Boston Retirement System

July 25, 2024

Alex G. Geourntas, City Clerk
Boston City Council
Boston City Hall, Room 601
Boston, MA 02201

RE: FY25 Retiree Cost-of-Living Adjustment (COLA) Base Vote

Dear Clerk Geourntas:

The Trustees of the Boston Retirement Board hereby notifies the Boston City Council that it shall receive public comment relative to retiree Cost of Living Adjustment ("COLA") base at a public meeting scheduled for August 21, 2024, at 9:00 a.m., in the Pavilion Conference Room on Boston City Hall Plaza. It is anticipated that we will reach this agenda item at approximately 10:30 a.m. The actual vote on whether or not to adjust the COLA base will take place at the Board meeting of September 17, 2024.

Attached you will find a preliminary actuarial valuation (as of 01/01/2024) with funding schedules, as well as additional costs associated with increasing the System's COLA base prepared by our actuary. The COLA base is currently set at $15,000. As always, I remain available should you have any questions or concerns. Thank you.

Respectfully submitted,
BOSTON RETIREMENT SYSTEM

BY: _____
Timothy J. Smyth, Esquire
Executive Officer

Attachment.

cc: Honorable Michelle Wu, Mayor of City of Boston (hand delivery)
Ruthzee Louijeune, City Council President (hand delivery)
Ashley Groffenberger, City of Boston Chief Financial Officer (via email)
Priscilla M. Bok, Boston Housing Authority (via email)
Bisola Ojikutu, MD, Boston Public Health Commission (via email)
Teresa Polhemus, Boston Planning & Development Agency (via email)
Henry F. Vitale, Boston Water & Sewer Commission (via email)
Kathleen A. Riley, Segal Co. (via email)

Boston Retirement System

January 1, 2024 Preliminary Actuarial Valuation Results

August 21, 2024 / Kathleen A. Riley, FSA, MAAA, EA / Bridget P. Orr, ASA, MAAA, EA / Andrew R. Luongo, ASA

Segal

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BRS Excluding Teachers

Participant Data

The table below summarizes the data used in this year's valuation for the BRS excluding Teachers, compared to the data used in the January 1, 2022 valuation.

- The number of active participants has decreased 0.7% since the prior valuation.
- Total payroll has increased 9.1% and average payroll has increased 9.9% over the past two years.
- The number of participants in pay status has increased 2.0%.

	Year Ended December 31		Change From Prior Year
	2023	2021	
Active participants:			
• Number	14,476	14,581	-0.7%
• Average age	46.2	46.1	0.1
• Average years of service	12.3	12.6	-0.3
• Total payroll	$1,233,414,210	$1,130,019,040	9.1%
• Average payroll	85,204	77,499	9.9%
• Member contributions	1,162,542,983	1,113,737,128	4.4%
• Number with unknown age	0	1	-100.0%
Inactive participants:			
• Inactive participants due a refund of employee contributions	10,869	9,921	9.6%
• Inactive participants with a vested right to a deferred or immediate benefit	934	856	9.1%
Retired participants:			
• Number in pay status	6,917	6,651	4.0%
• Average age	73.6	73.5	0.1
• Average monthly benefit	$3,832	$3,551	7.9%
Disabled participants:			
• Number in pay status	1,583	1,565	1.2%
• Average age	70.2	69.8	0.4
• Average monthly benefit	$5,133	$4,756	7.9%
Beneficiaries:			
• Number in pay status	1,707	1,782	-4.2%
• Average age	76.3	76.7	-0.4
• Average monthly benefit	$2,377	$2,149	10.6%

Notes:
Payroll figures are for the prior year and reflect annualized salaries for participants hired during the year.
Calendar year 2023 payroll figures were increased by 15.1% for Police to estimate unsettled contracts and TCAP impact in fiscal 2025 and decreased by 5.6% for Fire Fighters and 2.5% for school department employees to estimate retroactive payments made during the year.
Calendar year 2021 payroll figures were increased by 3% for Police, 1% for Fire Fighters and 2.5% for Group 1 and 2 employees to estimate unsettled contracts.

Financial Information

- During the plan years ending December 31, 2022 and December 31, 2023, the rate of return on the market value of assets was -10.44% and 10.45%, respectively, compared to the assumed rate of return of 6.90%. The rate of return on the actuarial value of assets (which gradually recognizes market fluctuations) for the plan years ending December 31, 2022 and December 31, 2023 was 4.39% and 5.51%, respectively.

- The actuarial value of assets as of December 31, 2023 was $7.623 billion, or 105.5% of the market value of assets of $7.223 billion (as reported in the Annual Statement).

  – As of December 31, 2021, the actuarial value of assets was 94.9% of the market value of assets.

- With the actuarial value of assets, there was a total unrecognized investment loss as of December 31, 2023 of -$400.2 million. This investment loss will be recognized in the determination of the actuarial value of assets for funding purposes in the next few years, to the extent it is not offset by recognition of investment gains derived from future experience.

