Newton Contributory Retirement System

Actuarial Valuation and Review as of January 1, 2022

Segal

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July 15, 2022

Retirement Board
Newton Contributory Retirement System
1000 Commonwealth Ave
Newton Centre, Ma 02459-1449

Dear Board Members:

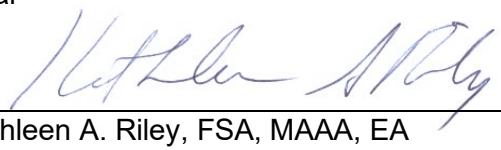
We are pleased to submit this Actuarial Valuation and Review as of January 1, 2022. It summarizes the actuarial data used in the valuation, analyzes the preceding year's experience, and establishes the funding requirements for fiscal 2023 and later years.

This report was prepared in accordance with generally accepted actuarial principles and practices at the request of the Board to assist in administering the Retirement System. The census information and financial information on which our calculations were based was prepared by the staff of the System. That assistance is gratefully acknowledged.

The actuarial calculations were directed under my supervision. I am a member of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein. To the best of my knowledge, the information supplied in this actuarial valuation is complete and accurate. The assumptions used in this actuarial valuation were selected by the Board based upon our analysis and recommendations. In my opinion, the assumptions are reasonable and take into account the experience of the Newton Contributory Retirement System and reasonable expectations.

We look forward to reviewing this report at your next meeting and to answering any questions.

Sincerely,
Segal



Kathleen A. Riley, FSA, MAAA, EA
Senior Vice President and Actuary

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Section 1: Actuarial Valuation Summary

Purpose and basis

This report was prepared by Segal to present a valuation of the Newton Contributory Retirement System as of January 1, 2022. The valuation was performed to determine whether the assets and contributions are sufficient to provide the prescribed benefits. The measurements shown in this actuarial valuation may not be applicable for other purposes. In particular, the measures herein are not necessarily appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the System's benefit obligations. 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.

The contribution requirements presented in this report are based on:

- The benefit provisions of Massachusetts General Law Chapter 32;
- The characteristics of covered active participants, inactive participants, and retired participants and beneficiaries as of December 31, 2021, provided by the staff of the Retirement System;
- The assets of the System as of December 31, 2021, provided by the staff of the Retirement System;
- Economic assumptions regarding future salary increases and investment earnings; and
- Other actuarial assumptions regarding employee terminations, retirement, death, etc.

Certain disclosure information required by GASB Statements No 67 and 68 as of December 31, 2021 for the System is provided in a separate report.

Valuation highlights

1. Segal strongly recommends an actuarial funding method that targets 100% funding of the actuarial accrued liability. Generally, this implies payments that are ultimately at least enough to cover normal cost, interest on the unfunded actuarial accrued liability and the principal balance. The funding policy adopted by the Newton Contributory Retirement System meets this standard and funds the unfunded actuarial accrued liability by June 30, 2030.
2. During the plan year ending December 31, 2021, the rate of return on the market value of assets was 18.97%. The rate of return on the actuarial value of assets (which gradually recognizes market fluctuations) for the plan year ending December 31, 2021 was 11.54%. The actuarial value of assets as of December 31, 2021, was $472.1 million, or 89.7% of the market value of assets of $526.3 million (as reported in the Annual Statement). As of December 31, 2020, the actuarial value of assets was 95.6% of the market value of assets.
3. The actuarial value of assets does not reflect an unrecognized investment gain as of December 31, 2021 of $54.2 million. This investment gain 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 losses 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 gains on the actuarial value of assets in the next few years.
   - The projected unfunded actuarial accrued liability in the funding schedules does not reflect the recognition of deferred investment gains.
4. With this valuation the following assumptions were changed:
   - The investment return assumption was lowered from 7.25% to 6.90%;
   - The allowance for net 3(8)(c) payments was lowered from $200,000 for 2021 to $145,000 for 2022; and
   - The mortality improvement scale was updated from MP-2017 to MP-2021.
5. The unfunded liability was expected to decrease by $10.3 million from $312.4 million as of January 1, 2021 to $302.1 million as of January 1, 2022. The actual unfunded liability of $280.2 million as of January 1, 2021, before consideration of any changes, is $21.9 million lower than expected.
6. In the funding schedule included in this report, the fiscal 2023 appropriation has been set equal to the previously budgeted amount of $40,847,226. The funding schedule fully funds the System by June 30, 2030, if all assumptions are met and there are no changes in the plan of benefits or actuarial assumptions. The appropriation increases 9.60% per year.
7. It is important to note that this actuarial valuation is based on plan assets as of December 31, 2021. The System's funded status does not reflect short-term fluctuations of the market, but rather is based on the market values on the last day of the plan year.

Moreover, this actuarial valuation does not include any possible short-term or long-term impacts on mortality of the covered population that may emerge after December 31, 2021 due to COVID-19. Segal is available to prepare projections of potential outcomes of market conditions and other demographic experience upon request.

8. Since the actuarial valuation results are dependent on a given set of assumptions, there is a risk that emerging results may differ significantly as actual experience proves to be different from the assumptions. We have not been engaged to perform a detailed analysis of the potential range of the impact of risk relative to the System's future financial condition but have included a brief discussion of some risks that may affect the System in *Section 2*. A more detailed assessment would provide the Board with a better understanding of the inherent risks.

Summary of key valuation results

		2022	2021
Contributions for plan year beginning July 1:	• Actuarially Determined Contributions for fiscal year 2023 and 2022	$40,847,226	$37,269,367
	• Actuarially Determined Contributions for fiscal year 2024 and 2023	44,768,560	40,847,226
Actuarial accrued liability for plan year beginning January 1:	• Retired participants and beneficiaries	$435,041,641	$425,472,486
	• Inactive vested participants	6,566,626	5,274,375
	• Inactive participants due a refund of employee contributions	4,943,100	4,418,104
	• Active participants	326,669,355	297,643,150
	• Total	773,220,722	732,808,115
	• Normal cost including administrative expenses and allowance for net 3(8)(c) payments for plan year beginning January 1	17,808,280	16,106,428
Assets for plan year beginning January 1:	• Market value of assets (MVA)	$526,328,950	$439,660,969
	• Actuarial value of assets (AVA)	472,061,348	420,396,000
	• Actuarial value of assets as a percentage of market value of assets	89.69%	95.62%
Funded status for plan year beginning January 1:	• Unfunded actuarial accrued liability on market value of assets	$246.891.772	$293,147,146
	• Funded percentage on MVA basis	68.07%	60.00%
	• Unfunded actuarial accrued liability on actuarial value of assets	$301,159,374	$312,412,115
	• Funded percentage on AVA basis	61.05%	57.37%
Key assumptions:	• Net investment return	6.90%	7.25%
	• Inflation rate	2.75%	2.75%
Demographic data for plan year beginning January 1:	• Number of retired participants and beneficiaries	1,334	1,337
	• Number of inactive vested participants	49	43
	• Number of inactive participants due a refund of employee contributions	526	512
	• Number of active participants	1,555	1,570
	• Total payroll[1]	$111,990,380	$107,216,124
	• Average payroll	72,020	68,291

[1] Payroll figures are for the prior year and reflect annualized salaries for participants hired during the year.
Calendar year 2021 payroll figures were increased by 10.9% for superior officers and patrolmen, 9.8% for parking control clerks, 6.6% for engineers and Local 2443 foremen and 4.5% for inspectors to reflect unsettled bargaining contracts. Figures were decreased by 4.3% for Local 3092 City Hall associates and 1.5% for Local 25 teamsters to reflect retroactive payments.
Calendar year 2020 payroll figures were increased by 7.7% for superior officers, 1.5% for Local 25 teamsters, 5.6% for parking control clerks and patrolmen and 3.5% for Local 3092 City Hall associates and inspectors, engineers, and Local 2443 foremen to reflect unsettled bargaining contracts. Figures were decreased by 1.5% for firemen, 0.2% for nurses, 2.9% for Local 25 teamsters, 0.6% for school clerical staff and 1.0% for custodians to reflect retroactive payments. Figures were also decreased for superior officers based on individual retroactive payment information provided by the staff of the Retirement System.

Important information about actuarial valuations

An actuarial valuation is a budgeting tool with respect to the financing of future projected obligations of a pension plan. It is an estimated forecast – the actual long-term cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the plan.

In order to prepare a valuation, Segal relies on a number of input items. These include:

Plan of benefits	Plan provisions define the rules that will be used to determine benefit payments, and those rules, or the interpretation of them, may change over time. Even where they appear precise, outside factors may change how they operate. It is important to keep Segal informed with respect to plan provisions and administrative procedures, and to review the plan summary included in our report to confirm that Segal has correctly interpreted the plan of benefits.
Participant data	An actuarial valuation for a plan is based on data provided to the actuary by the State. Segal does not audit such data for completeness or accuracy, other than reviewing it for obvious inconsistencies compared to prior data and other information that appears unreasonable. It is important for Segal to receive the best possible data and to be informed about any known incomplete or inaccurate data.
Assets	The valuation is based on the market value of assets as of the valuation date, as provided by the State. The State uses an "actuarial value of assets" that differs from market value to gradually reflect year-to-year changes in the market value of assets in determining the contribution requirements.
Actuarial assumptions	In preparing an actuarial valuation, Segal projects the benefits to be paid to existing plan participants for the rest of their lives and the lives of their beneficiaries. This projection requires actuarial assumptions as to the probability of death, disability, withdrawal, and retirement of each participant for each year. In addition, the benefits projected to be paid for each of those events in each future year reflect actuarial assumptions as to salary increases and cost-of-living adjustments. The projected benefits are then discounted to a present value, based on the assumed rate of return that is expected to be achieved on the plan's assets. There is a reasonable range for each assumption used in the projection and the results may vary materially based on which assumptions are selected. It is important for any user of an actuarial valuation to understand this concept. Actuarial assumptions are periodically reviewed to ensure that future valuations reflect emerging plan experience. While future changes in actuarial assumptions may have a significant impact on the reported results that does not mean that the previous assumptions were unreasonable.
Models	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.

Section 1: Actuarial Valuation Summary

The user of Segal's actuarial valuation (or other actuarial calculations) should keep the following in mind:

The actuarial valuation is prepared at the request of the State. Segal is not responsible for the use or misuse of its report, particularly by any other party.
An actuarial valuation is a measurement of the Plan's assets and liabilities at a specific date. Accordingly, except where otherwise noted, Segal did not perform an analysis of the potential range of future financial measures. The actual long-term cost of the Plan will be determined by the actual benefits and expenses paid and the actual investment experience of the Plan.
Actuarial results in this report are not rounded, but that does not imply precision.
If the State is aware of any event or trend that was not considered in this valuation that may materially change the results of the valuation, Segal should be advised, so that we can evaluate it.
Segal does not provide investment, legal, accounting, or tax advice. Segal's valuation is based on our understanding of applicable guidance in these areas and of the Plan's provisions, but they may be subject to alternative interpretations. The State should look to their other advisors for expertise in these areas.

