-Funded Retirement Allowance	$4,858,434	$4,795,260	1.3%
Average System-Funded Retirement Allowance	$39,823	$38,671	3.0%
Inactive Members	795	612	29.9%
Annuity Savings Fund	$8,154,403	$6,542,672	24.6%

Exhibit 7.2 - Active Members by Age and Years of Service as of January 1, 2022

Attained Age	Years of Service 0 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 & up	Total	Total Salary	Average Salary
Under 20	1	-	-	-	-	-	-	-	-	1	48,527	48,527
20 to 24	85	-	-	-	-	-	-	-	-	85	3,114,122	36,637
25 to 29	144	26	-	-	-	-	-	-	-	170	7,351,618	43,245
30 to 34	125	54	12	-	-	-	-	-	-	191	9,967,032	52,183
35 to 39	62	36	24	15	2	-	-	-	-	139	7,759,522	55,824
40 to 44	68	32	25	24	17	-	-	-	-	166	9,026,910	54,379
45 to 49	47	32	19	24	42	14	1	-	-	179	10,980,503	61,344
50 to 54	91	33	20	30	50	35	11	1	-	271	15,254,087	56,288
55 to 59	36	23	21	26	25	30	25	8	-	194	11,486,988	59,211
60 to 64	11	6	11	11	23	18	9	3	2	94	5,454,806	58,030
65 to 69	6	9	3	11	9	7	1	2	-	48	2,454,490	51,135
70 & up	1	3	2	1	1	4	2	1	1	16	770,021	48,126
Total	677	254	137	142	169	108	49	15	3	1,554	83,668,626	53,841
Average Salary	43,609	50,380	59,966	55,209	67,727	75,021	88,548	79,020	73,940			
					Average Age:		44.6	Average Service:		10.4		



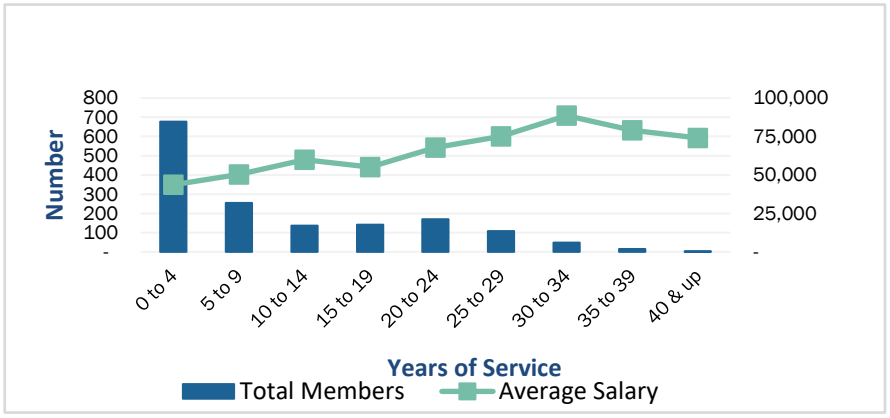
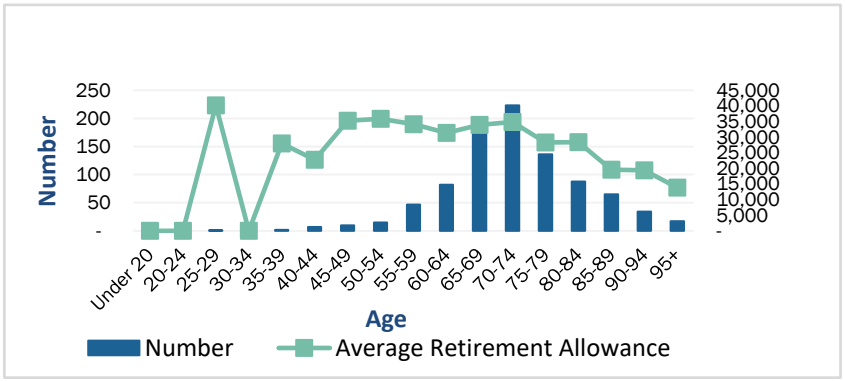
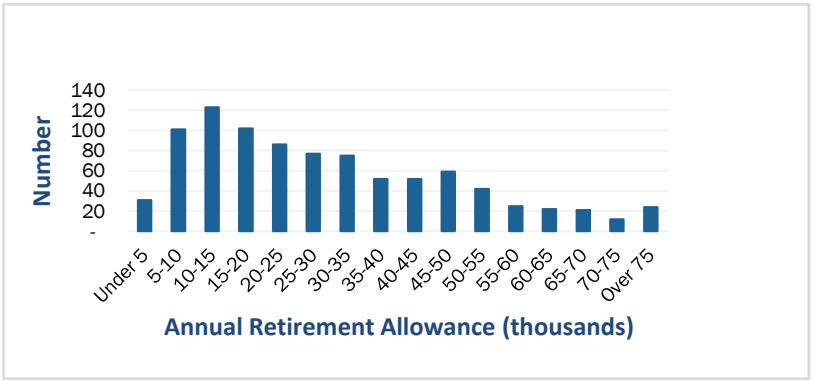