  – This implies that earning the assumed rate of investment return (net of expenses) on a market value basis will result in investment losses on the actuarial value of assets in the next few years.
  – The projected unfunded actuarial accrued liability in the funding schedule does not reflect the recognition of deferred investment losses.

Experience Analysis

- The unfunded liability was expected to decrease by $530 million from $1,449 million as of January 1, 2022 to $919 million as of January 1, 2024 before reflecting the 5% COLA which was approved after the prior valuation was completed. This expected decrease reflects the additional contribution of $23.5 million made in 2023. The actual unfunded liability (before consideration of assumption changes) of $1,257 million as of January 1, 2022 is $309 million higher than expected. The sources of the net experience loss are:

	(In millions)
January 1, 2022 unfunded actuarial accrued liability	$1,449
January 1, 2024 expected unfunded actuarial accrued liability before 5% COLA	919
January 1, 2024 expected unfunded actuarial accrued liability after 5% COLA	948
Change due to:	
• Investment loss on an actuarial value basis	271
• Gain due to administrative expenses less than assumed	-3
• Gain due to mortality experience	-59
• Loss due to salaries increasing more than expected	97
• Loss due to transfer from Teachers	23
• Miscellaneous experience gain	-20
Net loss	$309
January 1, 2024 unfunded actuarial accrued liability (before consideration of assumption changes)	$1,257

Assumptions Review

Mortality assumption

- **Current assumption:**
  - Groups 1 and 2
    - Healthy: Pub-2010 General Employee, Healthy Retiree and Contingent Survivor Amount-weighted Mortality Tables set forward one year, projected generationally using Scale MP-2021
    - Disabled: Pub-2010 General Healthy Retiree Amount-weighted Mortality Tables set forward one year, projected generationally using Scale MP-2021
  - Group 4
    - Healthy: Pub-2010 Safety Employee, Healthy Retiree and Contingent Survivor Amount-weighted Mortality Tables, projected generationally using Scale MP-2021
    - Disabled: Pub-2010 Disabled Retiree Amount-weighted Mortality Tables, projected generationally using Scale MP-2021
- **Experience:**

	Retirees		Disableds		Beneficiaries	
Years	**Expected**	**Actual**	**Expected**	**Actual**	**Expected**	**Actual**
2014-2015	546.66	556	128.24	128	252.96	309
2016-2017	551.00	626	112.50	140	241.22	318
2018-2019	501.42	530	102.14	135	232.74	279
2020-2021	477.24	619	92.16	140	199.84	260
2022-2023	455.66	546	87.60	115	194.16	274
Average	**506**	**575**	**105**	**132**	**224**	**288**

- **Comment:**
  - We recommend maintaining the current mortality assumption.

Investment return

- The System's investment advisor (NEPC) has calculated the following expected rates of return:
  - 30 year time horizon: 7.5%
  - 10 year time horizon: 6.4%
- Based on the current target asset allocation, Segal Marco Advisors' capital market expectations as of December 31, 2023 and a building block approach, we calculate the following expected geometric rates of return (see next page for additional detail):
  - 20 year time horizon: 7.20%
  - 15 year time horizon: 7.32%
  - 10 year time horizon: 7.49%
- After reviewing this information and the experience since the last valuation, we recommend maintaining the investment return assumption of 6.90%.

Segal Marco Advisors Capital Market Assumptions as of December 31, 2023

Arithmetic Returns by Asset Class	Equity			Fixed Income			Core Real Estate	Hedge Fund, GTAA, Risk Parity, etc.	Private Equity
	Domestic	International Developed Markets	Emerging Markets	Core	High Yield	Emerging Mkt Debt			
Nominal Expected Return as of December 31, 2023									
5 Year Time Horizon	9.51%	9.61%	10.91%	4.71%	6.51%	6.61%	6.31%	5.91%	12.81%
10 Year Time Horizon	9.26%	9.36%	10.66%	4.46%	6.26%	6.36%	6.06%	5.67%	12.56%
15 Year Time Horizon	9.11%	9.21%	10.51%	4.31%	6.11%	6.21%	5.91%	5.52%	12.41%
20 Year Time Horizon	9.00%	9.10%	10.40%	4.20%	6.00%	6.10%	5.80%	5.40%	12.30%
Target Allocation	**23.00%**	**16.00%**	**8.00%**	**18.00%**	**5.00%**	**4.00%**	**10.00%**	**5.00%**	**11.00%**

Returns for Total Portfolio	(1) Forward Looking Expected Arithmetic Return	(2) Forward Looking Expected Geometric Return	(3) Median Geometric Return
Nominal Expected Return as of December 31, 2023			
5 Year Time Horizon	8.34%	7.81%	7.67%
10 Year Time Horizon	8.09%	7.49%	7.43%
15 Year Time Horizon	7.94%	7.32%	7.28%
20 Year Time Horizon	7.83%	7.20%	7.17%

Review of other assumptions

- Administrative expense assumption
  - We recommend increasing the assumption from $7,280,000 for calendar 2022 to $8,190,000 for calendar year 2024 based on information on expenses provided by the Retirement System.
- We do not recommend any changes in the salary increase, retirement, turnover, disability or other assumptions at this time.

Summary of Preliminary Valuation Results

The table below summarizes the results of the January 1, 2024 actuarial valuation using the recommended $8,190,000 administrative expense assumption with a comparison to the prior valuation (excluding the 5% COLA).

	2024		2022	
	Amount	% of Projected Payroll	Amount	% of Projected Payroll
1. Total normal cost	$218,663,563	17.05%	$201,019,348	17.11%
2. Administrative expense assumption	8,190,000	0.64%	7,280,000	0.62%
3. Expected employee contributions	-130,390,399	-10.17%	-117,816,039	-10.03%
4. Employer normal cost: **(1) + (2) + (3)**	$96,463,164	7.52%	$90,483,309	7.70%
5. Actuarial accrued liability	$8,879,934,968		8,217,718,066	
6. Actuarial value of assets (AVA)	7,623,038,719		6,768,562,195	
7. Unfunded actuarial accrued liability: **(5) - (6)**	$1,256,896,249		$1,449,155,871	
8. Funded percentage based on AVA	85.85%		82.37%	
9. Market value of assets (MVA)	$7,222,830,103		$7,130,505,146	
10. Funded percentage based on MVA	81.34%		86.77%	

Funding Schedules

Funding Schedule adopted with the January 1, 2022 Valuation

With the prior valuation, the Board approved a funding schedule that fully funded the System by June 30, 2027 with appropriations that increased by approximately 8.85% per year. The schedule below reflects the subsequent update to the funding schedule to reflect the 5% COLA.

(1) Fiscal Year Ended June 30	(2) Employer Normal Cost	(3) Amortization of Unfunded Inactive Sheriff Liability	(4) Amortization of Remaining Unfunded Liability	(5) Actuarially Determined Contribution (ADC): (2) + (3) + (4)	(6) Unfunded Actuarial Accrued Liability (using AVA) at Beginning of Fiscal Year	(7) Percent Increase in ADC over Prior Year
2023	$91,941,906	$2,888,636	$313,980,142	$408,810,684	$1,524,934,060	8.85%
2024	95,246,366	2,888,636	346,855,428	444,990,430	1,291,421,787	8.85%
2025	98,668,993	2,888,636	382,814,454	484,372,083	1,006,653,486	8.85%
2026	102,213,992	2,888,636	422,136,384	527,239,012	663,795,971	8.85%
2027	105,885,721	2,888,636	252,357,507	361,131,864	255,246,144	-31.51%
2028	109,688,690	0	0	109,688,690	0	-69.63%

Notes:
Actuarially determined contribution for fiscal year 2023 is set equal to the amount determined with the prior valuation.
Actuarially determined contributions are assumed to be paid on July 1.
Item (2) reflects 3.25% growth in payroll and a 0.15% adjustment to total normal cost to reflect the effect of morality improvements due to the generational mortality assumption.
Projected normal cost does not reflect the future impact of pension reform for new hires.
Projected unfunded actuarial accrued liability does not reflect the recognition of deferred investment gains or losses.

Preliminary Funding Schedules for 2024

- We have prepared two funding schedules for the Board's consideration and one funding schedule to illustrate the impact of the deferred investment losses. In all schedules:
  - The fiscal 2025 appropriation is set equal to the budgeted amount of $484,372,083 determined with the prior valuation.
  - The appropriation is assumed to be paid on July 1st.
- Funding Schedule 1 maintains full funding by June 30, 2027. As a result, the fiscal 2026 and 2027 appropriations increase by 16.3%.
  - The fiscal 2027 appropriation is $655 million compared to $361 million in the current schedule.
  - The projected unfunded actuarial accrued liability does not reflect the recognition of deferred investment losses.
- Funding Schedule 2 maintains the 8.85% increases in the appropriation. As a result, the System reaches full funding by June 30, 2028.
  - The fiscal 2027 appropriation is $574 million compared to $361 million in the current schedule and the fiscal 2028 appropriation is $237 million compared to $110 million.
  - The projected unfunded actuarial accrued liability does not reflect the recognition of deferred investment losses.
- Funding Schedule 3 uses the market value of assets to determine the unfunded actuarial accrued liability and maintains the 8.85% increases in the appropriation. As a result, the System reaches full funding by June 30, 2029.
  - This schedule is provided only to illustrate the impact of the deferred losses.
- Funding Schedule 4 is also a schedule that reaches full funding by June 30, 2029. This schedule uses the actuarial value of assets to determine the unfunded actuarial accrued liability. The appropriation in fiscal 2026, 2027 and 2028 is 5% lower than the prior fiscal year.
  - This represents the maximum year over year reduction in the appropriation that PERAC will approve for a System that is projected to be fully funded by 2030.

Funding Schedule 1
6.90% investment return assumption

Appropriations increase 16.30% per year
Fully funded by June 30, 2027

(1) Fiscal Year Ended June 30	(2) Employer Normal Cost	(3) Amortization of Unfunded Inactive Sheriff Liability	(4) Amortization of Remaining Unfunded Liability	(5) Actuarially Determined Contribution (ADC): (2) + (3) + (4)	(6) Unfunded Actuarial Accrued Liability (using AVA) at Beginning of Fiscal Year	(7) Percent Increase in ADC over Prior Year
2025	$98,018,157	$2,888,636	$383,465,290	$484,372,083	$1,299,535,904	- -
2026	101,547,862	2,888,636	458,888,235	563,324,733	976,191,534	16.30%
2027	105,203,998	2,888,636	547,020,639	655,113,273	549,909,275	16.29%
2028	108,991,074	0	0	108,991,074	0	-83.36%
2029	112,913,759	0	0	112,913,759	0	3.60%
2030	116,976,887	0	0	116,976,887	0	3.60%
2031	121,185,461	0	0	121,185,461	0	3.60%
2032	125,544,666	0	0	125,544,666	0	3.60%

Notes:
Actuarially determined contribution for fiscal year 2025 is set equal to the amount determined with the prior valuation.
Actuarially determined contributions are assumed to be paid on July 1.
Item (2) reflects 3.25% growth in payroll and a 0.15% adjustment to total normal cost to reflect the effect of morality improvements due to the generational mortality assumption.
Projected normal cost does not reflect the future impact of pension reform for new hires.
Projected unfunded actuarial accrued liability does not reflect the recognition of deferred investment gains or losses.

Funding Schedule 2
6.90% investment return assumption

Appropriations increase 8.85% per year
Fully funded by June 30, 2028

(1) Fiscal Year Ended June 30	(2) Employer Normal Cost	(3) Amortization of Unfunded Inactive Sheriff Liability	(4) Amortization of Remaining Unfunded Liability	(5) Actuarially Determined Contribution (ADC): (2) + (3) + (4)	(6) Unfunded Actuarial Accrued Liability (using AVA) at Beginning of Fiscal Year	(7) Percent Increase in ADC over Prior Year
2025	$98,018,157	$2,237,070	$384,116,856	$484,372,083	$1,299,535,904	- -
2026	101,547,862	2,237,070	423,454,080	527,239,012	976,191,534	8.85%
2027	105,203,998	2,237,070	466,458,597	573,899,665	588,484,910	8.85%
2028	108,991,074	2,237,070	125,817,631	237,045,775	128,054,701	-58.70%
2029	112,913,759	0	0	112,913,759	0	-52.37%
2030	116,976,887	0	0	116,976,887	0	3.60%
2031	121,185,461	0	0	121,185,461	0	3.60%
2032	125,544,666	0	0	125,544,666	0	3.60%

Notes:
Actuarially determined contribution for fiscal year 2025 is set equal to the amount determined with the prior valuation.
Actuarially determined contributions are assumed to be paid on July 1.
Item (2) reflects 3.25% growth in payroll and a 0.15% adjustment to total normal cost to reflect the effect of morality improvements due to the generational mortality assumption.
Projected normal cost does not reflect the future impact of pension reform for new hires.
Projected unfunded actuarial accrued liability does not reflect the recognition of deferred investment gains or losses.

Funding Schedule 3
6.90% investment return assumption

Market Value of Assets used to Determine Unfunded Actuarial Accrued Liability
Appropriations increase 8.85% per year
Fully funded by June 30, 2029

(1) Fiscal Year Ended June 30	(2) Employer Normal Cost	(3) Amortization of Unfunded Inactive Sheriff Liability	(4) Amortization of Remaining Unfunded Liability	(5) Actuarially Determined Contribution (ADC): (2) + (3) + (4)	(6) Unfunded Actuarial Accrued Liability (using MVA) at Beginning of Fiscal Year	(7) Percent Increase in ADC over Prior Year
2025	$98,018,157	$1,847,287	$384,506,639	$484,372,083	$1,713,321,422	- -
2026	101,547,862	1,847,287	423,843,863	527,239,012	1,418,528,253	8.85%
2027	105,203,998	1,847,287	466,848,380	573,899,665	1,061,342,863	8.85%
2028	108,991,074	1,847,287	513,851,424	624,689,785	633,539,853	8.85%
2029	112,913,759	1,847,287	124,124,894	238,885,940	125,972,181	-61.76%
2030	116,976,887	0	0	116,976,887	0	-51.03%
2031	121,185,461	0	0	121,185,461	0	3.60%
2032	125,544,666	0	0	125,544,666	0	3.60%

Notes:
Actuarially determined contribution for fiscal year 2025 is set equal to the amount determined with the prior valuation.
Actuarially determined contributions are assumed to be paid on July 1.
Item (2) reflects 3.25% growth in payroll and a 0.15% adjustment to total normal cost to reflect the effect of morality improvements due to the generational mortality assumption.
Projected normal cost does not reflect the future impact of pension reform for new hires.

Funding Schedule 4
6.90% investment return assumption

Appropriations decrease 5.00% per year
Fully funded by June 30, 2029

(1) Fiscal Year Ended June 30	(2) Employer Normal Cost	(3) Amortization of Unfunded Inactive Sheriff Liability	(4) Amortization of Remaining Unfunded Liability	(5) Actuarially Determined Contribution (ADC): (2) + (3) + (4)	(6) Unfunded Actuarial Accrued Liability (using AVA) at Beginning of Fiscal Year	(7) Percent Increase in ADC over Prior Year
2025	$98,018,157	$1,847,287	$384,506,639	$484,372,083	$1,299,535,904	--
2026	101,547,862	1,847,287	356,758,330	460,153,479	976,191,534	-5.00%
2027	105,203,998	1,847,287	330,094,520	437,145,805	660,199,345	-5.00%
2028	108,991,074	1,847,287	304,450,154	415,288,515	350,907,308	-5.00%
2029	112,913,759	1,847,287	45,840,661	160,601,707	47,687,948	-61.33%
2030	116,976,887	0	0	116,976,887	0	-27.16%
2031	121,185,461	0	0	121,185,461	0	3.60%
2032	125,544,666	0	0	125,544,666	0	3.60%

Notes:
Actuarially determined contribution for fiscal year 2025 is set equal to the amount determined with the prior valuation.
Actuarially determined contributions are assumed to be paid on July 1.
Item (2) reflects 3.25% growth in payroll and a 0.15% adjustment to total normal cost to reflect the effect of morality improvements due to the generational mortality assumption.
Projected normal cost does not reflect the future impact of pension reform for new hires.
Projected unfunded actuarial accrued liability does not reflect the recognition of deferred investment gains or losses.

Cost of Increasing the COLA Base Effective July 1, 2024

- The additional unfunded liability and employer normal cost if the COLA base is increased for Non-Teachers effective July 1, 2024 from $15,000 to $16,000, $17,000 and $18,000 is shown in the following table:

Cost element	January 1, 2024 valuation results	Increase due to change in COLA base to $16,000	Increase due to change in COLA base to $17,000	Increase due to change in COLA base to $18,000
1. July 1, 2024 projected unfunded liability	$1,299,535,904	$30,317,659	$60,298,998	$89,927,497
– Percent increase	N/A	2.3%	4.6%	6.9%
2. July 1, 2025 projected employer normal cost	$98,018,157	$700,599	$1,388,324	$2,063,463
– Percent increase	N/A	0.7%	1.4%	2.1%

- The following table shows four alternatives for reflecting in the funding schedule the additional cost of increasing the COLA base. The four alternatives amortize the unfunded liability due to increasing the COLA base over three, four, five or six years, with the additional cost increasing 8.85% each year. Depending on the funding schedule adopted by the Board, some of these alternatives extend funding of the increase in the COLA base beyond the full funding of the existing unfunded liability. This approach to amortizing the unfunded liability is referred to as layered amortization.

COLA funding date	Fiscal 2025 appropriation	Increase due to change in COLA base to $16,000	Increase due to change in COLA base to $17,000	Increase due to change in COLA base to $18,000
1. COLA increase funded by fiscal 2027	$484,372,083	$10,624,362	$21,125,763	$31,499,085
– Percent increase	N/A	2.2%	4.4%	6.5%
2. COLA increase funded by fiscal 2028	$484,372,083	$8,075,750	$16,056,811	$23,939,454
– Percent increase	N/A	1.7%	3.3%	4.9%
3. COLA increase funded by fiscal 2029	$484,372,083	$6,546,915	$13,016,102	$19,404,663
– Percent increase	N/A	1.4%	2.7%	4.0%
4. COLA increase funded by fiscal 2030	$484,372,083	$5,527,970	$10,989,514	$16,382,292
– Percent increase	N/A	1.1%	2.3%	3.4%

Teachers

Participant Data

The table below summarizes the data used in this year's valuation for the Teachers, compared to the data used in the January 1, 2022 valuation.

- The number of active participants has decreased 4.3% since the prior valuation.
- Total payroll has increased 5.7% and average payroll has increased 10.4% over the past two years.
- The number of participants in pay status has decreased 0.5%.

	Year Ended December 31		Change From Prior Year
	2023	2021	
Active participants:			
• Number	6,035	6,303	-4.3%
• Average age	43.4	42.6	0.8
• Average years of service	12.1	11.4	0.7
• Total payroll	$692,763,688	$655,169,031	5.7%
• Average payroll	114,791	103,946	10.4%
• Member contributions	684,310,648	630,836,725	8.5%
Inactive participants:			
• Inactive participants due a refund of employee contributions	3,169	2,900	9.3%
• Inactive participants with a vested right to a deferred or immediate benefit	548	447	22.6%
Retired participants:			
• Number in pay status	4,360	4,383	-0.5%
• Average age	75.0	74.2	0.8
• Average monthly benefit	$5,034	$4,867	3.4%
Disabled participants:			
• Number in pay status	104	112	-7.1%
• Average age	70.4	70.6	-0.2
• Average monthly benefit	$3,708	$3,534	4.9%
Beneficiaries:			
• Number in pay status	334	326	2.5%
• Average age	75.0	75.5	-0.5
• Average monthly benefit	$2,381	$2,189	8.8%

Notes:
Payroll figures are for the prior calendar year and reflect annualized salaries for participants hired during the year.
Calendar year 2023 payroll figures decreased by 2.5% to estimate retroactive payments made during the year.
Calendar year 2021 payroll figures were increased by 1% to estimate unsettled contracts.

Financial Information

- During the plan years ending December 31, 2022 and December 31, 2023, the rate of return on the market value of assets was -11.12% and 10.52%, respectively, compared to the assumed rate of return of 7.0%. The rate of return on the actuarial value of assets (which gradually recognizes market fluctuations) for the plan years ending 2022 and 2023 was 5.70% and 6.63%, respectively.
- The actuarial value of assets as of December 31, 2023 was $2.397 billion, or 101.40% of the market value of assets of $2.364 billion (as reported in the Annual Statement).
  - As of December 31, 2021, the actuarial value of assets was 88.44% of the market value of assets.
- With the actuarial value of assets, there was a total unrecognized investment loss as of December 31, 2023 of -$33.1 million. This investment loss will be recognized in the determination of the actuarial value of assets for funding purposes in the next few years, to the extent it is not offset by recognition of investment gains derived from future experience.
  - This implies that earning the assumed rate of investment return (net of expenses) on a market value basis will result in investment losses on the actuarial value of assets in the next few years.

Experience Analysis

- The unfunded liability was expected to decrease by $40 million from $2,544 million as of January 1, 2022 to $2,504 million as of January 1, 2024 before reflecting the 5% COLA which was approved after the prior valuation was completed. The actual unfunded liability (before consideration of assumption changes) of $2,466 billion as of January 1, 2024, is $53 million lower than expected. The sources of the net experience gain are:

	(In millions)
January 1, 2022 unfunded actuarial accrued liability	**$2,544**
January 1, 2024 expected unfunded actuarial accrued liability before 5% COLA	2,504
January 1, 2024 expected unfunded actuarial accrued liability after 5% COLA	2,519
Change due to:	
• Investment loss on an actuarial value basis	35
• Gain due to administrative expenses less than assumed	-3
• Gain due to mortality experience	-15
• Loss due to salaries increasing more than expected	0
• Gain due to transfer to non-Teachers	-23
• Miscellaneous experience gain (including a reduction in the number of active participants)	-47
Net gain	-53
January 1, 2024 unfunded actuarial accrued liability (before consideration of assumption changes)	$2,466

Assumptions Review

Mortality assumption

- **Current assumption:**
  - Healthy: Pub-2010 Teacher Employee, Healthy Retiree and Contingent Survivor Headcount-weighted Mortality Tables, projected generationally using Scale MP-2021
  - Disabled: Pub-2010 Teacher Healthy Retiree Headcount-weighted Mortality Tables, projected generationally using Scale MP-2021
- **Experience:**

	Retirees		Disableds		Beneficiaries	
Years	**Expected**	**Actual**	**Expected**	**Actual**	**Expected**	**Actual**
2014-2015	203.06	209	7.86	6	23.94	27
2016-2017	221.26	220	9.48	6	25.06	32
2018-2019	199.18	231	9.72	13	20.86	24
2020-2021	197.68	256	5.48	12	28.92	33
2022-2023	209.12	245	4.54	15	32.20	44
Average	**206**	**232**	**7**	**10**	**26**	**32**

- **Comment:**
  - We recommend maintaining the current mortality assumption.

Investment return

- The PRIT Fund's investment advisor (NEPC) has calculated the following expected rates of return:
  - 30 year time horizon: 7.7%
  - 10 year time horizon: 6.6%
- Based on the current target asset allocation, Segal Marco Advisors' capital market expectations as of December 31, 2023 and a building block approach, we calculate the following expected geometric rates of return (see next page for additional detail):
  - 20 year time horizon: 7.18%
  - 15 year time horizon: 7.30%
  - 10 year time horizon: 7.47%
- After reviewing this information and the experience since the last valuation, we recommend maintaining the investment return assumption of 7.00%.