As Segal has no discretionary authority with respect to the management or assets of the Plan, it is not a fiduciary in its capacity as actuaries and consultants with respect to the System.

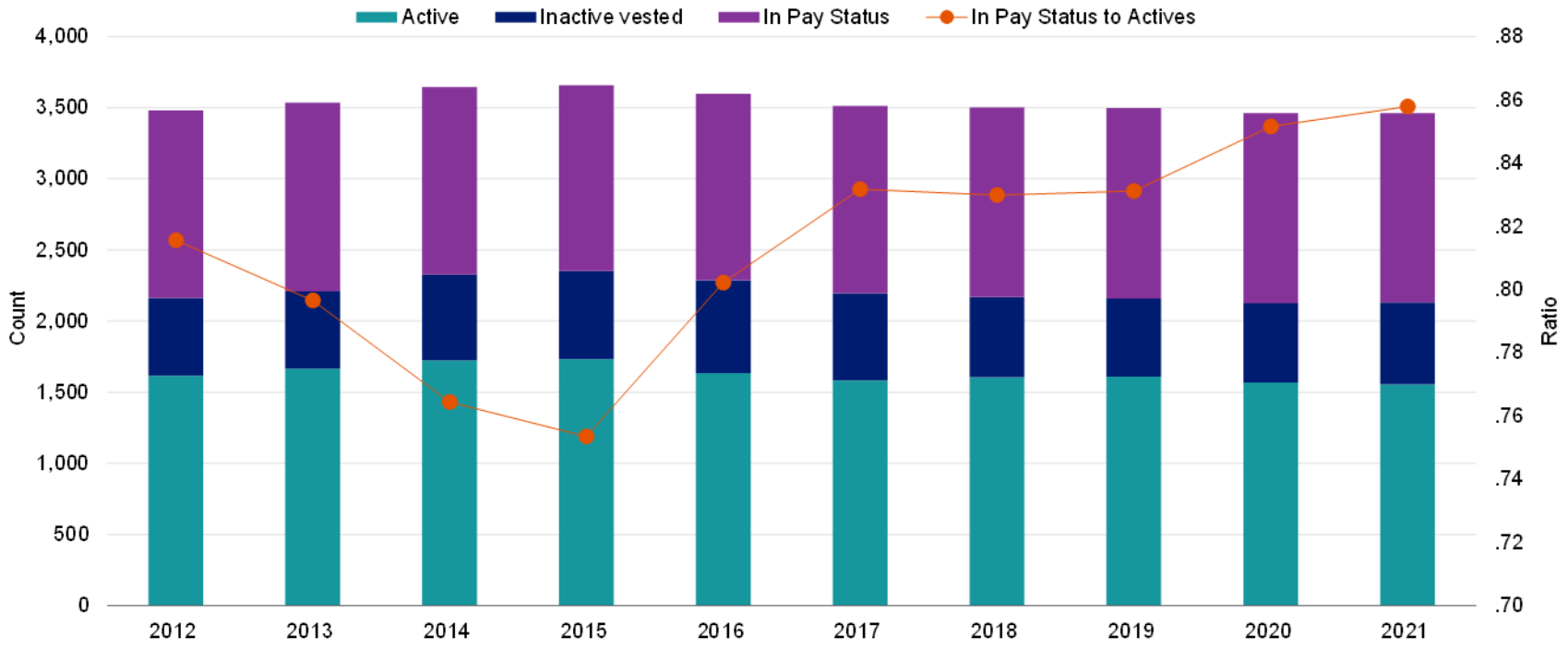
Section 2: Actuarial Valuation Results

Participant data

This section presents a summary of significant statistical data on covered participants.

More detailed information for this valuation year and the preceding valuation can be found in *Section 3, Exhibits A and B.*

Participant Population: 2012 – 2021



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
In Pay Status	1,318	1,327	1,317	1,305	1,310	1,315	1,332	1,339	1,337	1,334
Inactive Vested[1]	547	542	604	622	655	616	565	548	555	575
Active	1,616	1,666	1,723	1,732	1,633	1,581	1,605	1,611	1,570	1,555
Ratio	0.82	0.80	0.76	0.75	0.80	0.83	0.83	0.83	0.85	0.86

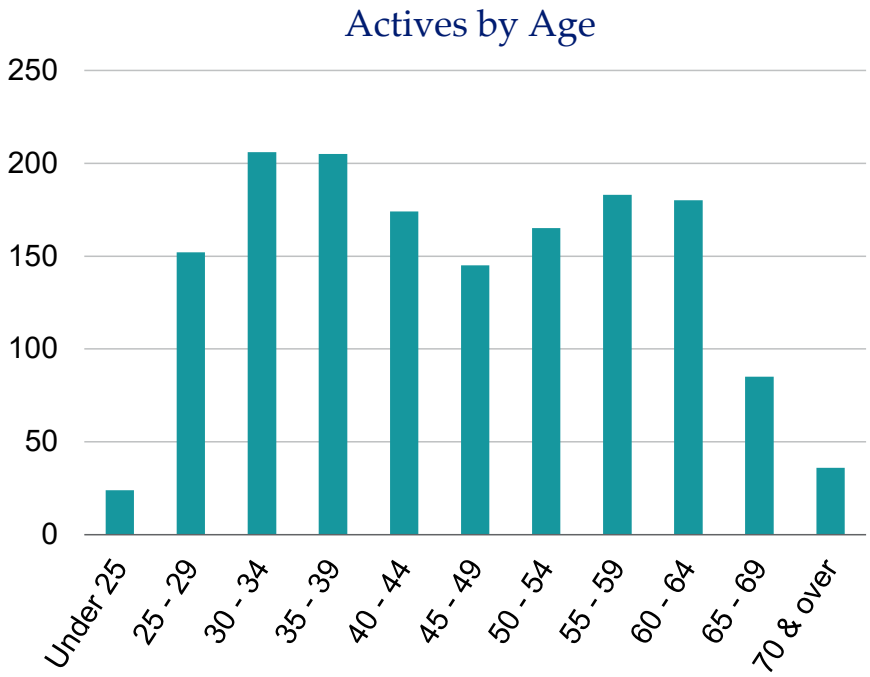
[1] Includes terminated participants due a refund of employee contributions.

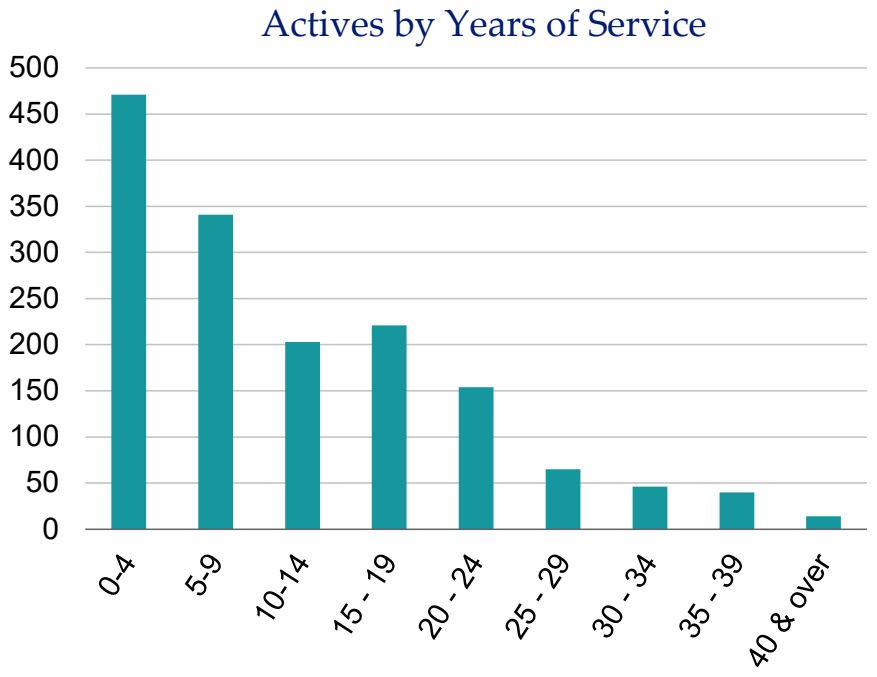
Active participants

As of December 31,	2021	2020	Change
Active participants	1,555	1,570	-1.0%
Average age	46.4	46.0	0.4
Average years of service	12.1	11.8	0.3
Average compensation	$72,020	$68,291	5.5%

Among the active participants, there were none with unknown age and/or service information.

Distribution of Active Participants as of December 31, 2021





Inactive participants

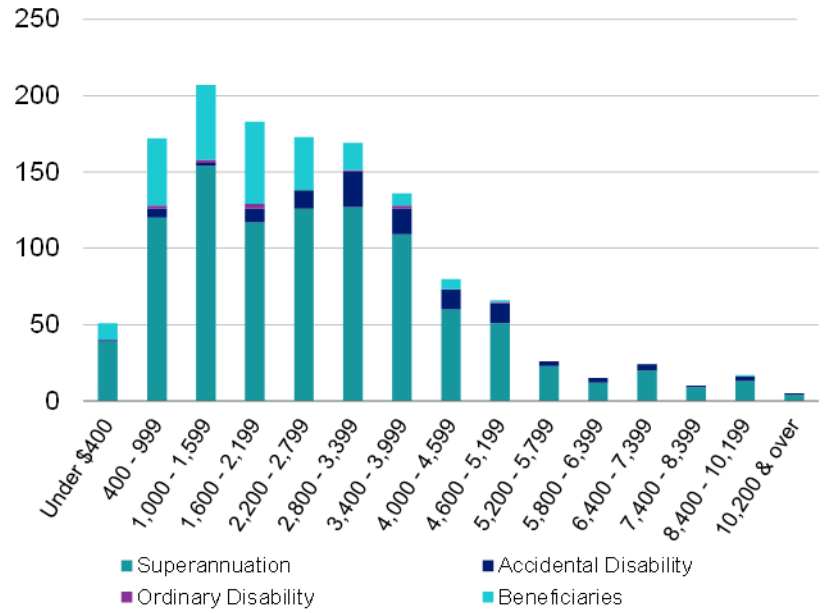
In this year's valuation, there were 49 participants with a vested right to a deferred or immediate vested benefit and 526 participants entitled to a return of their employee contributions.

Retired participants and beneficiaries

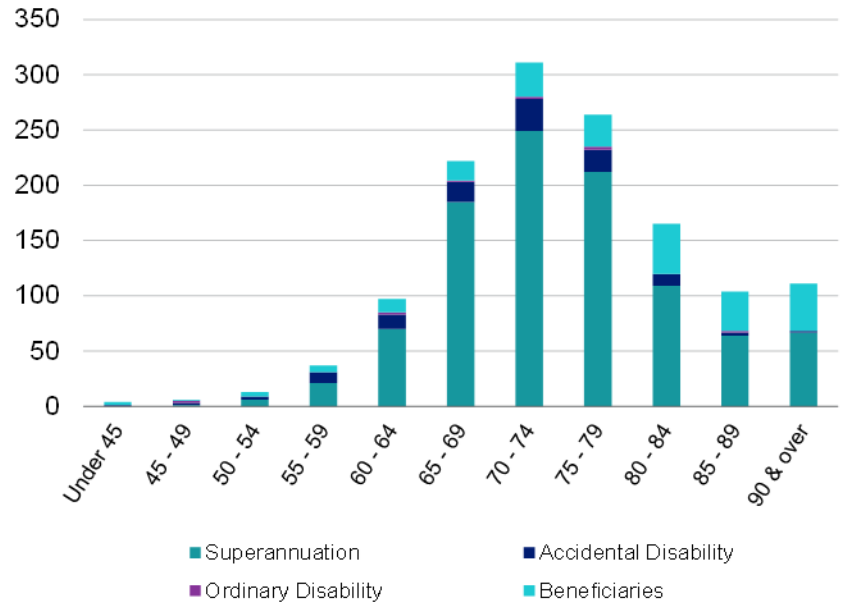
As of December 31,	2021	2020	Change
Retirees	1,105	1,113	-0.7%
Beneficiaries	229	224	2.2%
Average age	74.8	74.4	0.4
Average amount	$2,664	$2,630	1.3%
Total monthly amount[1]	$3,553,501	$3,516,243	1.1%

Distribution of Retired Participants and Beneficiaries as of December 31, 2021

by Type and Monthly Amount



by Type and Age



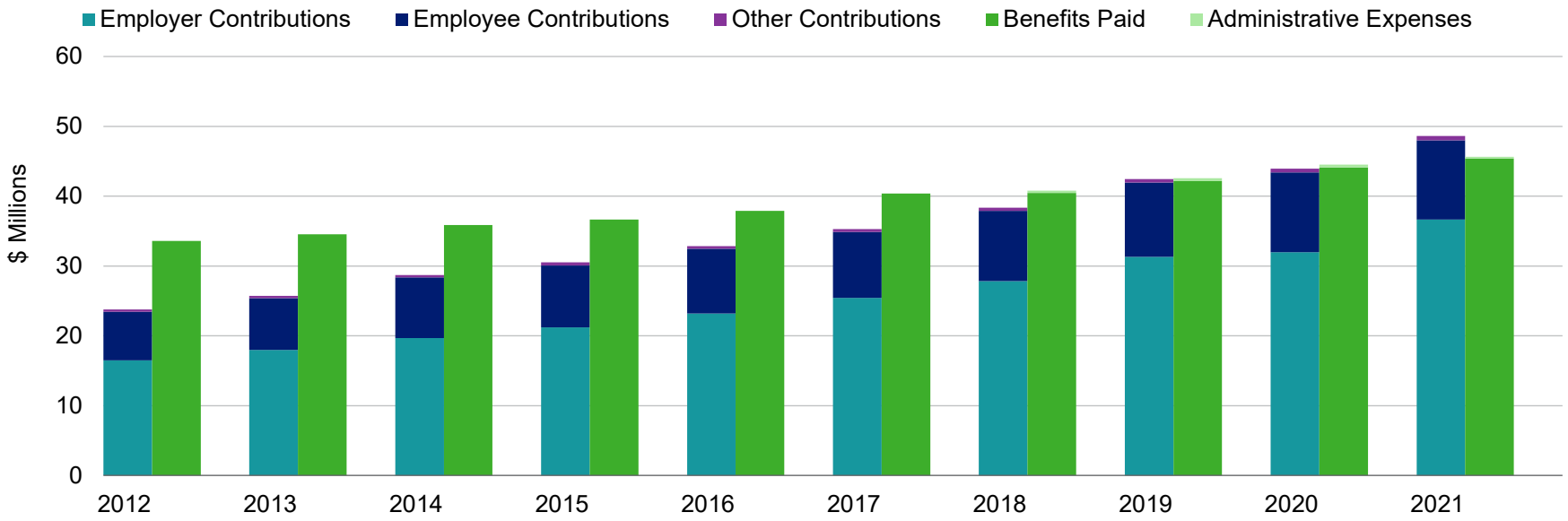
[1] Excluding COLAs reimbursed by the Commonwealth.

Financial information

Retirement plan funding anticipates that, over the long term, both contributions (less administrative expenses) and investment earnings (less investment fees) will be needed to cover benefit payments. Retirement plan assets change as a result of the net impact of these income and expense components.

Additional financial information, including a summary of transactions for the valuation year, is presented in *Section 3, Exhibits C*.

Comparison of Contributions with Benefits and Expenses for Years Ended December 31, 2012 – 2021



Note:
Excludes administrative expenses and administrative expense appropriation prior to 2018.

Section 2: Actuarial Valuation Results

It is desirable to have level and predictable plan costs from one year to the next. For this reason, the Board has approved an asset valuation method that gradually adjusts to market value. Under this valuation method, the full value of market fluctuations is not recognized in a single year and, as a result, the asset value and the plan costs are more stable. The amount of the adjustment to recognize market value is treated as income, which may be positive or negative. Realized and unrealized gains and losses are treated equally and, therefore, the sale of assets has no immediate effect on the actuarial value.

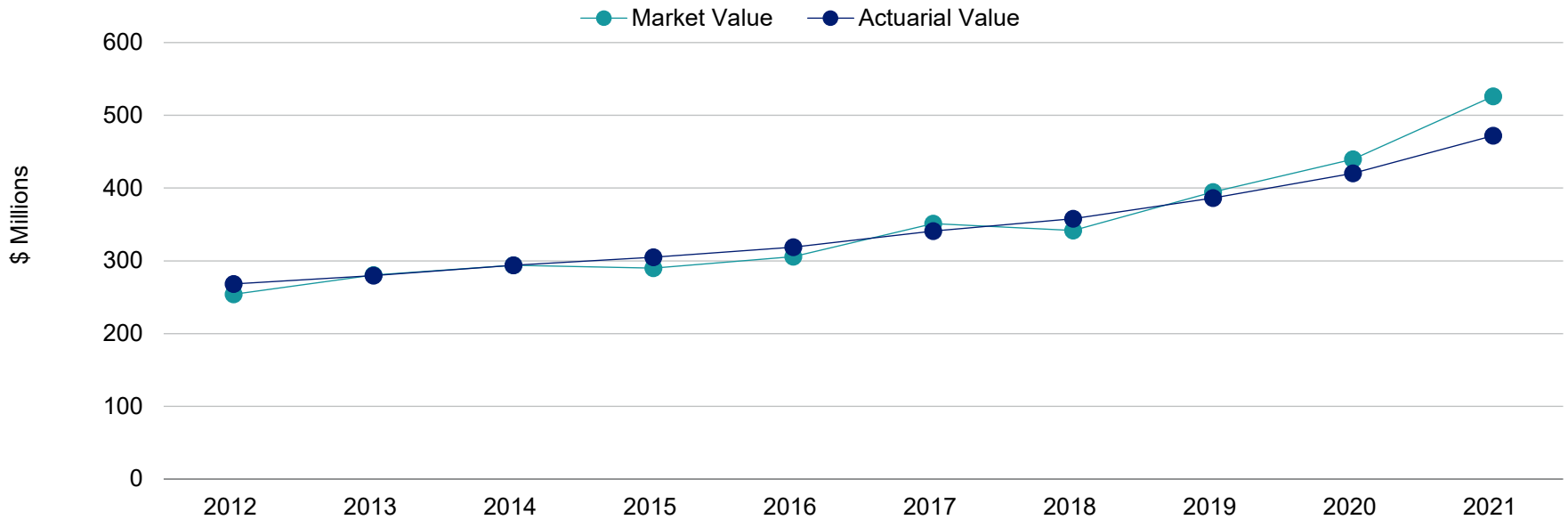
Determination of Actuarial Value of Assets for Year Ended December 31, 2021

1	Actuarial value of assets as of December 31, 2020	$420,396,000
2	Contributions less benefit payments and expenses	2,989,084
3	Expected investment income on **(1)** and **(2)**	30,587,064
4	Preliminary actuarial value of assets: **(1) + (2) + (3)**	$453,972,148
5	Market value of assets, December 31, 2021	526,328,950
6	Adjustment toward market value: 25% of **[(5) - (4)]**	$18,014,200
7	Adjustment to be within 20% corridor	0
8	Final actuarial value of assets as of December 31, 2021: **(4) + (6) + (7)**	472,061,348
9	Actuarial value as a percentage of market value: **(8) ÷ (5)**	89.69%
10	Amount deferred for future recognition: **(5) - (8)**	$54,267,602

Section 2: Actuarial Valuation Results

Both the actuarial value and market value of assets are representations of the System's financial status. As investment gains and losses are gradually taken into account, the actuarial value of assets tracks the market value of assets. The actuarial asset value is significant because the System's liabilities are compared to these assets to determine what portion, if any, remains unfunded. Amortization of the unfunded actuarial accrued liability is an important element in determining the contribution requirement.

Market Value of Assets vs. Actuarial Value of Assets



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Market Value[1]	$254.18	$280.35	$293.92	$289.93	$305.87	$351.18	$341.84	$394.68	$439.66	$526.33
Actuarial Value[1]	268.09	279.85	293.84	304.94	318.75	340.84	357.99	386.55	420.40	472.06

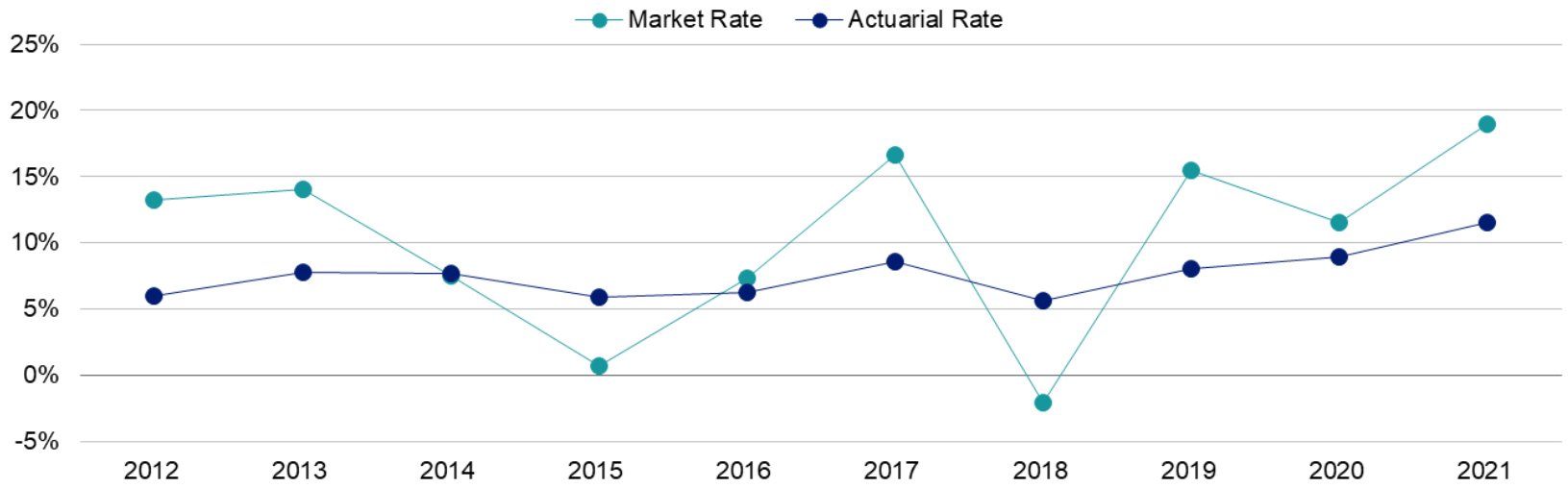
[1] In $ millions

Section 2: Actuarial Valuation Results

Because actuarial planning is long term, it is useful to see how the assumed investment rate of return has followed actual experience over time. The chart below shows the rate of return on an actuarial basis compared to the actual market value investment return for the last 10 years, including averages over select time periods.

As described earlier in this section, the actuarial asset valuation method gradually recognizes fluctuations in the market value rate of return. The goal of this is to stabilize the actuarial rate of return and to produce more level pension plan costs.

Market and Actuarial Rates of Return for Years Ended December 31, 2011 – 2021



MVA	13.20%	14.01%	7.50%	0.74%	7.30%	16.61%	-2.07%	15.49%	11.55%	18.97%
AVA	5.95%	7.81%	7.66%	5.93%	6.23%	8.59%	5.67%	8.01%	8.91%	11.54%
Assumed rate	N/A	7.75%	7.65%	7.65%	7.50%	7.25%	7.25%	7.25%	7.25%	7.25%

Average Rates of Return	Actuarial Value	Market Value
Most recent five-year average return:	8.68%	12.31%
Most recent ten-year average return:	7.84%	10.57%

Actuarial experience

To calculate any actuarially determined contribution, assumptions are made about future events that affect the amount and timing of benefits to be paid and assets to be accumulated. Each year actual experience is measured against the assumptions. If overall experience is more favorable than anticipated (an actuarial gain), any contribution requirement will decrease from the previous year. On the other hand, any contribution requirement will increase if overall actuarial experience is less favorable than expected (an actuarial loss).

Taking account of experience gains or losses in one year without making a change in assumptions reflects the belief that the single year's experience was a short-term development and that, over the long term, experience will return to the original assumptions. For contribution requirements to remain stable, assumptions should approximate experience. If assumptions are changed, the contribution requirement is adjusted to take into account a change in experience anticipated for all future years.

The net experience gain during the year is $21,944,502, which includes $18,089,200 from investment gains and $3,855,302 in gains from all other sources. The net experience variation from individual sources other than investments was 0.5% of the actuarial accrued liability. A discussion of the major components of the actuarial experience is on the following pages.

Actuarial Experience for Year Ended December 31, 2021

1	Net gain from investments	$18,089,200
2	Net gain from administrative expenses	275,698
3	Net gain from other experience	3,579,604
4	Net experience gain: **1 + 2 + 3**	$21,944,502

Investment experience

A major component of projected asset growth is the assumed rate of return. The assumed return should represent the expected long-term rate of return, based on the System's investment policy. The rate of return on the market value of assets was 18.97% for the year ended December 31, 2021.

For valuation purposes, the assumed rate of return on the actuarial value of assets for the year ending December 31, 2021 was 7.25%. The actual rate of return on an actuarial basis for the 2021 plan year was 11.54%. Since the actual return for the year was greater than the assumed return, the System experienced an actuarial gain during the year ended December 31, 2021, with regard to its investments.

Based on this experience and future expectations, we have lowered the assumed rate of return from 7.25% to 6.90%.

Investment Experience

		Year Ended December 31, 2021	
		Market Value	**Actuarial Value**
1	Net investment income	$83,678,897	$48,676,264
2	Average value of assets	441,155,511	421,890,542
3	Rate of return: **1 ÷ 2**	18.97%	11.54%
4	Assumed rate of return	7.25%	7.25%
5	Expected investment income: **2 x 4**	$31,983,775	$30,587,064
6	Actuarial gain/(loss): **1 - 5**	51,695,122	18,089,200

Non-investment experience

Administrative expenses and net 3(8)(c) allowance

Administrative expenses for the year ended December 31, 2021 totaled $255,503, as compared to the assumption of $450,000. Based on information provided by the staff of the Retirement System, we have maintained the administrative expense assumption at $450,000. Net 3(8)(c) payments were $137,483 for the year ended December 31, 2021, as compared to the allowance of $200,000. We have lowered the net 3(8)(c) allowance to $145,000.

Mortality experience

Mortality experience (more or fewer than expected deaths) yields actuarial gains or losses.

The average number of deaths for nondisabled pensioners over the past three years was 40.8 per year compared to 37.6 projected deaths per year. The average number of deaths for disabled pensioners over the past three years was 6.4 per year compared to 4.3 projected deaths per year. The average number of deaths for beneficiaries over the past three years was 17.4 per year compared to 14.8 projected deaths per year.

Other experience

There are other differences between the expected and the actual experience that appear when the new valuation is compared with the projections from the previous valuation. These include:

- the extent of turnover among participants,
- retirement experience (earlier or later than projected),
- the number of disability retirements (more or fewer than projected), and
- salary increases (greater or smaller than projected).

The net gain from this other experience for the year ended December 31, 2021 amounted to $3,579,604, which is 0.5% of the actuarial accrued liability.

Section 2: Actuarial Valuation Results

Liability Changes Due to Demographic Experience for Year Ended December 31, 2021

Loss due to net turnover	-$5,930,133
Gain due to salaries increasing less than expected for continuing actives	352,258
Gain due to retirement and disability experience	3,370,812
Gain due to pension and beneficiary mortality experience	1,496,011
Miscellaneous experience gain (including changes in data)	4,290,656
Net gain	$3,579,604

Actuarial assumptions

With this valuation the following assumptions were changed:

- The investment return assumption was lowered from 7.25% to 6.90%;
- The allowance for net 3(8)(c) payments was lowered from $200,000 for 2021 to $145,000 for 2022; and
- The mortality improvement scale was updated from MP-2017 to MP-2021.

The change in the assumptions increased the Total Normal Cost by 6.9% and the Actuarial Accrued Liability by 2.8%.

Details on actuarial assumptions and methods are in *Section 4, Exhibit I*.

Plan provisions

There were no changes in plan provisions since the prior valuation.

A summary of plan provisions is in *Section 4, Exhibit II*.

Section 2: Actuarial Valuation Results

Development of Unfunded Actuarial Accrued Liability for Year Ended December 31, 2021

1	Unfunded actuarial accrued liability at beginning of year		$312,412,115
2	Normal cost at beginning of year		16,106,428
3	Total expected contributions		-48,626,617
4	Interest on 1, 2 & 3		22,222,191
5	Expected unfunded actuarial accrued liability		$302,114,117
6	Changes due to:		
	(a) Net experience gain	-$21,944,502	
	(b) Changes in assumptions	20,989,759	
	Total changes		-$954,743
7	Unfunded actuarial accrued liability at end of year		$301,159,374

Actuarially determined contribution

The actuarially determined contribution is equal to the employer normal cost payment and a payment on the unfunded actuarial accrued liability. For fiscal 2023, the Actuarially Determined Contribution has been set equal to the previously budgeted amount of $40,847,226 determined with the prior valuation.

The funding schedule included in this report fully funds the System by June 30, 2030, if all assumptions are met and there are no changes in the plan of benefits or actuarial assumptions. The appropriation increases 9.60% per year.

Actuarially Determined Contribution

		2022		2021	
		Amount	% of Projected Payroll	Amount	% of Projected Payroll
1	Total normal cost	$17,213,280	14.76%	$15,456,428	13.83%
2	Administrative expenses	595,000	0.51%	650,000	0.58%
3	Expected employee contributions	-11,713,903	-10.04%	-11,155,066	-9.98%
4	Employer normal cost: **(1) + (2) + (3)**	$6,094,377	5.22%	$4,951,362	4.43%
5	Actuarial accrued liability	$773,220,722		$732,808,115	
6	Actuarial value of assets	472,061,348		420,396,000	
7	Unfunded actuarial accrued liability: **(5) - (6)**	$301,159,374		$312,412,115	
8	Employer normal cost projected to July 1, 2022 and 2021, adjusted for timing	6,212,051	5.33%	5,048,341	4.46%
9	Projected unfunded actuarial accrued liability	311,376,074		323,538,910	
10	Payment on unfunded actuarial accrued liability, adjusted for timing	34,625,175	29.69%	32,221,025	28.45%
11	Actuarially determined contribution: **(8) + (10)**	$40,847,226	35.02%	$37,269,367	32.90%
12	Projected payroll as of July 1	$116,652,214		$113,271,976	

Notes:
Actuarially Determined Contributions are assumed to be paid August 1.
Actuarially Determined Contributions set equal to the budgeted amount determined with the prior valuation.

Funding Schedule

(1) Fiscal Year Ended June 30	(2) Employer Normal Cost	(3) Amortization of Unfunded Liability	(4) Actuarially Determined Contribution (ADC): (2)+(3)	(5) Total Unfunded Actuarial Accrued Liability at Beginning of Fiscal Year	(6) Percent Increase in ADC Over Prior Year
2023	$6,212,051	$34,635,175	$40,847,226	$311,376,074	- -
2024	6,409,925	38,358,635	44,768,560	296,041,320	9.60%
2025	6,614,026	42,452,316	49,066,342	275,690,160	9.60%
2026	6,824,548	46,952,163	53,776,711	249,582,890	9.60%
2027	7,041,690	51,897,585	58,939,275	216,890,555	9.60%
2028	7,265,659	57,331,786	64,597,445	176,685,106	9.60%
2029	7,496,668	63,302,132	70,798,800	127,928,531	9.60%
2030	7,734,936	69,848,141	77,583,077	69,460,842	9.58%
2031	7,980,689	0	7,980,689	0	-89.71%

Notes:
Fiscal 2023 Actuarially Determined Contribution is set equal to the budgeted amount.
Actuarially Determined Contributions are assumed to be paid August 1.
Item (2) reflects 2.75% growth in payroll and a 0.15% adjustment to total normal cost to reflect the effect of mortality 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.

Risk

Since the actuarial valuation results are dependent on a given set of assumptions and data as of a specific date, there is a risk that emerging results may differ significantly as actual experience differs from the assumptions.

This report does not contain a detailed analysis of the potential range of future measurements but does include a brief discussion of some risks that may affect the System. This discussion is focused on funding-related risks, but similar concerns may apply to risks regarding the level of expense and liabilities reported for System accounting purposes as well.

A more detailed assessment would provide the Board with a better understanding of the risks inherent in the Plan. This assessment may include scenario testing, sensitivity testing, stress testing and stochastic modeling.

- Investment Risk (the risk that returns will be different than expected)

  The market value rate of return over the last 10 years has ranged from a low of -2.07% to a high of 18.97%.

- Longevity Risk (the risk that mortality experience will be different than expected)

  The actuarial valuation includes an expectation of future improvement in life expectancy. Emerging plan experience that does not match these expectations will result in either an increase or decrease in the actuarially determined contribution.

- Contribution Risk (the risk that actual contributions will be different from actuarially determined contribution)

  Massachusetts General Law requires payment of the actuarially determined contribution. If future experience matches the current assumptions, we project the unfunded actuarial accrued liability will be paid off in 8 years.

- Demographic Risk (the risk that participant experience will be different than assumed)

  Examples of this risk include:

  – Actual retirements occurring earlier or later than assumed. The value of retirement plan benefits is sensitive to the rate of benefit accruals and any early retirement subsidies that apply.
  – More or less active participant turnover than assumed.
  – Disability experience greater or less than expected.
  – Salary increases greater or less than projected.

- Actual Experience and Implications for the Future

  Past experience can help demonstrate the sensitivity of key results to the Plan's actual experience. Over the past nine years:

  The investment gain(loss) has ranged from a loss of $32.6 million to a gain of $51.7 million

The non-investment gain(loss) for a year has ranged from a loss of $15.6 million to a gain of $4.1 million.

The funded percentage on the actuarial value of assets has ranged from a low of 50.8% as of January 1, 2015, to a high of 61.1% as of January 1, 2022.

- Maturity Measures

As pension plans mature, the cash need to fulfill benefit obligations will increase over time. Therefore, cash flow projections and analysis should be performed to assure that the Plan's asset allocation is aligned to meet emerging pension liabilities.

In 2021, contributions received exceeded benefits plus administrative expenses by $3.8 million. While this excess continues, the Plan is not dependent on investment returns in order to pay future benefits.

Section 3: Supplemental Information

Exhibit A: Table of Plan Demographics

	Year Ended December 31		Change From Prior Year
	2021	2020	
Active participants:			
• Number	1,555	1,570	-1.0%
• Average age	46.4	46.0	0.4
• Average years of service	12.1	11.8	0.3
• Total payroll[1]	$111,990,380	$107,216,124	4.5%
• Average payroll	72,020	68,291	5.5%
• Total account balances	102,683,049	98,137,069	4.6%
Inactive participants:			
• Inactive participants with a vested right to a deferred or immediate benefit	49	43	14.0%
• Inactive participants due a refund of employee contributions	526	512	2.7%
Retired participants:			
• Number in pay status	983	986	-0.3%
• Average age	74.6	74.4	0.2
• Average monthly benefit	$2,919	$2,711	7.7%
Disabled participants:			
• Number in pay status	122	127	-3.9%
• Average age	69.8	69.4	0.4
• Average monthly benefit	$3,709	$3,505	5.8%
Beneficiaries:			
• Number in pay status	229	224	2.2%
• Average age	78.8	77.3	1.5
• Average monthly benefit	$1,805	$1,775	1.7%

[1] Payroll figures are for the prior year and reflect annualized salaries for participants hired during the year.
Calendar year 2021 payroll figures were increased by 10.9% for superior officers and patrolmen, 9.8% for parking control clerks, 6.6% for engineers and Local 2443 foremen and 4.5% for inspectors to reflect unsettled bargaining contracts. Figures were decreased by 4.3% for Local 3092 City Hall associates and 1.5% for Local 25 teamsters to reflect retroactive payments.
Calendar year 2020 payroll figures were increased by 7.7% for superior officers, 1.5% for Local 25 teamsters, 5.6% for parking control clerks and patrolmen and 3.5% for Local 3092 City Hall associates and inspectors, engineers, and Local 2443 foremen to reflect unsettled bargaining contracts. Figures were decreased by 1.5% for firemen, 0.2% for nurses, 2.9% for Local 25 teamsters, 0.6% for school clerical staff and 1.0% for custodians to reflect retroactive payments. Figures were also decreased for superior officers based on individual retroactive payment information provided by the staff of the Retirement System.

Exhibit B: Participants in Active Service as of December 31, 2021 by Age, Years of Service, and Average Payroll

Age	Years of Service									
	Total	0-4	5-9	10-14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 & over
Under 25	24	24	- -	- -	- -	- -	- -	- -	- -	- -
	$55,628	$55,628	- -	- -	- -	- -	- -	- -	- -	- -
25 - 29	152	132	20	- -	- -	- -	- -	- -	- -	- -
	$50,489	$48,847	$61,326	- -	- -	- -	- -	- -	- -	- -
30 - 34	206	103	84	18	1	- -	- -	- -	- -	- -
	$66,283	$60,067	$69,507	$85,455	$90,713	- -	- -	- -	- -	- -
35 - 39	205	54	73	67	11	- -	- -	- -	- -	- -
	$76,469	$60,271	$74,680	$87,354	$101,567	- -	- -	- -	- -	- -
40 - 44	174	36	35	28	62	13	- -	- -	- -	- -
	$77,097	$52,520	$67,501	$75,460	$93,521	$96,184	- -	- -	- -	- -
45 - 49	145	32	28	16	29	38	2	- -	- -	- -
	$78,840	$57,217	$68,956	$70,593	$96,574	$91,680	$128,034	- -	- -	- -
50 - 54	165	32	26	24	29	35	15	4	- -	- -
	$78,717	$46,619	$58,623	$70,566	$82,238	$107,030	$103,366	$149,313	- -	- -
55 - 59	183	24	33	16	25	31	22	22	9	1
	$76,319	$58,090	$59,284	$68,748	$73,216	$75,314	$103,592	$97,121	$94,355	$85,857
60 - 64	180	24	31	24	28	20	16	12	19	6
	$75,917	$50,860	$64,660	$85,563	$65,099	$66,691	$91,776	$96,215	$104,657	$103,063
65 - 69	85	9	7	10	25	12	6	5	8	3
	$68,196	$40,906	$61,992	$70,755	$65,427	$75,191	$91,412	$87,517	$66,979	$75,719
70 & over	36	1	4	- -	11	5	4	3	4	4
	$66,315	$41,847	$60,992	- -	$69,506	$72,714	$44,991	$79,500	$54,688	$84,047
Total	1,555	471	341	203	221	154	65	46	40	14
	$72,020	$54,061	$67,369	$79,743	$82,558	$87,108	$96,653	$99,230	$89,807	$90,541

Exhibit C: Summary Statement of Income and Expenses on a Market Value Basis

	Year Ended December 31, 2021		Year Ended December 31, 2020	
Net assets at market value at the beginning of the year		$439,660,696		$394,676,536
Contribution income:				
• Employer contributions	$36,660,386		$31,996,468	
• Employee contributions	11,357,250		11,415,653	
• Federal Grant Reimbursement and Other contributions	608,981		519,163	
• Less administrative expenses	-255,503		-410,977	
Net contribution income		*$48,371,114*		*$43,520,307*
Investment income:				
• Investment income	$85,974,297		$47,405,015	
• Less investment fees	-2,295,400		-1,840,093	
Net investment income		*$83,678,897*		*$45,564,922*
Total income available for benefits		**$132,050,011**		**$89,085,229**
Less benefit payments:				
• Pensions	-$44,434,833		-$43,959,517	
• Net 3(8)(c) reimbursements	-137,436		-141,279	
Net benefit payments		*-$45,382,030*		*-$44,100,796*
Change in reserve for future benefits		**$86,667,981**		**$44,984,433**
Net assets at market value at the end of the year		**$526,328,950**		**$439,660,696**

Exhibit D: Department Breakouts

Department Code	Category	Active participants in valuation	Projected payroll for fiscal 2023	Fiscal year ending 2024		
				Normal Cost, including 3(8)c reimbursements	Amortization of Unfunded Actuarial Accrued Liability	Total Appropriation
001	Information Technology	10	$1,012,113	$26,175	$249,578	$275,753
002	Human Resources	7	582,341	16,162	218,732	234,894
003	Senior Services	6	429,121	9,021	105,895	114,916
004	Financial Information Systems	4	499,057	3,123	164,118	167,241
005	Jackson Homestead	2	172,460	16,020	39,659	55,679
006	Executive	9	917,097	50,057	295,010	345,067
007	Comptroller's	6	573,685	7,912	281,777	289,689
008	Retirement	3	302,996	3,003	98,561	101,564
009	Assessing	13	1,077,722	41,325	460,838	502,163
010	Purchasing	5	423,958	26,911	159,532	186,443
011	Treasury	10	789,887	18,937	203,288	222,225
012	Law	12	1,251,909	37,645	469,510	507,155
013	City Clerk	9	650,036	24,306	140,333	164,639
014	Clerk of the Board	2	157,501	4,321	93,325	97,646
015	City Council	16	256,188	23,119	82,679	105,798
016	Building	33	2,569,725	156,212	749,559	905,771
017	Elections	1	57,926	5,916	112,201	118,117
018	Planning	19	1,605,951	66,003	262,616	328,619
018F	Planning - Federally Funded	6	436,305	6,315	210,280	216,595
018P	Community Preservation (Planning)	1	79,080	540	32,294	32,834
019	Fire (Group 2 & 4)	186	20,011,341	2,162,436	8,212,242	10,374,678

Section 3: Supplemental Information

Department Code	Category	Active participants in valuation	Projected payroll for fiscal 2023	Fiscal year ending 2024		
				Normal Cost, including 3(8)c reimbursements	Amortization of Unfunded Actuarial Accrued Liability	Total Appropriation
019A	Fire (Civilian Personnel)	6	596,873	23,177	180,908	204,085
019S	Fire (Retired under “Starck” Bill)	0	0	2,227	316,495	318,722
020	Police (Group 2 & 4)	103	10,229,363	1,077,398	5,261,556	6,338,954
020A	Police (Civilian Personnel)	31	2,342,093	48,357	590,810	639,167
020S	Police Superior Officers (Group 4)	37	5,732,745	549,650	2,164,501	2,714,151
021	Police School Traffic Supervisors	9	502,170	40,466	276,223	316,689
022	Sealer/Weights & Measures	0	0	164	23,345	23,509
023	Inspectional Services	16	1,565,895	84,179	371,886	456,065
025	Health & Human Services	45	3,246,600	116,305	824,634	940,939
026	Veterans	1	84,636	2,376	72,694	75,070
027	Library	53	3,402,731	99,825	1,338,794	1,438,619
028	School Custodian	91	5,599,584	191,427	1,858,525	2,049,952
029	School Cafeteria	0	0	1,420	201,805	203,225
030	School Teacher Aides	421	21,033,370	611,545	3,186,648	3,798,193
031	School Clerical	122	10,073,603	337,055	2,834,933	3,171,988
031A	School Committee	4	32,935	4,072	4,166	8,238
031B	School Use of Building (revolving)	2	107,207	6,923	53,169	60,092
031C	School Community Ed. / Summer School (revolving)	11	774,098	30,026	116,631	146,657
031E	School Ed Ctr Preschool (revolving)	12	403,745	13,184	33,826	47,010
031N	School NSHS Preschool (revolving)	1	42,300	1,585	860	2,445
032	Recreation	45	3,472,962	86,064	1,277,524	1,363,588

Section 3: Supplemental Information

Department Code	Category	Active participants in valuation	Projected payroll for fiscal 2023	Fiscal year ending 2024		
				Normal Cost, including 3(8)c reimbursements	Amortization of Unfunded Actuarial Accrued Liability	Total Appropriation
033	Engineering	0	0	1,593	251,320	252,913
034	DPW	107	7,770,603	271,181	2,720,301	2,991,482
034A	DPW-Storm Water Management	8	576,722	18,442	128,555	146,997
035	Water/Sewer (General Personnel)	0	0	640	92,278	92,918
035S	Sewer Personnel	24	1,709,511	36,918	560,636	597,554
035W	Water Personnel	19	1,353,586	20,124	490,266	510,390
036	Newton Housing Authority	27	2,142,483	28,143	483,319	511,462
	TOTAL	**1,555**	$116,652,214	$6,409,925	$38,358,635	$44,768,560

Exhibit E: Cashflow Forecast

Plan Year	MVA BOY	Administrative Expenses	Net 3(8)(c) Payments	Benefit Payments	Employee Contributions	Employer Contributions	Investment Returns	MVA EOY	Net Change in Plan Assets
2022	$526,328,950	$450,000	$145,000	$50,181,657	$11,357,250	$40,847,226	$36,345,430	$564,102,199	$37,773,249
2023	564,102,199	462,375	148,988	52,321,355	11,669,574	44,768,560	39,022,897	606,630,512	42,528,313
2024	606,630,512	475,090	153,085	54,240,416	11,990,488	49,066,342	42,049,328	654,868,079	48,237,566
2025	654,868,079	488,155	157,294	56,039,540	12,320,226	53,776,711	45,488,342	709,768,367	54,900,289
2026	709,768,367	501,580	161,620	57,729,465	12,659,032	58,939,275	49,406,732	772,380,742	62,612,374
2027	772,380,742	515,373	166,065	59,218,682	13,007,156	64,597,445	53,881,566	843,966,789	71,586,047
2028	843,966,789	529,546	170,631	60,660,362	13,364,852	70,798,800	58,996,260	925,766,162	81,799,373
2029	925,766,162	544,108	175,324	61,894,438	13,732,386	77,583,077	64,843,250	1,019,311,005	93,544,843
2030	1,019,311,005	559,071	180,145	63,053,157	14,110,027	7,980,689	68,868,249	1,046,477,596	27,166,591
2031	1,046,477,596	574,446	185,099	63,930,227	14,498,052	8,234,159	70,733,214	1,075,253,249	28,775,653
2032	1,075,253,249	590,243	190,189	64,790,675	14,896,749	8,495,587	72,710,382	1,105,784,859	30,531,610
2033	1,105,784,859	606,475	195,420	65,616,275	15,306,409	8,765,222	74,810,534	1,138,248,855	32,463,996
2034	1,138,248,855	623,153	200,794	66,251,182	15,727,336	9,043,317	77,051,240	1,172,995,620	34,746,765
2035	1,172,995,620	640,289	206,315	66,871,290	16,159,837	9,330,135	79,450,627	1,210,218,324	37,222,704
2036	1,210,218,324	657,897	211,989	67,501,470	16,604,233	9,625,949	82,021,183	1,250,098,332	39,880,008
2037	1,250,098,332	675,990	217,819	68,066,478	17,060,849	9,931,035	84,778,039	1,292,907,969	42,809,636
2038	1,292,907,969	694,579	223,809	68,597,315	17,530,023	10,245,686	87,738,936	1,338,906,910	45,998,941
2039	1,338,906,910	713,680	229,964	69,130,715	18,012,098	10,570,196	90,920,545	1,388,335,390	49,428,480
2040	1,388,335,390	733,306	236,288	69,705,939	18,507,431	10,904,871	94,338,109	1,441,410,268	53,074,878
2041	1,441,410,268	753,472	242,786	70,312,368	19,016,385	11,250,027	98,006,981	1,498,375,036	56,964,768
2042	1,498,375,036	774,193	249,462	70,941,779	19,539,336	11,605,991	101,944,268	1,559,499,196	61,124,161
2043	1,559,499,196	795,483	256,322	71,545,592	20,076,668	11,973,095	106,170,264	1,625,121,825	65,622,629
2044	1,625,121,825	817,359	263,371	72,000,222	20,628,776	12,351,689	110,712,654	1,695,733,992	70,612,167
2045	1,695,733,992	839,836	270,614	72,363,505	21,196,067	12,742,124	115,603,351	1,771,801,579	76,067,587
2046	1,771,801,579	862,932	278,056	72,730,125	21,778,959	13,144,770	120,871,260	1,853,725,456	81,923,877
2047	1,853,725,456	886,662	285,702	73,137,337	22,377,880	13,560,009	126,542,782	1,941,896,426	88,170,970
2048	1,941,896,426	911,046	293,559	73,362,925	22,993,272	13,988,226	132,652,576	2,036,962,971	95,066,545
2049	2,036,962,971	936,099	301,632	73,624,660	23,625,587	14,429,827	139,237,903	2,139,393,896	102,430,925
2050	2,139,393,896	961,842	309,927	73,733,196	24,275,291	14,885,225	146,337,669	2,249,887,116	110,493,220
2051	2,249,887,116	988,293	318,450	73,642,741	24,942,861	15,354,848	154,001,642	2,369,236,984	119,349,868

Notes:

1. Projected benefit payments are based on a closed group projection and do not include return of employee money for inactive non-vested participants.
2. Employee contributions, administrative expenses and net (3)(8)(c) payments are projected to increase at 2.75% inflation assumption.
3. Employer contributions are as shown in the Funding Schedule in Section 2.

Exhibit F: Definition of Pension Terms

The following list defines certain technical terms for the convenience of the reader:

Actuarial Accrued Liability for Actives:	The equivalent of the accumulated normal costs allocated to the years before the valuation date.
Actuarial Accrued Liability for Retirees and Beneficiaries:	Actuarial Present Value of lifetime benefits to existing retirees and beneficiaries. This sum takes account of life expectancies appropriate to the ages of the annuitants and the interest that the sum is expected to earn before it is entirely paid out in benefits.
Actuarial Cost Method:	A procedure allocating the Actuarial Present Value of Future Benefits to various time periods; a method used to determine the Normal Cost and the Actuarial Accrued Liability that are used to determine the actuarially determined contribution.
Actuarial Gain or Loss:	A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions, during the period between two Actuarial Valuation dates. To the extent that actual experience differs from that assumed, Actuarial Accrued Liabilities emerge which may be the same as forecasted or may be larger or smaller than projected. Actuarial gains are due to favorable experience, e.g., assets earn more than projected, salary increases are less than assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, actuarial losses are the result of unfavorable experience, i.e., actual results yield actuarial liabilities that are larger than projected.
Actuarially Equivalent:	Of equal Actuarial Present Value, determined as of a given date and based on a given set of Actuarial Assumptions.
Actuarial Present Value (APV):	The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of Actuarial Assumptions. Each such amount or series of amounts is: Adjusted for the probable financial effect of certain intervening events (such as changes in compensation levels, marital status, etc.) Multiplied by the probability of the occurrence of an event (such as survival, death, disability, withdrawal, etc.) on which the payment is conditioned, and Discounted according to an assumed rate (or rates) of return to reflect the time value of money.
Actuarial Present Value of Future Benefits:	The Actuarial Present Value of benefit amounts expected to be paid at various future times under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age, anticipated future compensation, and future service credits. The Actuarial Present Value of Future Benefits includes the liabilities for active members, retired members, beneficiaries receiving benefits, and inactive members entitled to either a refund of member contributions or a future retirement benefit. Expressed another way, it is the value that would have to be invested on the valuation date so that the amount invested plus investment earnings would provide sufficient assets to pay all projected benefits and expenses when due.

Section 3: Supplemental Information

Actuarial Valuation:	The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a plan, as well as Actuarially Determined Contributions.
Actuarial Value of Assets (AVA):	The value of the Plan's assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets, but commonly plans use a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the Actuarially Determined Contribution.
Actuarially Determined:	Values that have been determined utilizing the principles of actuarial science. An actuarially determined value is derived by application of the appropriate actuarial assumptions to specified values determined by provisions of the Plan.
Actuarially Determined Contribution (ADC):	The employer's periodic required contributions, expressed as a dollar amount or a percentage of covered plan compensation, determined under the Plan's funding policy. The ADC consists of the Employer Normal Cost and the Amortization Payment.
Amortization Method:	A method for determining the Amortization Payment. The most common methods used are level dollar and level percentage of payroll. Under the Level Dollar method, the Amortization Payment is one of a stream of payments, all equal, whose Actuarial Present Value is equal to the Unfunded Actuarial Accrued Liability. Under the Level Percentage of Pay method, the Amortization Payment is one of a stream of increasing payments, whose Actuarial Present Value is equal to the Unfunded Actuarial Accrued Liability. Under the Level Percentage of Pay method, the stream of payments increases at the assumed rate at which total covered payroll of all active members will increase.
Amortization Payment:	The portion of the pension plan contribution, or ADC, that is intended to pay off the Unfunded Actuarial Accrued Liability.
Assumptions or Actuarial Assumptions:	The estimates upon which the cost of the Plan is calculated, including: Investment return - the rate of investment yield that the Plan will earn over the long-term future; Mortality rates - the rate or probability of death at a given age for employees and retirees; Retirement rates - the rate or probability of retirement at a given age or service; Disability rates - the rate or probability of disability retirement at a given age; Withdrawal rates - the rate or probability at which employees of various ages are expected to leave employment for reasons other than death, disability, or retirement; Salary increase rates - the rates of salary increase due to inflation, real wage growth and merit and promotion increases.
Closed Amortization Period:	A specific number of years that is counted down by one each year, and therefore declines to zero with the passage of time. For example, if the amortization period is initially set at 20 years, it is 19 years at the end of one year, 18 years at the end of two years, etc. See Open Amortization Period.
Decrements:	Those causes/events due to which a member's status (active-inactive-retiree-beneficiary) changes, that is: death, retirement, disability, or withdrawal.

Section 3: Supplemental Information

Defined Benefit Plan:	A retirement plan in which benefits are defined by a formula based on the member's compensation, age and/or years of service.
Defined Contribution Plan:	A retirement plan, such as a 401(k) plan, a 403(b) plan, or a 457 plan, in which the contributions to the plan are assigned to an account for each member, the plan's earnings are allocated to each account, and each member's benefits are a direct function of the account balance.
Employer Normal Cost:	The portion of the Normal Cost to be paid by the employer. This is equal to the Normal Cost less expected member contributions.
Experience Study:	A periodic review and analysis of the actual experience of the Plan that may lead to a revision of one or more actuarial assumptions. Actual rates of decrement and salary increases are compared to the actuarially assumed values and modified based on recommendations from the Actuary.
Funded Ratio:	The ratio of the actuarial value of assets (AVA) to the actuarial accrued liability (AAL). Plans sometimes calculate a market funded ratio, using the market value of assets (MVA), rather than the AVA.
GASB 67 and GASB 68:	Governmental Accounting Standards Board (GASB) Statements No. 67 and No. 68. These are the governmental accounting standards that set the accounting rules for public retirement systems and the employers that sponsor or contribute to them. Statement No. 68 sets the accounting rules for the employers that sponsor or contribute to public retirement systems, while Statement No. 67 sets the rules for the systems themselves.
Investment Return:	The rate of earnings of the Plan from its investments, including interest, dividends and capital gain and loss adjustments, computed as a percentage of the average value of the fund. For actuarial purposes, the investment return often reflects a smoothing of the capital gains and losses to avoid significant swings in the value of assets from one year to the next.
Net Pension Liability (NPL):	The Net Pension Liability is equal to the Total Pension Liability minus the Plan Fiduciary Net Position.
Normal Cost:	The portion of the Actuarial Present Value of Future Benefits and expenses allocated to a valuation year by the Actuarial Cost Method. Any payment with respect to an Unfunded Actuarial Accrued Liability is not part of the Normal Cost (see Amortization Payment). For pension plan benefits that are provided in part by employee contributions, Normal Cost refers to the total of member contributions and employer Normal Cost unless otherwise specifically stated.
Open Amortization Period:	An open amortization period is one which is used to determine the Amortization Payment, but which does not change over time. If the initial period is set as 30 years, the same 30-year period is used in each future year in determining the Amortization Period.
Plan Fiduciary Net Position:	Market value of assets.
Total Pension Liability (TPL):	The actuarial accrued liability under the entry age normal cost method and based on the blended discount rate as described in GASB 67 and 68.

Section 3: Supplemental Information

Unfunded Actuarial Accrued Liability:	The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets. This value may be negative, in which case it may be expressed as a negative Unfunded Actuarial Accrued Liability, also called the Funding Surplus or an Overfunded Actuarial Accrued Liability.
Valuation Date or Actuarial Valuation Date:	The date as of which the value of assets is determined and as of which the Actuarial Present Value of Future Benefits is determined. The expected benefits to be paid in the future are discounted to this date.

Section 4: Actuarial Valuation Basis

Exhibit I: Actuarial Assumptions, Actuarial Cost Method and Models

Net Investment Return:

6.90%, net of investment expenses (previously, 7.25%).

The net investment return assumption is a long-term estimate derived from historical data, current and recent market expectations, and professional judgment. As part of the analysis, a building block approach was used that reflects inflation expectations and anticipated risk premiums for each of the portfolio's asset classes, as well as the System's target asset allocation.

Salary Increases:

Years of Service	Groups 1 and 2	Group 4
0	7.00%	8.00%
1	6.50%	7.50%
2	6.00%	7.00%
3	5.50%	6.50%
4	5.25%	6.00%
5	5.00%	5.50%
6	4.75%	5.25%
7	4.50%	5.00%
8	4.25%	4.75%
9	4.00%	4.50%
10	3.75%	4.25%
11+	3.50%	4.00%

Includes allowance for wage inflation of 2.75%.

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

Interest on Employee Contributions:

3.5%

Section 4: Actuarial Valuation Basis

Administrative Expenses:	$450,000 for calendar 2022, increasing 2.75% per year (previously, $450,000 for calendar 2021, increasing 2.75% per year). The administrative expense assumption is based on information on expected expenses provided by the Retirement System.
Allowance for Net 3(8)(c) Payments:	$145,000 for calendar year 2022, increasing 2.75% per year (previously, $200,000 for calendar year 2021, increasing 2.75% per year).
Mortality Rates:	*Pre-Retirement:* RP-2014 Blue Collar Employee Mortality Table projected generationally with Scale MP-2021 (previously, MP-2017) *Healthy Retiree:* RP-2014 Blue Collar Healthy Annuitant Mortality Table projected generationally with Scale MP-2021 (previously, MP-2017) *Disabled Retiree:* RP-2014 Blue Collar Healthy Annuitant Mortality Table set forward one year and projected generationally with Scale MP-2021 (previously, MP-2017) The mortality tables, including the generation projection to the measurement date, reasonably reflect the projected mortality experience of the Plan as of the measurement date based on historical and current demographic data. As part of the analysis, a comparison was made between the actual number of retiree deaths and the projected number based on the prior years' assumptions over the five most recent valuations. The mortality tables were then adjusted to future years using generational projection under Scale MP-2021 to reflect future mortality improvement.

Section 4: Actuarial Valuation Basis

Termination Rates before Retirement:

	Groups 1 and 2 - Rate (%)		
	Mortality		
Age	Male	Female	Disability
20	0.05	0.02	0.01
25	0.06	0.02	0.02
30	0.06	0.02	0.03
35	0.07	0.03	0.06
40	0.08	0.04	0.10
45	0.13	0.07	0.15
50	0.22	0.12	0.19
55	0.36	0.19	0.24
60	0.61	0.27	0.28

Notes:
Mortality rates do not reflect generational projection.
70% of the disability rates shown represent accidental disability.
20% of the accidental disabilities will die from the same cause as the disability.
70% of the death rates shown represent accidental death.

Section 4: Actuarial Valuation Basis

	Group 4 - Rate (%)		
	Mortality		
Age	Male	Female	Disability
20	0.05	0.02	0.10
25	0.06	0.02	0.20
30	0.06	0.02	0.30
35	0.07	0.03	0.30
40	0.08	0.04	0.30
45	0.13	0.07	1.00
50	0.22	0.12	1.25
55	0.36	0.19	1.20
60	0.61	0.27	0.85

Notes:
Mortality rates do not reflect generational projection.
90% of the disability rates shown represent accidental disability.
60% of the accidental disabilities will die from the same cause as the disability.
90% of the death rates shown represent accidental death.

Section 4: Actuarial Valuation Basis

Withdrawal Rates:

Rate per year (%)			
Years of Service	**Groups 1 and 2**	**Years of Service**	**Group 4**
0	15.0	0 – 10	1.5
1	12.0	11+	0.0
2	10.0		
3	9.0		
4	8.0		
5	7.6		
6	7.5		
7	6.7		
8	6.3		
9	5.9		
10	5.4		
11	5.0		
12	4.6		
13	4.1		
14	3.7		
15	3.3		
16 – 20	2.0		
21 – 29	1.0		
30+	0.0		

The termination rates and disability rates were based on historical and current demographic data, adjusted to reflect economic conditions of the area and estimated future experience and professional judgment. As part of the analysis, a comparison was made between the actual number of terminations and disability retirements and the projected number based on the prior years' assumptions over the five most recent valuations.

Section 4: Actuarial Valuation Basis

Retirement Rates:

	Rate per year (%)		
	Groups 1 and 2		
Age	Male	Female	Group 4
45 – 49	- -	- -	1.0
50 – 51	1.0	1.5	2.0
52	1.0	2.0	2.0
53	1.0	2.5	5.0
54	2.0	2.5	7.5
55	2.0	5.5	30.0[1]
56 – 57	2.5	6.5	10.0
58	5.0	6.5	10.0
59	6.5	6.5	15.0
60	20.0[2]	5.0	20.0
61	20.0	13.0	20.0
62	30.0	15.0	25.0
63	25.0	12.5	25.0
64	22.0	18.0	30.0
65	40.0	15.0	100.0
66 – 67	25.0	20.0	- -
68	30.0	25.0	- -
69	30.0	20.0	- -
70	100.0	100.0	- -

Retirement rates are 0.0% if the employee is not eligible to retire.

The retirement rates were based on historical and current demographic data, adjusted to reflect economic conditions of the area and estimated future experience and professional judgment. As part of the analysis, a comparison was made between the actual number of retirements by age and the projected number based on the prior years' assumptions over the five most recent valuations.

[1] Rate is 15.0% for employees hired prior to April 2, 2012 and 30.0% for employees hired on or after April 2, 2012
[2] Rate is 12% for employees hired prior to April 2, 2012 and 20.0% for employees hired on or after April 2, 2012

Section 4: Actuarial Valuation Basis

Retirement Rates for Inactive Vested Participants:	55 for participants hired prior to April 2, 2012. For participants hired April 2, 2012 or later, 60 for Group 1, 55 for Group 2, and 50 for Group 4. The retirement age for inactive vested participants was based on historical and current demographic data, adjusted to reflect economic conditions of the area and estimated future experience and professional judgment.
Unknown Data for Participants:	Same as those exhibited by participants with similar known characteristics.
Family Composition:	80% of participants are assumed to be married. None are assumed to have dependent children. Females are assumed to be three years younger than their spouses.
Benefit Election:	All participants are assumed to elect Option A. The benefit election reflects the fact that all benefit options are actuarially equivalent.
Total Service:	Total creditable service reported in the data
2021 Salaries:	2021 salaries are equal to salaries provided in the data, annualized for new hires, and increased by 10.9% for superior officers and patrolmen, 9.8% for parking control clerks, 6.6% for engineers and Local 2443 foremen and 4.5% for inspectors to reflect unsettled bargaining contracts. Figures were decreased by 4.3% for Local 3092 City Hall associates and 1.5% for Local 25 teamsters to reflect retroactive payments.
Actuarial Value of Assets:	A preliminary actuarial value is first determined by taking the actuarial value of assets at the beginning of the year and adding assumed investment earnings (at the assumed actuarial rate of return) and the net new money during the year (contributions less benefit payments). Twenty-five percent of the difference between the market value of assets as reported in the System's Annual Statement and the preliminary actuarial value of assets is added to the preliminary actuarial value. In order that the actuarial value not differ too significantly from the market value of assets, the final actuarial value of assets must be within 20% of the market value of assets.
Actuarial Cost Method:	Entry Age Normal Actuarial Cost Method. Entry Age is the attained age of the participant minus total creditable service. Normal Cost and Actuarial Accrued Liability are calculated on an individual basis and are allocated by salary. Normal Cost is determined using the plan of benefits applicable to each participant.
Models:	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.

Section 4: Actuarial Valuation Basis

Justification for Change in Actuarial Assumptions:	Based on past experience and future expectations, the following actuarial assumptions were changed as of January 1, 2022. • The investment return assumption was lowered from 7.25% to 6.90%; • The allowance for net 3(8)(c) payments was lowered from $200,000 for 2021 to $145,000 for 2022; and • The mortality improvement scale was updated from MP-2017 to MP-2021.

Exhibit II: Summary of Plan Provisions

This exhibit summarizes the major provisions of the Plan included in the valuation. It is not intended to be, nor should it be interpreted as, a complete statement of all plan provisions.

Plan Year:	January 1 through December 31
Plan Status:	Ongoing
Retirement Benefits:	Employees covered by the Contributory Retirement Law are classified into one of four groups depending on job classification. Group 1 comprises most positions in state and local government. It is the general category of public employees. Group 4 comprises mainly police and firefighters. Group 2 is for other specified hazardous occupations. (Officers and inspectors of the State Police are classified as Group 3.) For employees hired prior to April 2, 2012, the annual amount of the retirement allowance is based on the member's final three-year average salary multiplied by the number of years and full months of creditable service at the time of retirement and multiplied by a percentage according to the following table based on the age of the member at retirement:

Age Last Birthday at Date of Retirement

Percent	Group 1	Group 2	Group 4
2.5	65 or over	60 or over	55 or over
2.4	64	59	54
2.3	63	58	53
2.2	62	57	52
2.1	61	56	51
2.0	60	55	50
1.9	59	--	49
1.8	58	--	48
1.7	57	--	47
1.6	56	--	46
1.5	55	--	45

A member's final three-year average salary is defined as the greater of the highest consecutive three-year average annual rate of regular compensation and the average annual rate of regular compensation received during the last three years of creditable service prior to retirement.

For employees hired on April 2, 2012 or later, the annual amount of the retirement allowance is based on the member's final five-year average salary multiplied by the number of years and full months of creditable service at the time of retirement and multiplied by a percentage according to the following tables based on the age and years of creditable service of the member at retirement:

For members with less than 30 years of creditable service:
Age Last Birthday at Date of Retirement

Percent	Group 1	Group 2	Group 4
2.50	67 or over	62 or over	57 or over
2.35	66	61	56
2.20	65	60	55
2.05	64	59	54
1.90	63	58	53
1.75	62	57	52
1.60	61	56	51
1.45	60	55	50

For members with 30 years of creditable service or greater:
Age Last Birthday at Date of Retirement

Percent	Group 1	Group 2	Group 4
2.500	67 or over	62 or over	57 or over
2.375	66	61	56
2.250	65	60	55
2.125	64	59	54
2.000	63	58	53
1.875	62	57	52
1.750	61	56	51
1.625	60	55	50

	A member's final five-year average salary is defined as the greater of the highest consecutive five-year average annual rate of regular compensation and the average annual rate of regular compensation received during the last five years of creditable service prior to retirement. 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). In addition, regular compensation for members who retire after April 2, 2012 will be limited to prohibit "spiking" of a member's salary to increase the retirement benefit. For all employees, the maximum annual amount of the retirement allowance is 80 percent of the member's final average salary. Any member who is a veteran also receives an additional yearly retirement allowance of $15 per year of creditable service, not exceeding $300. The veteran allowance is paid in addition to the 80 percent maximum.
Employee Contributions:	**Date of Hire** / **Contribution Rate** Prior to January 1, 1975 — 5% January 1, 1975 – December 31, 1983 — 7% January 1, 1984 – June 30, 1996 — 8% July 1, 1996 onward — 9% In addition, employees hired after December 31, 1978 contribute an additional 2 percent of salary in excess of $30,000. Employees hired after 1983 who voluntarily withdraw their contributions with less than 10 ten years of credited service receive 3% interest on their contributions. Employees in Group 1 hired on or after April 2, 2012 with 30 years of creditable service or greater will pay a base contribution rate of 6%.
Retirement Benefits (Superannuation):	Members of Group 1, 2 or 4 hired prior to April 2, 2012 may retire upon the attainment of age 55. For retirement at ages below 55, twenty years of creditable service is required. Members hired prior to April 2, 2012 who terminate before age 55 with ten or more years of creditable service are eligible for a retirement allowance upon the attainment of age 55 (provided they have not withdrawn their accumulated deductions from the Annuity Savings Fund of the System). Members of Group 1 hired April 2, 2012 or later may retire upon the attainment of age 60. Members of Group 2 or 4 hired April 2, 2012 or later may retire upon the attainment of age 55. Members of Group 4 may retire upon attainment of age 50 with ten years of creditable service. Members hired April 2, 2012 or later who terminate before age 55 (60 for members of Group 1) with ten or more years of creditable service are eligible for a retirement allowance upon the attainment of age 55 (60 for members of Group 1) provided they have not withdrawn their accumulated deductions from the Annuity Savings Fund of the System.

Section 4: Actuarial Valuation Basis

Ordinary Disability Benefit:	A member who is unable to perform his or her job due to a non-occupational disability will receive a retirement allowance if he or she has ten or more years of creditable service and has not reached age 55. The annual amount of such allowance shall be determined as if the member retired for superannuation at age 55 (age 60 for Group 1 members hired on or after April 2, 2012), based on the amount of creditable service at the date of disability. For veterans, there is a minimum benefit of 50 percent of the member's most recent year's pay plus an annuity based on his or her own contributions.
Accidental Disability Benefit:	For a job-connected disability, the benefit is 72 percent of the member's most recent annual pay plus an annuity based on his or her own contributions, plus additional amounts for surviving children. Benefits are capped at 75 percent of annual rate of regular compensation for employees who become members after January 1, 1988.
Death Benefits:	In general, the beneficiary of an employee who dies in active service will receive a refund of the employee's own contributions. Alternatively, if the employee were eligible to retire on the date of death, a spouse's benefit will be paid equal to the amount the employee would have received under Option C. The surviving spouse of a member who dies with two or more years of credited service has the option of a refund of the employee's contributions or a monthly benefit regardless of eligibility to retire, if they were married for at least one year. There is also a minimum widow's pension of $250 per month, and there are additional amounts for surviving children. If an employee's death is job-connected, the spouse will receive 72 percent of the member's most recent annual pay, in addition to a refund of the member's accumulated deductions, plus additional amounts for surviving children. However, in accordance with Section 100 of Chapter 32, the surviving spouse of a police officer, firefighter or corrections officer is killed in the line of duty will be eligible to receive an annual benefit equal to the maximum salary held by the member at the time of death. Upon the death of a job-connected disability retiree who retired prior to November 7, 1996, and could not elect an Option C benefit, a surviving spouse will receive an allowance of $9,000 per year if the member dies for a reason unrelated to cause of disability.
"Heart And Lung Law" And Cancer Presumption:	Any case of hypertension or heart disease resulting in total or partial disability or death to a uniformed fireman, permanent member of a police department, or certain employees of a county correctional facility is presumed to have been suffered in the line of duty, unless the contrary is shown by competent evidence. Any case of disease of the lungs or respiratory tract resulting in total disability or death to a uniformed fireman is presumed to have been suffered in the line of duty, unless the contrary is shown by competent evidence. There is an additional presumption for uniformed firemen that certain types of cancer are job-related if onset occurs while actively employed or within five years of retirement.
Options:	Members may elect to receive a full retirement allowance payable for life under Option A. Under Option B a member may elect to receive a lower monthly allowance in exchange for a guarantee that at the time of death any contributions not expended for annuity payments will be refunded to the beneficiary. Option C allows the member to take a lesser retirement allowance in exchange for providing a survivor with two-thirds of the lesser amount. Option C pensioners will have benefits converted from a reduced to a full retirement if the beneficiary predeceases the retiree

Section 4: Actuarial Valuation Basis

Post-Retirement Benefits:	The Board has adopted the provisions of Section 51 of Chapter 127 of the Acts of 1999, which provide that the Retirement Board may approve an annual COLA in excess of the Consumer Price Index but not to exceed a 3% COLA on the first $12,000 of a retirement allowance. Cost-of-living increases granted prior to July 1, 1998, are reimbursed by the Commonwealth and not reflected in this report.
Changes in Plan Provisions:	There have been no changes in plan provisions since the last valuation.