Exhibit 7.3 - Annual Retirement Allowances as of January 1, 2022

Attained Age	Service Retirements		Disability Retirements		Beneficiaries	
	Number	Annual Retirement Allowance	Number	Annual Retirement Allowance	Number	Annual Retirement Allowance
Under 20	0	0	0	0	0	0
20-24	0	0	0	0	0	0
25-29	0	0	0	0	1	40,177
30-34	0	0	0	0	0	0
35-39	0	0	1	10,860	1	45,112
40-44	1	19,880	3	102,744	3	36,374
45-49	0	0	7	311,183	3	41,183
50-54	2	53,887	9	342,816	4	141,392
55-59	36	1,280,979	5	184,848	6	139,247
60-64	58	1,763,683	13	574,891	11	234,849
65-69	157	5,246,699	17	812,088	11	208,881
70-74	171	5,928,275	33	1,382,852	19	470,013
75-79	102	2,869,332	21	749,766	13	234,894
80-84	56	1,808,510	6	232,050	26	461,106
85-89	36	758,053	3	92,723	26	425,123
90-94	19	393,240	3	73,071	12	193,264
95+	7	110,955	1	21,152	9	102,762
Total	**645**	**20,233,493**	**122**	**4,891,044**	**145**	**2,774,377**
Average Age	**72.8**		**68.7**		**76.6**	
Average Retirement Allowance		**31,370**		**40,091**		**19,134**





SECTION 8 - GLOSSARY OF TERMS

Actuarial Accrued Liability – That portion of the Actuarial Present Value of pension plan benefits which is not provided by future Normal Costs or employee contributions. It is the portion of the Actuarial Present Value attributable to service rendered as of the Valuation Date.

Actuarial Assumptions – Assumptions, based upon past experience or standard tables, used to predict the occurrence of future events affecting the commencement, amount and duration of pension benefits, such as: changes in compensation, mortality, withdrawal, disablement and retirement; rates of investment earnings and asset appreciation or depreciation; and any other relevant items.

Actuarial Cost Method (or Funding Method) – A procedure for allocating the Actuarial Present Value of all past and future pension plan benefits to the current year (Normal Cost) and the past (Actuarial Accrued Liability).

Actuarial Gain or Loss (or Experience Gain or Loss) – A measure of the difference between actual experience and that expected based upon the set of Actuarial Assumptions, during the period between the valuation date and the most recent immediately preceding valuation date.

Actuarial Present Value – The dollar value on the valuation date of all benefits expected to be paid to current members based upon the Actuarial Assumptions and the terms of the Plan.

Amortization Payment – That portion of the pension plan appropriation which represents payments made to pay interest on and the reduction of the Unfunded Accrued Liability.

Annual Statement – The statement submitted by the local retirement board to PERAC each year that describes the asset holdings and Fund balances as of December 31 and the transactions during the calendar year that affected the financial condition of the retirement system.

Annuity Reserve Fund – The fund into which total accumulated Member Contributions, including interest, is transferred at the time a member retires, and from which annuity payments are made.

Annuity Savings Fund – The fund in which Member Contributions plus interest credited are held for active members and for former members who have not withdrawn their contributions and are not yet receiving a benefit (inactive members).

Assets – The total value of the investments held by the Plan trust that are for the payment of promised benefits. Employer appropriations and Member Contributions, as well as investment earnings, are added to the Plan trust. Benefit payments and other disbursements are withdrawn from the Plan trust. For valuation purposes, assets are usually measured at market value.

Cost of Benefits – The estimated payment from the pension system for benefits for the fiscal year.

Expense Fund – The fund into which the appropriation for administrative expenses is paid and from which all such expenses are paid.

SECTION 8 - GLOSSARY OF TERMS

Funded Ratio – The Actuarial Value of Assets expressed as a percentage of the Actuarial Accrued Liability.

Funding Schedule – The schedule based upon the most recently approved actuarial valuation which sets forth the amount which would be appropriated to the pension system in accordance with Section 22D and Section 22F of M.G.L. Chapter 32.

GASB – Governmental Accounting Standards Board.

Normal Cost – Total Normal Cost is that portion of the Actuarial Present Value of pension plan benefits which is expected to accrue in the current fiscal year. The Employee Normal Cost is the amount of the expected Member Contributions for the current fiscal year. The Employer Normal Cost is the difference between the Total Normal Cost and the Employee Normal Cost.

Pension Fund – The fund into which appropriation amounts as determined by PERAC are paid and from which pension benefits are paid.

Pension Reserve Fund – The fund which shall be credited with all amounts set aside by a system for the purpose of establishing a reserve to meet future pension liabilities. These amounts would include excess interest earnings.

Present Value of Future Benefits – The actuarial present value of the cost to finance benefits payable in the future, discounted to reflect the expected effects of the time value of money and the probabilities of payment.

Special Fund for Military Service Credit – The fund which is credited with amounts paid by the retirement board equal to the amount which would have been contributed by a member during a military leave of absence as if the member had remained in active service of the retirement board. In the event of retirement or a non-job related death, such amount is transferred to the Annuity Reserve Fund. In the event of termination prior to retirement or death, such amount shall be transferred to the Pension Fund.

Total Pension Liability – The portion of the Actuarial Present Value attributable to past service in accordance with the Entry Age cost method as stipulated by GASB Statement Number 67 (GASB 67).

Unfunded Actuarial Accrued Liability – The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets.