Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS)

Actuarial Valuation Report

June 30, 2023

Table of Contents

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September 14, 2023

Retirement Board
Missouri Department of Transportation
and Highway Patrol Employees' Retirement System
1913 William Street
Jefferson City, Missouri 65102

Ladies and Gentlemen:

The results of the regular annual actuarial valuation as of June 30, 2023 of the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS), as established by Chapter 104 of the Missouri Revised Statutes, are presented in this report. Reports providing accounting and financial reporting information that are intended to comply with the Governmental Accounting Standards Board (GASB) Statements No. 67 and No. 68 will be provided separately. The purposes of this valuation were:

- To measure the System's funding progress;
- To determine the employer contribution rate for Fiscal Year 2025; and
- To provide certain supplemental schedules for use in the System's Annual Report.

Your attention is directed particularly to the summary of the results and comments on pages 1-12.

This report was prepared at the request of the Board and is intended for use by the Retirement System and those designated or approved by the Board. This report may be provided to parties other than the Retirement System only in its entirety and only with the permission of the Board. This report should not be relied on for any purpose other than the purpose described. GRS is not responsible for unauthorized use of this report.

The member statistical data required for the valuation, together with pertinent data on financial operations, was furnished by your Executive Director and his staff. Member data was reviewed for reasonableness, but was not audited by the actuary. Financial data was received in aggregate and reviewed for reasonableness. Individual investments were not reviewed. Assets are not audited by the actuary. We are not responsible for the accuracy or completeness of the data provided by MPERS.

The cooperation of the Executive Director and the staff in furnishing materials requested for this valuation, and the complete and excellent condition of the records, is acknowledged with appreciation.

The valuation results summarized in this report involve actuarial calculations that require assumptions about future events. The assumptions are established by the Board after consulting with the actuary. We believe that the assumptions and methods used in this report are reasonable and appropriate for the purpose for which they have been used. However, other assumptions and methods could also be reasonable and could result in materially different results. In addition, because it is not possible or practical to consider every possible contingency, we may use summary information, estimates or simplifications of calculations to facilitate the modeling of future events. We may also exclude factors or data that are deemed to be immaterial.

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. This report does not contain an analysis of the potential range of such future measurements.

To the best of our knowledge, this report is complete and accurate and was made in accordance with standards of practice promulgated by the Actuarial Standards Board. The actuarial assumptions used for the valuation produce results which, individually and in the aggregate, are reasonable. The actuarial assumptions used in making the valuation are shown in Section E of this report.

The employer contributions determined in this report are based on the Board's funding policy. This policy is discussed on page 4 of this report. We commend the Board for its aggressive monitoring and updating of the funding policy over the recent past. However, continued employer contributions at the current level do not guarantee benefit security. We therefore encourage the Board to continue to routinely monitor and update its funding policy and to continue to consider benefit security when doing so.

This report includes risk measures on pages A-13 and A-14, but does not include a more robust assessment of the risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment. We recommend that the Board consider performing an analysis to assess risk related to investment and payroll.

This report was prepared using our proprietary valuation model and related software which, in our professional judgment, has the capability to provide results that are consistent with the purposes of the valuation and has no material limitations or known weaknesses. We performed tests to ensure that the model reasonably represents that which is intended to be modeled.

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. Heidi G. Barry and Jamal Adora are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

The signing actuaries are independent of the plan sponsor.

Respectfully submitted,
Gabriel, Roeder, Smith & Company

Heidi G. Barry, ASA, FCA, MAAA

Jamal Adora, ASA, EA, MAAA

HGB/JA:dj

Summary

This report contains the results of the June 30, 2023 valuation. The table below shows a summary of the data used in the valuation as well as the unfunded actuarial accrued liability for the two experience rated groups. This data was the basis for determining valuation results and recommended employer contribution rates.

	Non-Uniformed				
	Patrol Employees	MoDOT Employees	Non-Uniformed Total	Uniformed Patrol	Total
Participants					
Active Members					
Closed Plan	159	860	1,019	295	1,314
Year 2000 Plan (also closed)	303	1,261	1,564	348	1,912
Year 2011 Tier (open)	586	2,330	2,916	479	3,395
Total Active Members	1,048	4,451	5,499	1,122	6,621
Total Active Members Prior Year	*1,026*	*4,666*	*5,692*	*1,182*	*6,874*
Retiree -- Regular Pensioners					
Closed Plan	479	3,074	3,553	1,128	4,681
Year 2000 Plan (also closed)	693	4,040	4,733	12	4,745
Year 2011 Tier (open)	17	33	50	1	51
Total Regular Pensioners	1,189	7,147	8,336	1,141	9,477
Self-Insured Disability Pensioners	1	36	37	3	40
Full-Insured Disability Pensioners	10	73	83	4	87
Terminated Vested Members	272	1,786	2,058	181	2,239
Total	**2,520**	**13,493**	**16,013**	**2,451**	**18,464**
Active Member Valuation Payroll	$ 55,285,348	$ 243,470,293	$ 298,755,641	$ 90,569,104	$ 389,324,745
Active Member Valuation Payroll Prior Year	*$ 49,500,683*	*$ 219,521,309*	*$ 269,021,992*	*$ 87,640,250*	*$ 356,662,242*
Unfunded Actuarial Accrued Liability	N/A	N/A	$ 989,773,506	$ 471,634,568	$ 1,461,408,074

The June 30, 2023 valuation results are used to determine the contribution rate for the plan year beginning July 1, 2024. A summary of valuation results and recommended contribution rates follows.

Summary (Continued)

The **total contribution rate** for the plan year beginning July 1, 2024 is shown below:

	FY 2025 Employer Contribution Rates Expressed as % of Active Payroll for Total Benefits			
	Non-Uniformed			
	Civilian Patrol Employees	MoDOT Employees	Total	Uniformed Patrol Total
Benefit Normal Cost	8.260%	8.260%	8.260%	17.080%
Expenses	1.340%	1.340%	1.340%	1.340%
Disability Insurance	0.475%	0.475%	0.475%	0.475%
Total Normal Cost	10.075%	10.075%	10.075%	18.895%
Unfunded Liability	41.933%	41.933%	41.933%	39.596%
Total	52.008%	52.008%	52.008%	58.491%
Projected $	$30,503,850	$134,335,433	$164,839,283	$56,200,938
Prior Year Projected $	*$30,458,859*	*$135,076,290*	*$165,535,149*	*$53,926,974*

The projected dollar amounts are the total employer rate multiplied by the valuation payroll projected to the fiscal year the rate is effective. The projection factor is 1.0609 for Non-Uniformed members and 1.0609 for Uniformed members. Prior year projected dollars reflect assumptions in effect as of the prior valuation and prior to the adoption of the 2022 experience study. Actual contributions will be based on the actual payroll during the 2025 Fiscal Year. The total contribution is based on a 1-year amortization period for unfunded retiree liabilities and a 16-year amortization period for other unfunded liabilities from July 1, 2024, in accordance with Board policy. In accordance with Board policy adopted September 26, 2014, a minimum Employer contribution of 58% of payroll for Non-Uniformed 58% of payroll for Uniformed was included to establish a Contribution Stabilization Reserve Fund.

The contributions above are Employer contributions only. In addition, Employee contributions are estimated to be (on average) 1.880% for Non-Uniformed members and 1.420% for Uniformed members.

The combined contribution rate (53.55% of active payroll) is less than the actual benefit payout rate (74.25% of active payroll). The difference is intended to be made up by investment return. The ability to contribute less than the benefit payout is one of the advantages of a funded retirement plan.

Prior year projected dollars (FY 2024) are based on rates of 58.000% for Non-Uniform members and 58.000% for Uniform members.

Summary (Continued)

Benefits, Assumptions and Methods for the June 30, 2023 valuation: There were no changes in benefits for the June 30, 2023 valuation. New assumptions were adopted by the Board from the July 1, 2017 through June 30, 2022 Experience Study. In addition, the Board adopted a funding policy that uses a 1-year amortization period for unfunded retiree liabilities and a 16-year amortization period for other unfunded liabilities from July 1, 2024.