Segal Marco Advisors Capital Market Assumptions as of December 31, 2023

Arithmetic Returns by Asset Class	Equity			Fixed Income					
	Domestic	International Developed Markets	Emerging Markets	Core	High Yield	Core Real Estate	Commodities	Hedge Fund, GTAA, Risk Parity, etc.	Private Equity
Nominal Expected Return as of December 31, 2023									
5 Year Time Horizon	9.51%	9.61%	10.91%	4.71%	6.51%	6.31%	6.81%	5.91%	12.81%
10 Year Time Horizon	9.26%	9.36%	10.66%	4.46%	6.26%	6.06%	6.56%	5.67%	12.56%
15 Year Time Horizon	9.11%	9.21%	10.51%	4.31%	6.11%	5.91%	6.41%	5.52%	12.41%
20 Year Time Horizon	9.00%	9.10%	10.40%	4.20%	6.00%	5.80%	6.30%	5.40%	12.30%
Target Allocation	**22.00%**	**9.50%**	**4.50%**	**15.00%**	**9.00%**	**10.00%**	**4.00%**	**10.00%**	**16.00%**

Returns for Total Portfolio	(1) Forward Looking Expected Arithmetic Return	(2) Forward Looking Expected Geometric Return	(3) Median Geometric Return
Nominal Expected Return as of December 31, 2023			
5 Year Time Horizon	8.30%	7.78%	7.65%
10 Year Time Horizon	8.05%	7.47%	7.41%
15 Year Time Horizon	7.90%	7.30%	7.26%
20 Year Time Horizon	7.79%	7.18%	7.15%

Review of other assumptions

- Administrative expense assumption
  - We recommend increasing the assumption from $3,120,000 for calendar 2022 to $3,510,000 for calendar year 2024 based on information on expenses provided by the Retirement System.
- We do not recommend any changes in the salary increase, retirement, turnover, disability or other assumptions at this time.

Summary of Preliminary Valuation Results

The table below summarizes the results of the January 1, 2024 actuarial valuation using an administrative expense assumption of $3,510,000 for 2024 with a comparison to the prior valuation (excluding the 5% COLA).

	2024		2022 7.00% Investment Return Assumption $15,000 COLA Base	
	Amount	% of Projected Payroll	Amount	% of Projected Payroll
1. Total normal cost	$97,995,181	13.43%	$93,846,960	13.62%
2. Administrative expense assumption	3,510,000	0.48%	3,120,000	0.45%
3. Expected employee contributions	-79,378,343	-10.88%	-74,760,210	-10.85%
4. Employer normal cost: **(1) + (2) + (3)**	$22,126,838	3.03%	$22,206,750	3.22%
5. Actuarial accrued liability	$4,863,094,136		4,624,735,417	
6. Actuarial value of assets (AVA)	2,396,714,185		2,080,996,195	
7. Unfunded actuarial accrued liability: **(5) - (6)**	$2,466,379,951		$2,543,739,222	
8. Funded ratio based on AVA: **(6) ÷ (5)**	49.28%		45.00%	
9. Market value of assets	$2,363,600,554		$2,353,125,177	
10. Funded ratio based on MVA: **(9) ÷ (5)**	48.60%		50.88%	

Cost of Increasing the COLA Base Effective July 1, 2024

- The additional unfunded liability and employer normal cost if the COLA base is increased for Teachers effective July 1, 2024 from $15,000 to $16,000, $17,000 and $18,000 is shown in the following table:

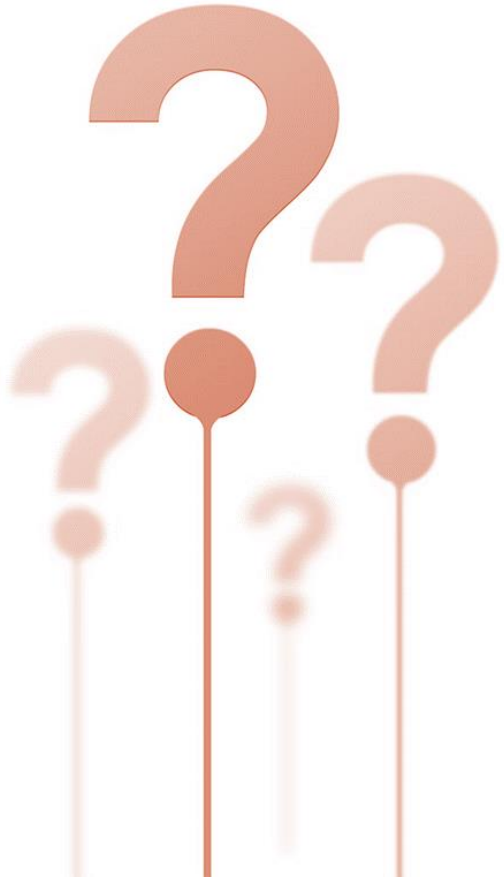
Cost element	January 1, 2024 valuation results	Increase due to change in COLA base to $16,000	Increase due to change in COLA base to $17,000	Increase due to change in COLA base to $18,000
1. July 1, 2024 projected unfunded liability	$2,551,243,258	$15,551,318	$31,075,997	$46,570,241
– Percent increase	N/A	0.6%	1.2%	1.8%
2. July 1, 2024 projected employer normal cost	$22,483,524	$258,186	$515,732	$772,556
– Percent increase	N/A	1.1%	2.3%	3.4%

Strategies to Consider When Approaching Full Funding

- When a retirement system is fully funded or approaching full funding, small experience fluctuations can result in significant changes in the employer cost because fluctuations may be large relative to the remaining unfunded liability and the number of years remaining on the funding schedule may be small.
- The Board may want to perform annual actuarial valuations, or alternatively, update the funding schedule to reflect the prior year's investment performance in years when an actuarial valuation is not completed.
- The Board may want to lower the investment return assumption to increase the likelihood of achieving the assumption, assuming no change in the System's asset allocation.
- To provide a buffer for employer contributions once the System is fully funded, you may consider funding more than 100% of the actuarial accrued liabilities, e.g. 105% of the actuarial accrued liabilities.
- Another approach to consider for mitigating contribution volatility is a layered amortization approach. With layered amortization, changes in the unfunded liability due to experience gains or losses, changes in assumptions, or a change in the plan of benefits are identified and then amortized over a fixed time period. The amortization period could be as long as 10 to 15 years and the amortization payments can be level dollar payments or payments that are level as a percentage of payroll.
- MGL Chapter 32 currently requires the unfunded liability to be fully amortized in 16 years, by June 30, 2040. As we get closer to that date, MGL Chapter 32 may be amended to allow for layered amortization or the full funding date may be extended.
- Once a System is fully funded, the employer(s) may redirect all or a portion of the retirement contribution that was allocated to reduce the System's unfunded liability to the employer's OPEB liability. Future contributions could be redirected back to the System if necessary.
- We can model these strategies and show the impact of future investment volatility.

Caveats and Questions

- It is important to note that this actuarial valuation is based on plan assets as of December 31, 2023. The Plan's actuarial status is not based on the daily fluctuations of the market, but on the market values on the last day of the Plan Year. While it is impossible to determine how the market will perform in the future, and how that will affect the results of next year's valuation, Segal is available to prepare projections of potential outcomes upon request.
- Projections, by their nature, are not a guarantee of future results. The projections are intended to serve as estimates of future outcomes, based on the information available to us and the assumptions described herein. Emerging results may differ significantly if the actual experience proves to be different from these assumptions.
- A discussion of the risks inherent in the measurement of pension plan obligations will be included in the January 1, 2024 Actuarial Valuation and Review.



Disclosures

- This report was prepared in accordance with generally accepted actuarial principles and practices for the exclusive use and benefit of the Board, based upon information provided by the staff of the Retirement System and the System's other service providers.
- The actuarial assumptions and plan provisions used for this valuation are as described in Section 4 of the January 1, 2022 Actuarial Valuation and Review dated August 1, 2022, except for the changes noted previously. The financial information used in this valuation is as of December 31, 2023.
- The measurements shown in this actuarial valuation may not be applicable for other purposes. Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements and changes in plan provisions or applicable law.
- An actuarial valuation is a measurement at a specific date – it is not a prediction of a plan's future financial condition. We have not been retained to perform an analysis of the potential range of financial measurements, except where otherwise noted.
- Segal makes no representation or warranty as to the future status of the Retirement System and does not guarantee any particular result. This document does not constitute legal, tax, accounting or investment advice or create or imply a fiduciary relationship. The Board is encouraged to discuss any issues raised in this report with the System's legal, tax and other advisors before taking, or refraining from taking, any action.
- Segal valuation results are based on proprietary actuarial modeling software. The actuarial valuation models generate a comprehensive set of liability and cost calculations that are presented to meet regulatory, legislative and client requirements. Deterministic cost projections are based on a proprietary forecasting model. Our Actuarial Technology and Systems unit, comprised of both actuaries and programmers, is responsible for the initial development and maintenance of these models. The models have a modular structure that allows for a high degree of accuracy, flexibility and

user control. The client team programs the assumptions and the plan provisions, validates the models, and reviews test lives and results, under the supervision of the responsible actuary.

- The actuarial calculations were directed under the supervision of Kathleen A. Riley, FSA, MAAA, EA. She is a member of the American Academy of Actuaries and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein. To the best of her knowledge, the information supplied in this actuarial valuation is complete and accurate. The assumptions used in this actuarial valuation were selected by the Boston Retirement Board based upon our analysis and recommendations. In her opinion, the assumptions are reasonable and take into account the experience of the Boston Retirement System and reasonable expectations. In addition, in her opinion, the combined effect of these assumptions is expected to have no significant bias.