Experience: System assets earned an 8.9%# return on a market basis, although the fund recognized a 12.9% rate of return on an actuarial basis after accounting for the smoothing of the 2021 gain and 2022 loss (please see page C-2). In aggregate, there was an experience loss of $28 million (approximately 0.6% of beginning of year liabilities). This loss is primarily due to larger than expected salary and COLA increases and partially offset by investment gains. Despite this experience loss, the funding status increased from 66.3% to 69.6% before recognition of assumption changes. Pages A-11 and A-12 show the derivation of the gain/(loss) in aggregate and by division.

The table below shows a comparison of actual demographic activity versus expected activity (based on the prior year's valuation assumptions).

Demographic Experience

	Non-Uniformed				Uniformed			
	Number Count			General	Number Count			General
	Actual	Expected	A/E%	Direction	Actual	Expected	A/E%	Direction
Retirement	214	253.0	85%	Gain	69	43.1	160%	Loss
Death	1	5.0	20%	Gain	0	0.7	0%	Gain
Disability	17	16.1	106%	Loss	1	1.0	100%	Loss
Vested Terminations	155	112.5	138%	Gain	14	7.1	197%	Gain
Other Terminations	327	200.4	163%	Gain	14	9.2	152%	Gain
Post-Retirement Death	341	272.4	125%	Gain	55	30.8	179%	Gain

Payroll and COLA increases for both Uniform and Non-Uniformed members were larger than expected on an individual basis and resulted in an overall liability loss for both groups. While both groups experienced liability losses, the loss was slightly smaller for the Uniform group. Overall, the groups experienced losses of $25 million (Non-Uniformed) and $3 million (Uniformed) in aggregate.

 # Provided by the System's investment consultant.

Summary (Continued)

Funding Policy:

The total contribution is based on normal cost plus a 1-year amortization period for unfunded retiree liabilities and a 16-year amortization period for other unfunded liabilities. The retiree liability is fully funded in this valuation. Both amortization periods are closed periods starting July 1, 2024. If the Board keeps the current funding policy, the amortization period will be 15-years for all liabilities in the June 30, 2024 valuation.

In September 2014, the Board adopted a contribution stabilization reserve fund from experience gains in an effort to keep the employer contribution rate at or near 58%, in the near term. In February 2015, the Board established a maximum of $250 million in the contribution stabilization reserve fund. The contribution stabilization reserve fund is expected to result in the fund becoming more than 100% funded by the end of the amortization period, if experience is exactly as assumed.

An employer contribution rate of less than 58% can occur if the contribution stabilization reserve fund is at the maximum $250 million. In this valuation, the contribution stabilization reserve fund is at the maximum of $250 million and the resulting employer contribution rate for Non-Uniformed is less than 58%.

Rate Reconciliation: The table below shows the computed rate last year and the approximate effect of the changes that occurred during the year.

	Non-Uniform	Uniform
Prior valuation contribution rate		
Without Contribution Stabilization Reserve Fund	37.381%	56.099%
Additional amount for Contribution Stabilization Reserve Fund (CSR)	20.619%	1.901%
Total computed employer contribution rate	58.000%	58.000%
Prior rate without Contribution Stabilization Reserve Fund	37.381%	56.099%
Effects of:		
Accelerated contributions	(2.186)%	(0.324)%
Change in disability premiums	0.000%	0.000%
Change in administrative expenses	(0.040)%	(0.040)%
Phase-in of 2011 Tier members	(0.170)%	(0.520)%
22/23 liability experience loss/(gain)	4.580%	5.260%
22/23 recognized investment loss/(gain)	(3.850)%	(4.960)%
Change due to payroll increase other than expected	(2.172)%	(0.216)%
Change in assumptions and methods	(0.168)%	3.192%
Change in plan provisions	0.000%	0.000%
Computed employer contribution rate, current valuation without CSR	33.375%	58.491%
Additional amount for Contribution Stabilization Reserve Fund (CSR)	18.633%	0.000%
Computed employer contribution rate, current valuation	52.008%	58.491%

Summary (Continued)

Funded Status of Retiree Liability: The chart below indicates the funding status of retiree liabilities on an actuarial value of asset basis and a market value of asset basis:

	June 30, 2023			June 30, 2022
Asset Basis	**Non-Uniformed**	**Uniformed**	**Total**	**Total**
Actuarial Value	100.0%	100.0%	100.0%	98.3%
Market Value	100.0%	100.0%	100.0%	100.0%

Total Plan Funded Status: The plan is currently 69.0% funded on an actuarial value of assets basis or 69.7% funded on a market value of assets basis.

Plan Provisions: There were no plan provisions intentionally excluded from the valuation that were in effect on the valuation date. However, certain disability benefits are funded through third party insurance. The premiums for this insurance are included in the normal cost. The liabilities for these disability benefits are not included in the accrued liabilities of the plan, since they are liabilities of the insurance carrier.

Looking Forward: Before recognizing any fiscal year 2024 activity, the fund is positioned to recognize an investment gain of approximately $8.2 million next year (see page C-2). This gain, if not offset by other experience losses, will increase the funded status of the plan.

Despite falling from its peak in 2022, inflation rates remain high when compared to the last few decades. This can have several effects upon the valuation results. For instance, the COLA is directly tied to price inflation. Based on the increase in CPI-U during the 2022 calendar year, we understand that the COLA payable in the 2023 calendar year will exceed the assumed COLA of 1.80%. In addition, based on the partial-2023 inflation data available to date, it appears likely that the COLA payable in calendar year 2024 will also exceed the assumed COLA of 1.80%. Since the valuation census data is created as of May 31, each year, not all of the actual COLA is reflected immediately due to the timing of the valuation. The higher than expected COLAs for the remainder of FY 2023 and FY 2024 will put upward pressure on the contribution rate and downward pressure on the funded status of the Plan.

The higher or lower than assumed inflation will likely affect experience in future valuations (other than just COLAs) including experience related to:

- Rates of Investment return;
- Rates of Pay increases;
- Rates of Retirement; and
- Rates of Terminations.

The effect of higher or lower inflation on these different experience areas may result in gains or losses (depending on the specific area). Our experience study dated February 15, 2023 did not give significant weight to the recent inflation experience. However, if experience begins to change the industry's future expectations, it may result in changes to demographic and economic assumptions in the 2027/28 experience study.

Summary (Concluded)

Recommendations:

1) In accordance with changes in actuarial standards along with more recent changes in forecasts of future economic conditions, we recommend that economic assumptions continue to be reviewed annually each spring/summer before the next valuation cycle begins.

2) The contribution stabilization reserve fund is able to provide a limited buffer against losses in the short term. However, depletion of the contribution stabilization reserve fund would likely result in considerable contribution volatility. The Uniformed division's portion of the stabilization reserve fund was depleted for the June 30, 2023 valuation. We recommend the Board consider reviewing the funding policy to study if differing contribution stabilization reserve funds should be used.

Conclusion: Based upon the results of the June 30, 2023 regular annual actuarial valuation, it is our opinion that the Missouri Department of Transportation and Highway Patrol Employees' Retirement System continues to be financed in accordance with actuarial principles of level percent-of-payroll financing. This statement is based upon the fact that the employer is contributing to the System based upon actuarially determined rates and presumes a continuation of payment of actuarially determined contributions. We believe the contributions determined in this report are reasonable actuarially determined contributions. In addition, we commend the 2009 Board in its decision to more aggressively address the unfunded retiree liability issue, the 2011 Board in its decision to reflect the near-term downsizing of MoDOT, and the 2014 Board for establishing the contribution stabilization reserve fund, which effectively accelerated the funding of the UAAL. In addition, we commend all subsequent Boards for continuing to maintain the contribution stabilization reserve fund. The funded status of the System is higher than it has been in at least a decade.

Other Observations

General Implications of Contribution Allocation Procedure or Funding Policy on Future Expected Plan Contributions and Funded Status

Given the plan's contribution allocation procedure, if all actuarial assumptions are met (including the assumption of the plan earning 6.50% on the actuarial value of assets), it is expected that:

1) The unfunded actuarial accrued liabilities will be fully amortized after 16 years;
2) The funded status of the plan will increase gradually towards a 100% funded ratio and then slightly exceed 100% (due to the contribution stabilization reserve fund); and
3) The unfunded accrued liability will follow the pattern shown on page A-5.

Limitations of Funded Status Measurements

Unless otherwise indicated, a funded status measurement presented in this report is based upon the actuarial accrued liability and the actuarial value of assets. Unless otherwise indicated, with regard to any funded status measurements presented in this report:

1) The measurement is inappropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations; in other words, of transferring the obligations to an unrelated third party in an arm's length market value type transaction.
2) The measurement is dependent upon the actuarial cost method which, in combination with the plan's amortization policy, affects the timing and amounts of future contributions. A funded status measurement in this report of 100% is not synonymous with no required future contributions. If the funded status were 100%, the plan would still require future normal cost contributions (i.e., contributions to cover the cost of the active membership accruing an additional year of service credit).
3) The measurement would produce a different result if the market value of assets were used instead of the actuarial value of assets, unless the market value of assets is used in the measurement.

Limitations of Project Scope

Actuarial standards do not require the actuary to evaluate the ability of the plan sponsor or other contributing entity to make required contributions to the plan when due. Such an evaluation was not within the scope of this project and is not within the actuary's domain of expertise. Consequently, the actuary performed no such evaluation.

Risks to Future Employer Contribution Requirements

There are ongoing risks to future employer contribution requirements to which the Retirement System is exposed, such as:

- Actual and Assumed Investment Rate of Return;
- Actual and Assumed Mortality Rates; and
- Amortization Policy.

Scenario Testing/Sensitivity Testing

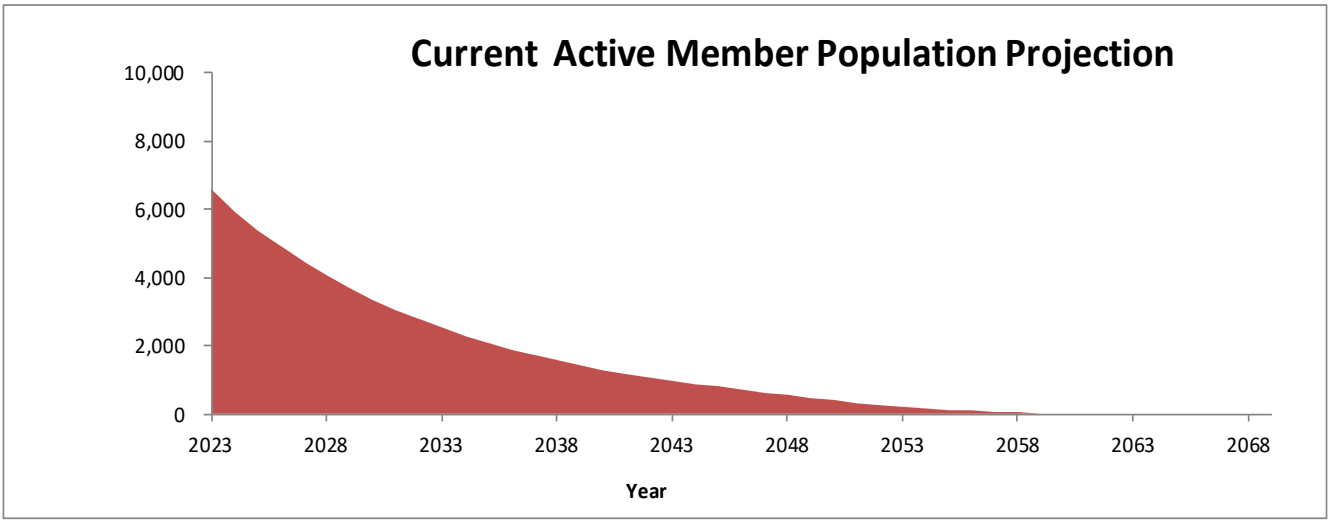
The MPERS staff is provided a 10-year projection tool that allows for various scenario and sensitivity testing. If the Board would like to see additional projections, we would be happy to perform such projections.

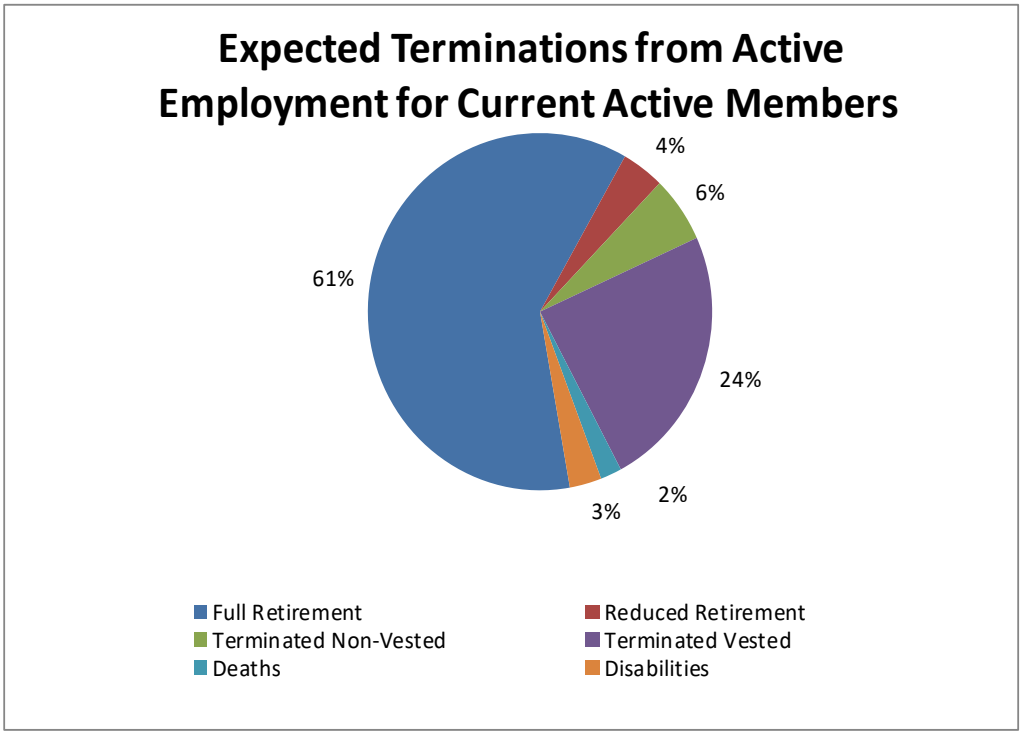
Summary of Key Valuation Results

Actuarial Present Value	June 30, 2023 (1) Actuarial Present Value	(2) Portion Covered By Future Normal Cost Contributions	(3) Actuarial Accrued Liabilities (1) - (2)	June 30, 2022 Actuarial Accrued Liabilities
Active Members				
Service retirement benefits based on service rendered before and likely to be rendered after valuation date	$ 1,686,012,579	$ 280,122,936	$ 1,405,889,643	$ 1,291,404,616
Disability benefits likely to be paid to present active members who become totally and permanently disabled*	32,911,818	20,416,034	12,495,784	12,455,066
Survivor benefits likely to be paid to widows and children of present active members who die before retiring	26,847,456	9,005,335	17,842,121	11,053,785
Separation benefits likely to be paid to present active members	75,976,580	46,959,759	29,016,821	19,850,733
Active Member Totals	$ 1,821,748,433	$ 356,504,064	$ 1,465,244,369	$ 1,334,764,200
Terminated Vested Members	124,632,780		124,632,780	123,770,692
Retired Lives	3,119,514,258		3,119,514,258	2,952,150,155
Total Actuarial Accrued Liability	$ 5,065,895,471	$ 356,504,064	$ 4,709,391,407	$ 4,410,685,047
Actuarial Value of Assets			3,247,983,333	2,925,561,398
Unfunded Actuarial Accrued Liability			$ 1,461,408,074	$ 1,485,123,649
Contribution Stabilization Reserve Fund			$ 250,000,000	$ 170,663,656
Total Amount Financed			$ 1,711,408,074	$ 1,655,787,305

* *The amounts presented for this category represent liabilities for retirement benefits for active members that may become participants of the long-term disability plan until they reach normal retirement eligibility. These are not liabilities for active members currently on long-term disability.*

Expected Development of Present Populations as of June 30, 2023

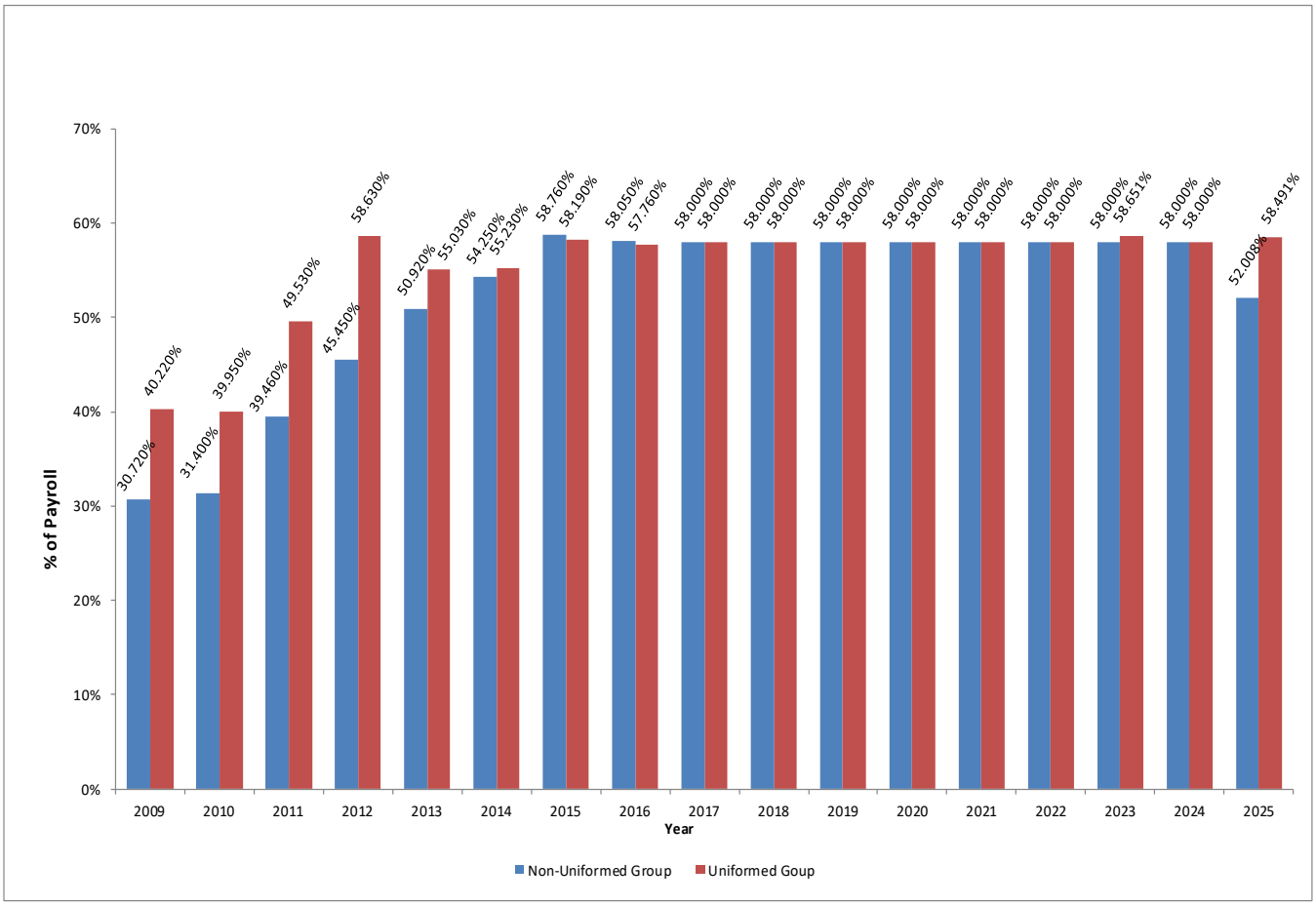




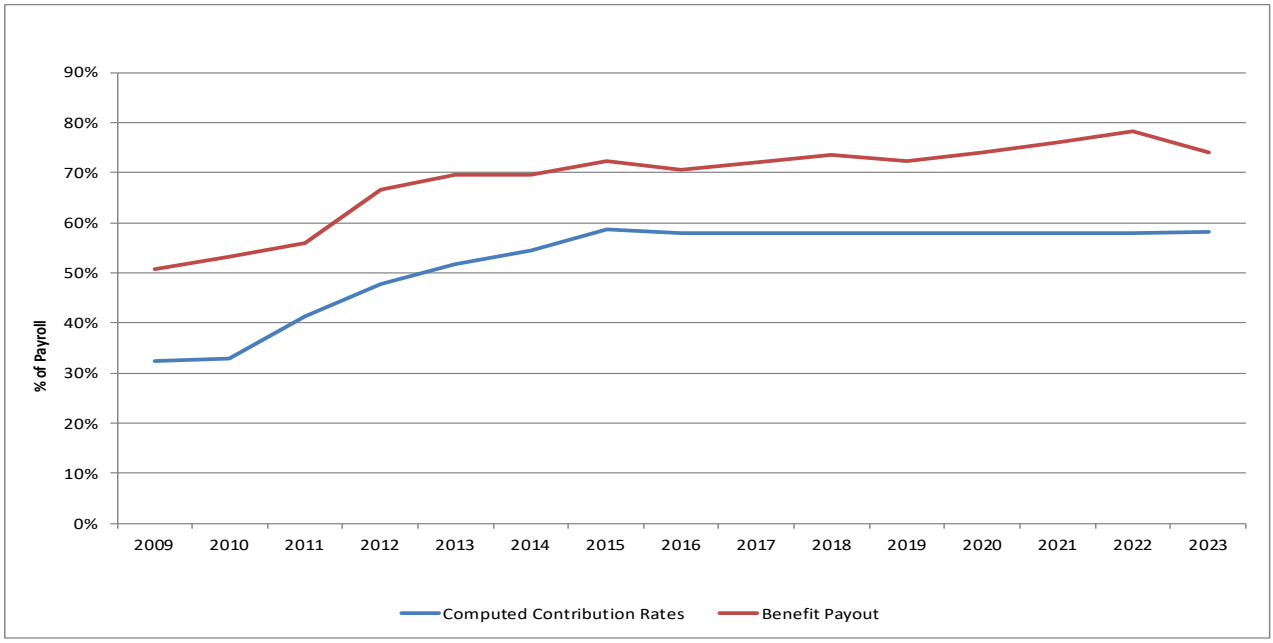
The charts above show the expected future development of the present population in simplified terms. The Retirement System presently covers 6,621 active members. Eventually, 6% of the population is expected to terminate covered employment prior to retirement and forfeit eligibility for an employer provided benefit. Of the present population, 89% is expected to receive monthly retirement benefits either by retiring directly from active service, or by separating from service with a vested benefit, and 5% of the present population is expected to become eligible for death-in-service or disability benefits. Within 8 years, over half of the covered membership is expected to consist of new hires.

Historical Contribution Rates and Benefit Payouts

Computed Contribution Rates

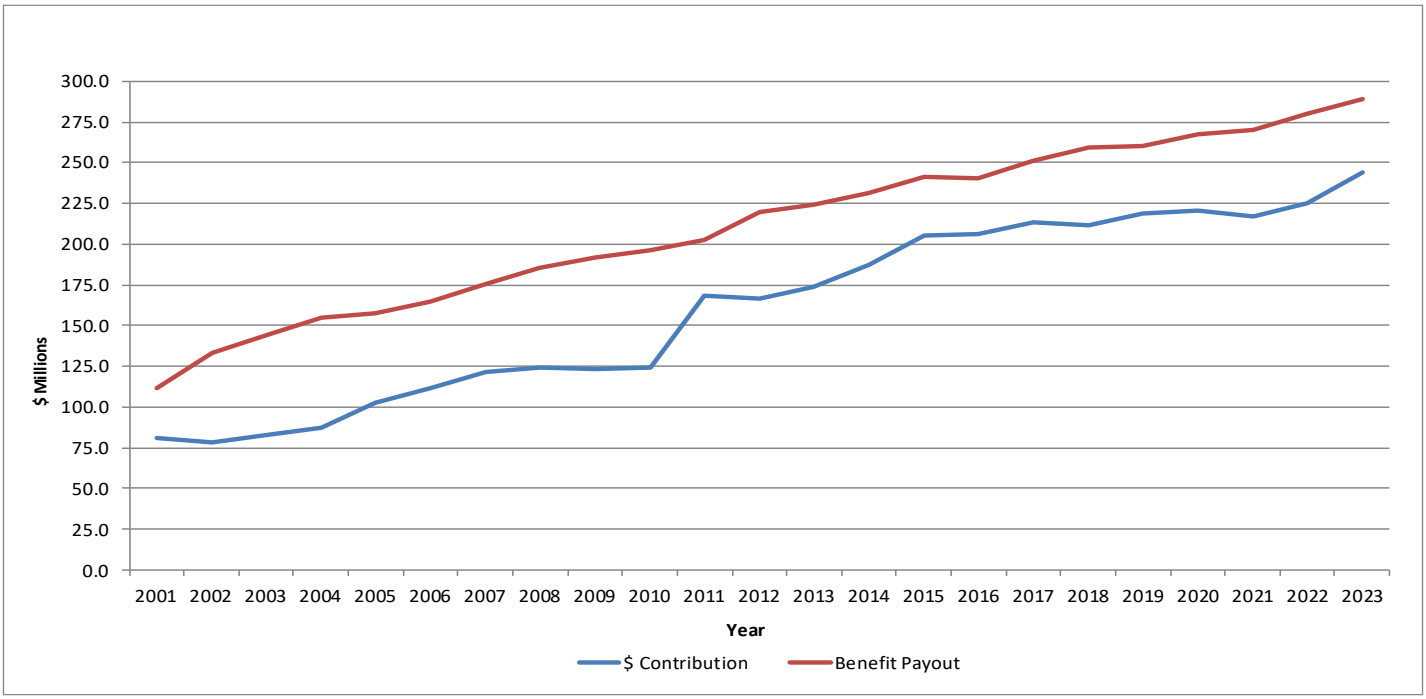


Contribution Rates vs. Benefit Payout



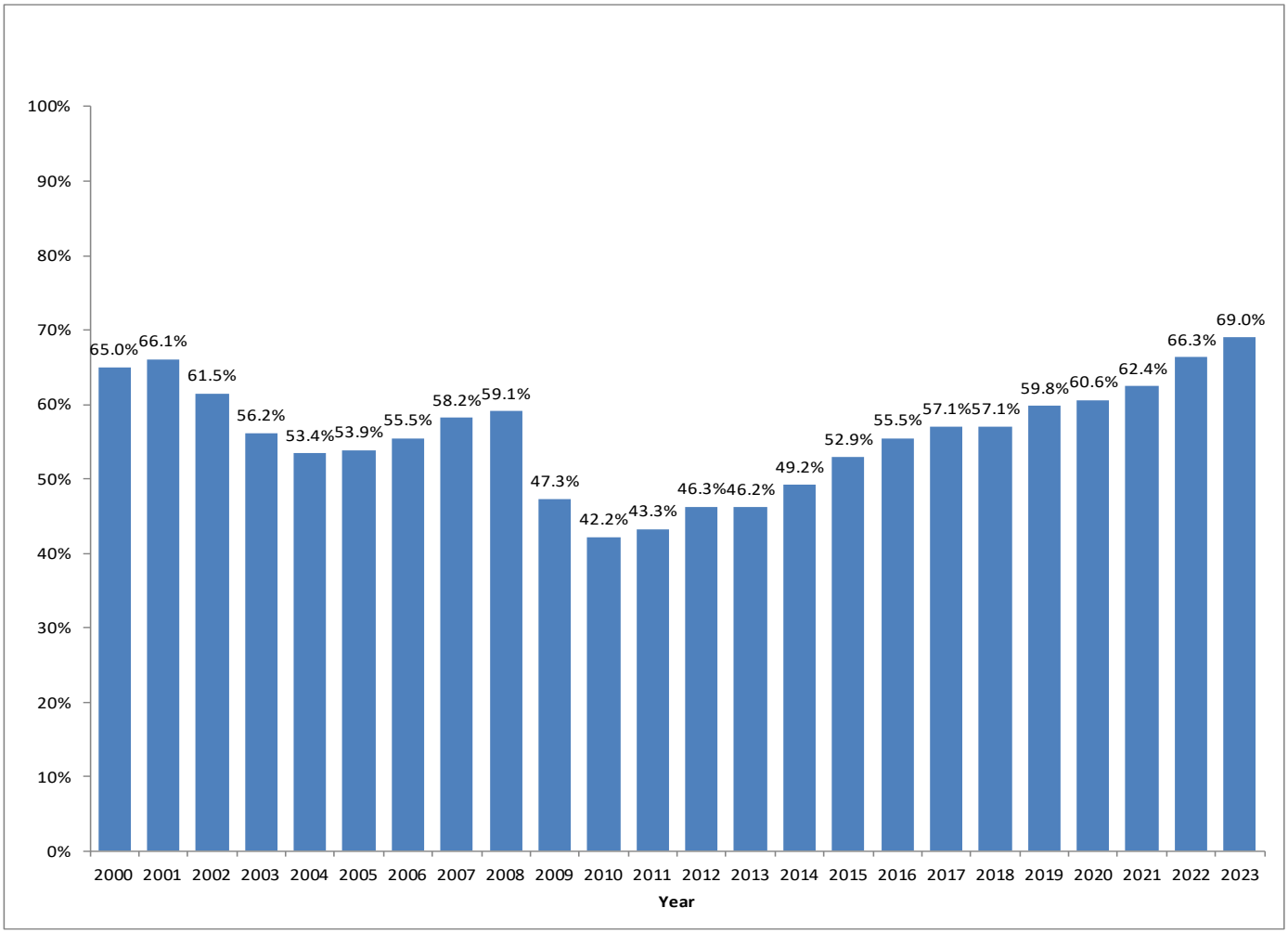
Historical Contribution Rates and Benefit Payouts (Concluded)

Contribution Dollars vs. Benefit Payout Dollars
($ Millions)



Historical Funded Ratios

Actuarial Value of Assets as Percents of Accrued Liabilities (Funded Ratio)



The funded status shown herein is not appropriate to assess the sufficiency of plan assets to cover the estimated cost of settling the Plan's benefit obligations. A funded status below 100% is an indication that additional contributions will be needed in the future, if experience is exactly as assumed. However, a funded status at or above 100% (by itself) cannot be used to determine the need for future contributions.

SECTION A

VALUATION RESULTS

Computed Contributions to Support Benefits for Fiscal Year 2025 Contributions Computed as of June 30, 2023

	Non-Uniformed Employees			Uniformed Patrol		
Contributions for	Closed & Year 2000	2011 Tier	Total	Closed & Year 2000	2011 Tier	Total
Normal Cost						
Age & service benefits	7.660%	6.770%	7.240%	17.820%	14.370%	16.600%
Disability benefits #	0.570%	0.950%	0.750%	0.460%	0.430%	0.450%
Survivor benefits	0.290%	0.340%	0.310%	0.300%	0.250%	0.280%
Separation benefits	1.950%	1.720%	1.840%	1.470%	0.620%	1.170%
Total Normal Cost	10.470%	9.780%	10.140%	20.050%	15.670%	18.500%
Member Contributions	0.000%	4.000%	1.880%	0.000%	4.000%	1.420%
Employer Normal Cost	10.470%	5.780%	8.260%	20.050%	11.670%	17.080%
Unfunded Actuarial Accrued Liabilities*			41.933%			39.596%
Expense Provision			1.340%			1.340%
Subtotal			51.533%			58.016%
Disability Insurance			0.475%			0.475%
Total Contribution Rate			52.008%			58.491%
Projected Dollar Contribution			$ 164,839,283			$ 56,200,938
Prior Year						
Total Contribution Rate			58.000%			58.000%
Projected Dollar Contribution			$ 165,535,149			$ 53,926,974

\# *Includes costs for benefits payable after conversion to normal retirement and/or benefits payable to survivors. Costs for disability benefits payable prior to conversion are shown under Disability Insurance which is outsourced.*

* *Amortized as a level-percentage of payroll over a 1-year amortization period for unfunded retiree liabilities and a 16-year amortization period for other unfunded liabilities from July 1, 2024 and then increased to achieve a minimum of 58% for Non-Uniform and 58% for Uniform total employer contribution rate.*

Development of Contribution Stabilization Reserve Fund as of June 30, 2023

	Non-Uniformed Employees	Uniformed Patrol	Total
Beginning of Year Contribution Stabilization Reserve Fund	$ 149,455,850	$ 21,207,806	$ 170,663,656
Growth (to maintain contribution rate)	100,544,150	-	100,544,150
Reduction (to match contribution rate)	-	(21,207,806)	(21,207,806)
End of Year Contribution Stabilization Reserve Fund	$ 250,000,000	$ -	$ 250,000,000

At the September 25, 2014 Board meeting, the Board adopted the use of a contribution stabilization reserve fund that would result in a MPERS employer contribution of minimum of 58.00% of pay.

At the February 19, 2015 Board meeting, the Board adopted to cap the contribution stabilization reserve fund at $250 million. Furthermore, the Board adopted a motion that if MPERS experienced a loss, MPERS would deplete the entire reserve fund if a loss of that magnitude were to be realized.

In order to determine the current amount of the contribution stabilization reserve fund for the separate groups, we determined the amount of reduction needed to achieve a 58.00% contribution rate for Non-Uniformed employees and a 58.00% contribution rate for Uniformed employees.

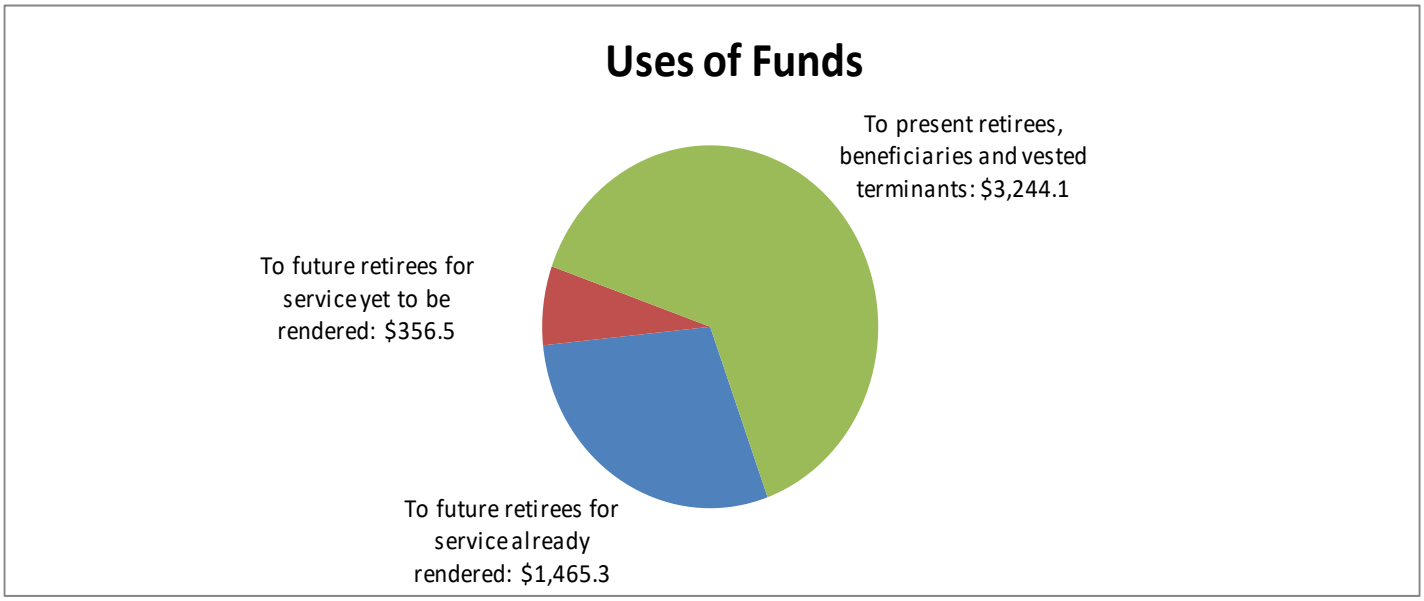
Development of Liabilities
as of June 30, 2023

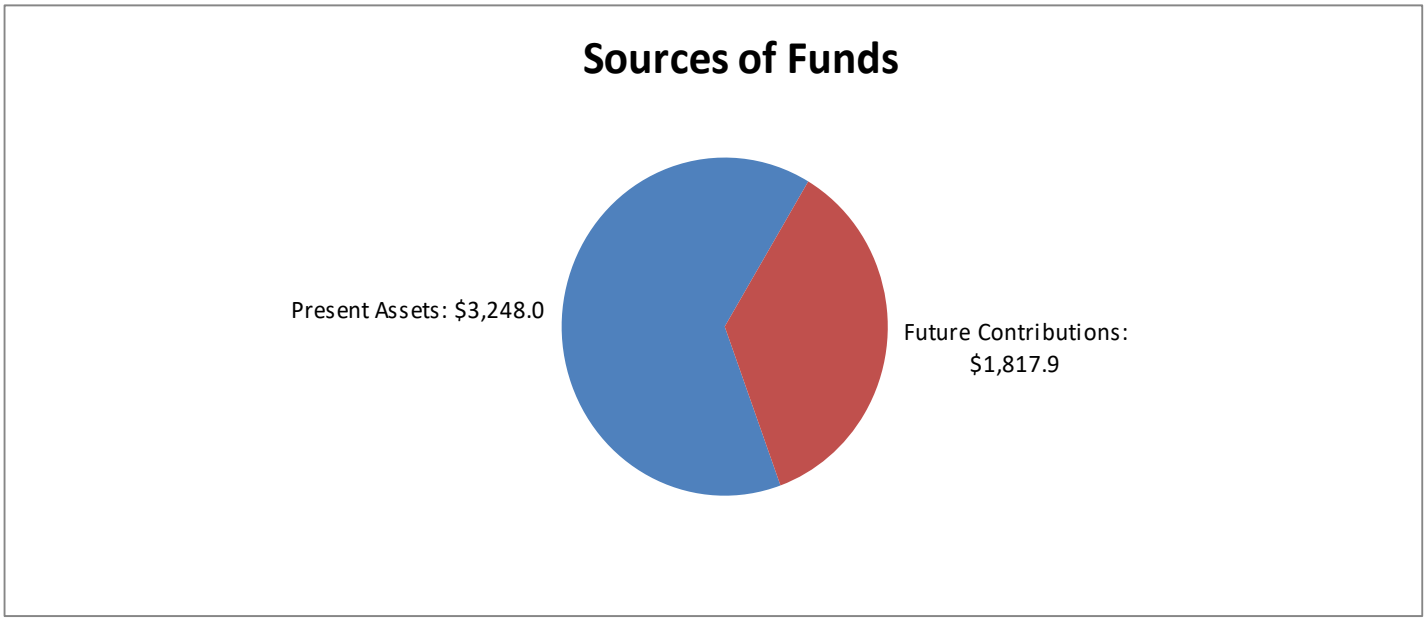
	Non-Uniformed Employees	Uniformed Patrol	Total
Present Value of Future Benefits - Inactives			
Retirees and Survivors	$2,179,902,748	$ 913,823,598	$3,093,726,346
Disability Pensioners	22,307,111	3,480,801	25,787,912
Vested Terminated Employees	107,940,467	16,692,313	124,632,780
Subtotal PVFB - Inactives	2,310,150,326	933,996,712	3,244,147,038
Present Value of Future Benefits - Actives			
Age & Service benefits	1,064,526,840	621,485,739	1,686,012,579
Normal and Work Related Disability benefits	28,529,436	4,382,382	32,911,818
Survivor benefits	21,566,836	5,280,620	26,847,456
Separation benefits	67,535,320	8,441,260	75,976,580
Subtotal PVFB - Actives	1,182,158,432	639,590,001	1,821,748,433
Total Present Value of Future Benefits	3,492,308,758	1,573,586,713	5,065,895,471
Less Present Value of Future Entry Age Normal Costs	207,651,344	148,852,720	356,504,064
Equals Actuarial Accrued Liability	3,284,657,414	1,424,733,993	4,709,391,407
Less Actuarial Value of Assets	2,294,883,908	953,099,425	3,247,983,333
Equals Unfunded Actuarial Accrued Liability	989,773,506	471,634,568	1,461,408,074
Plus Contribution Stabilization Reserve Fund	250,000,000	-	250,000,000
Equals Total Amount Financed	1,239,773,506	471,634,568	1,711,408,074
Amortization Payment on UAAL*	$ 132,905,287	$ 38,045,253	$ 170,950,540
as a % of Projected Payroll	41.933%	39.596%	41.384%

* *Amortized as a level-percentage of payroll over a 1-year amortization period for unfunded retiree liabilities and a 16-year amortization period for other unfunded liabilities from July 1, 2024 and then increased to achieve a minimum of a 58% employer contribution rate for Non-Uniformed employees and 58% employer contribution rate for Uniformed employees.*

System Resources and Obligations
Sources and Uses of $5,065.9 Million
as of June 30, 2023

($ Millions)





Financing Unfunded Actuarial Accrued Liabilities (UAAL) Which Were Calculated Using a Wage Inflation Assumption of 3.00%* and an Investment Return Assumption of 6.50% Compounded Annually 1/16-Year Amortization*

Fiscal Year Ending June 30	Active Employee Payroll	Unfunded Actuarial Accrued Liability at End of Year	Annual UAAL Contributions During Fiscal Year		UAAL at Year End as % of Payroll
			Dollars	% of Payroll	
2023	$ 389,324,744	$ 1,461,408,074			
2024	401,004,487	1,369,502,894	$ 181,073,576	45.155%	341.5%
2025	413,034,622	1,282,093,404	170,930,248	41.384%	310.4%
2026	425,425,661	1,226,426,871	134,671,709	31.656%	288.3%
2027	438,188,431	1,162,971,936	138,711,860	31.656%	265.4%
2028	451,334,084	1,091,097,249	142,873,216	31.656%	241.7%
2029	464,874,107	1,010,126,671	147,159,413	31.656%	217.3%
2030	478,820,330	919,336,249	151,574,195	31.656%	192.0%
2031	493,184,940	817,950,990	156,121,421	31.656%	165.9%
2032	507,980,488	705,141,426	160,805,063	31.656%	138.8%
2033	523,219,903	580,019,949	165,629,215	31.656%	110.9%
2034	538,916,500	441,636,905	170,598,092	31.656%	81.9%
2035	555,083,995	288,976,433	175,716,035	31.656%	52.1%
2036	571,736,515	120,952,024	180,987,516	31.656%	21.2%
2037	588,888,610	-63,598,207	186,417,141	31.656%	-10.8%
2038	606,555,268	-250,000,000	176,589,000	29.113%	-41.2%
2039	624,751,926	-250,000,000	-15,743,700	-2.520%	-40.0%
2040	643,494,484	-250,000,000	-15,743,700	-2.447%	-38.9%

* *Amortized as a level-percentage of payroll over a 1-year amortization period for unfunded retiree liabilities and a 16-year amortization period for other unfunded liabilities from July 1, 2024 and then increased to achieve a 58% minimum total employer contribution rate for Non-Uniformed employees and a 58% minimum total employer contribution rate for Uniformed employees (reduced by the retiree UAAL% once the retiree liabilities are fully amortized). Growth of the stabilization fund was capped at $250 million. Payroll was assumed to increase 3.00%.*

Projected Employer Contributions, 30 Years*

Fiscal Year Ending June 30	Active Employee Payroll	Annual Employer Contributions During Fiscal Year	
		Dollars	% of Payroll
2023	$ 389,324,744		
2024	401,004,487	$ 232,582,602	58.000%
2025	413,034,622	221,175,910	53.549%
2026	425,425,661	186,424,741	43.821%
2027	438,188,431	192,017,483	43.821%
2028	451,334,084	197,778,007	43.821%
2029	464,874,107	203,711,348	43.821%
2030	478,820,330	209,822,688	43.821%
2031	493,184,940	216,117,369	43.821%
2032	507,980,488	222,600,890	43.821%
2033	523,219,903	229,278,917	43.821%
2034	538,916,500	236,157,284	43.821%
2035	555,083,995	243,242,003	43.821%
2036	571,736,515	250,539,263	43.821%
2037	588,888,610	258,055,440	43.821%
2038	606,555,268	250,373,884	41.278%
2039	624,751,926	60,257,323	9.645%
2040	643,494,484	62,534,794	9.718%
2041	662,799,319	64,888,053	9.790%
2042	682,683,299	67,306,939	9.859%
2043	703,163,798	69,798,392	9.926%
2044	724,258,712	72,364,588	9.992%
2045	745,986,473	75,007,771	10.055%
2046	768,366,067	77,730,248	10.116%
2047	791,417,049	80,534,400	10.176%
2048	815,159,560	83,422,677	10.234%
2049	839,614,347	86,397,601	10.290%
2050	864,802,777	89,461,774	10.345%
2051	890,746,860	92,617,872	10.398%
2052	917,469,266	95,868,652	10.449%
2053	944,993,344	99,216,956	10.499%

* *Amortized as a level-percentage of payroll over a 1-year amortization period for unfunded retiree liabilities and a 16-year amortization period for other unfunded liabilities from July 1, 2024 and then increased to achieve a 58% minimum total employer contribution rate for Non-Uniformed employees and a 58% minimum total employer contribution rate for Uniformed employees (reduced by the retiree UAAL% once the retiree liabilities are fully amortized). Growth of the stabilization fund was capped at $250 million. Payroll was assumed to increase 3.00%.*

Projected Employer Contributions and Benefit Payments, 5 Years

Fiscal Year Ending June 30	Projected Annual Amounts During Fiscal Year	
	Employer Contributions	Benefit Payments *
2023		
2024	$ 232,582,602	$ 288,951,697
2025	221,175,910	297,054,235
2026	186,424,741	305,150,978
2027	192,017,483	313,136,581
2028	197,778,007	320,931,880

* *Projected benefit payments include assumed backdrop elections, but does not include any other optional forms of payment elections (other than straight life).*

Historical Funding Progress
June 30, 2023

Year Ending June 30	Actuarial Asset Value	Entry Age Accrued Liability	Unfunded Accrued Liability (UAAL)	Funded Ratio	Estimated Covered Payroll**	UAAL as a Percentage of Covered Payroll
2014	$ 1,795,264,291	$ 3,650,241,741	$ 1,854,977,450	49.18%	$ 336,590,797	551.11%
2015	1,967,001,509	3,715,845,651	1,748,844,142	52.94%	342,264,593	510.96%
2016	2,086,654,348	3,761,733,004	1,675,078,656	55.47%	344,275,147	486.55%
2017	2,172,787,144	3,802,443,730	1,629,656,586	57.14%	356,142,973	457.58%
2018#	2,274,248,122	3,981,838,941	1,707,590,819	57.12%	353,371,000	483.23%
2019	2,415,343,431	4,037,369,708	1,622,026,277	59.82%	362,356,771	447.63%
2020	2,481,329,531	4,092,097,897	1,610,768,366	60.64%	363,572,158	443.04%
2021#	2,711,272,503	4,344,072,912	1,632,800,409	62.41%	358,987,667	454.83%
2022	2,925,561,398	4,410,685,047	1,485,123,649	66.33%	366,743,306	404.95%
2023	**3,247,983,333**	**4,665,012,389**	**1,417,029,056**	**69.62%**	**400,360,785**	**353.94%**
2023#	**3,247,983,333**	**4,709,391,407**	**1,461,408,074**	**68.97%**	**400,360,785**	**365.02%**

** *Values are estimated from contribution rate and amount.*
\# *New assumptions and/or methods adopted.*

Historical Employer Contributions
Non-Uniformed Group
June 30, 2023

Valuation Date	Fiscal Year Ending June 30,	Estimated Covered Payroll**	Actual Employer Contributions	Actual Employer Contribution %	Annually Determined Employer Contribution (ADEC) %	Annually Determined Employer Contribution (ADEC) $	Percentage of ADEC Contributed
June 30, 2012	2014	$ 259,720,022	$ 140,898,112	54.25%	54.25%	$ 140,898,112	100.00%
June 30, 2013#	2015	258,737,537	152,034,177	58.76%	58.76%	152,034,177	100.00%
June 30, 2014	2016	260,714,141	151,344,559	58.05%	58.05%	151,344,559	100.00%
June 30, 2015	2017	269,522,202	156,322,877	58.00%	58.00%	156,322,877	100.00%
June 30, 2016	2018	269,229,112	156,152,885	58.00%	58.00%	156,152,885	100.00%
June 30, 2017	2019	276,575,119	160,413,569	58.00%	58.00%	160,413,569	100.00%
June 30, 2018#	2020	278,280,036	161,402,421	58.00%	58.00%	161,402,421	100.00%
June 30, 2019	2021	272,509,434	158,055,472	58.00%	58.00%	158,055,472	100.00%
June 30, 2020	2022	278,453,278	161,502,901	58.00%	58.00%	161,502,901	100.00%
June 30, 2021#	**2023**	**307,466,764**	**178,330,723**	**58.00%**	**58.00%**	**178,330,723**	**100.00%**

** *Values are estimated from contribution rate and amount.*
\# *New assumptions and/or methods adopted.*
Includes non-uniformed employees of MoDOT, Uniformed Patrol, and MPERS.

This information is presented in draft form for review by the System's auditor. Please let us know if there are any items that the auditor changes so that we may maintain consistency with the System's financial statements.

Historical Employer Contributions
Uniformed Patrol Group
June 30, 2023

Valuation Date	Fiscal Year Ending June 30,	Estimated Covered Payroll**	Actual Employer Contributions	Actual Employer Contribution %	Annually Determined Employer Contribution (ADEC) %	Annually Determined Employer Contribution (ADEC) $	Percentage of ADEC Contributed
June 30, 2012	2014	$ 76,870,775	$ 42,455,729	55.230%	55.230%	$ 42,455,729	100.00%
June 30, 2013#	2015	83,527,056	48,604,394	58.190%	58.190%	48,604,394	100.00%
June 30, 2014	2016	83,561,006	48,264,837	57.760%	57.760%	48,264,837	100.00%
June 30, 2015	2017	86,620,771	50,240,047	58.000%	58.000%	50,240,047	100.00%
June 30, 2016	2018	84,141,888	48,802,295	58.000%	58.000%	48,802,295	100.00%
June 30, 2017	2019	85,781,652	49,753,358	58.000%	58.000%	49,753,358	100.00%
June 30, 2018#	2020	85,292,122	49,469,431	58.000%	58.000%	49,469,431	100.00%
June 30, 2019	2021	86,478,233	50,157,375	58.000%	58.000%	50,157,375	100.00%
June 30, 2020	2022	88,290,028	51,208,216	58.000%	58.000%	51,208,216	100.00%
June 30, 2021#	**2023**	**92,894,021**	**54,483,272**	**58.651%**	**58.651%**	**54,483,272**	**100.00%**

*** Values are estimated from contribution rate and amount.*
 # New assumptions and/or methods adopted.

This information is presented in draft form for review by the System's auditor. Please let us know if there are any items that the auditor changes so that we may maintain consistency with the System's financial statements.

Development of Gain/(Loss)
July 1, 2022 to June 30, 2023

	UAAL =	AAL -	Assets
Beginning of Year Values (at July 1)	$ 1,485,123,649	$ 4,410,685,047	$ 2,925,561,398
Normal Cost	53,219,149	53,219,149	0
Transfer In and Service Purchase - Liability	4,610,022	4,610,022	0
Contributions	(244,262,169)	0	244,262,169
Disbursements	0	(294,585,794)	(294,585,794)
Interest	90,473,965	278,999,938	188,525,973
Expected Value Before Any Changes	1,389,164,616	4,452,928,362	3,063,763,746
Effect of Benefit Changes	0	0	0
Effect of Changes in Assumptions & Methods	44,379,018	44,379,018	0
Effect of Adjustment	0	0	0
Expected Value after Changes	1,433,543,634	4,497,307,380	3,063,763,746
End of Year Values (at June 30)	1,461,408,074	4,709,391,407	3,247,983,333
Gain/(Loss) for Year	$ (27,864,440)	$ (212,084,027)	$ 184,219,587

Development of Gain/(Loss)
July 1, 2022 to June 30, 2023

	Total	Non-Uniformed	Uniformed
Beginning of Year UAAL (at July 1)	$ 1,485,123,649	$ 1,032,184,126	$ 452,939,523
Normal Cost	53,219,149	35,260,040	17,959,109
Transfer In and Service Purchase - Liability	4,610,022	4,157,556	452,466
Contributions	(244,262,169)	(188,068,220)	(56,193,949)
Interest	90,473,965	62,260,823	28,213,142
Net Change in LTD Assets	0	0	0
Expected Value Before Any Changes	1,389,164,616	945,794,325	443,370,291
Effect of Benefit Changes	0	0	0
Effect of Changes in Assumptions & Methods	44,379,018	19,462,907	24,916,111
Effect of Adjustment	0	0	0
Expected Value After Changes	1,433,543,634	965,257,232	468,286,402
End of Year UAAL (at June 30)	1,461,408,074	989,773,506	471,634,568

Aggregate Gain/(Loss) for Year	$ (27,864,440)	$ (24,516,274)	$ (3,348,166)
Gain/(Loss) as a % of Beginning of Year Liabilities	(0.63)%	(0.79)%	(0.25)%

Asset Gain/(Loss) for Year	$ 184,219,587	$ 129,792,533	$ 54,427,054
Liability Gain/(Loss) for Year	(212,084,027)	(154,308,807)	(57,775,220)
Aggregate Gain/(Loss) for Year	$ (27,864,440)	$ (24,516,274)	$ (3,348,166)

Risk Measures

Plan Maturity Measures: Risks facing a pension plan evolve over time. A young plan with virtually no investments and paying few benefits may experience little investment risk. An older plan with a large number of members in pay status and a significant trust may be much more exposed to investment risk. Generally accepted plan maturity measures include the following:

	2023	2022	2021	2020
Ratio of the market value of assets to total payroll	8.43	8.60	8.46	6.54
Ratio of actives to retirees and beneficiaries	1.45	1.37	1.28	1.26
Duration of the actuarial liability	11.97	11.64	11.72	11.36

Ratio of Market Value of Assets to Payroll: The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. For example, if the market value of assets is 2.0 times the payroll, a return on assets 5% different than assumed would equal 10% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in plan sponsor contributions as a percentage of payroll.

Ratio of Actives to Retirees and Beneficiaries: A young plan with many active members and few retirees will have a high ratio of actives to retirees. A mature open plan may have close to the same number of actives to retirees resulting in a ratio near 1.0. A super-mature or closed plan may have significantly more retirees than actives resulting in a ratio below 1.0.

Duration of Actuarial Liability: The duration of the actuarial liability may be used to approximate the sensitivity to a 1% change in the assumed rate of return. For example, a duration of 10 indicates that the liability would increase approximately 10% if the assumed rate of return were lowered 1%.

Additional Risk Assessment: Additional risk assessment is outside the scope of the annual actuarial valuation. Additional assessment may include scenario tests, sensitivity tests, stochastic modeling, stress tests, and a comparison of the present value of accrued benefits at low-risk discount rates with the actuarial accrued liability.

A table of additional historical risk measures is shown on the next page.

Risk Measures

($ Thousands)

Valuation Date June 30	(1) Accrued Liabilities (AAL)	(2) Market Value of Assets	(3) Unfunded AAL (1)-(2)	(4) Valuation Payroll	(5) Funded Ratio (2)/(1)	(6) Liability/ Payroll (1)/(4)	(7) Assets/ Payroll (2)/(4)	(8) Unfunded/ Payroll (3)/(4)	(9) Portfolio Rate of Return#	(10) 10-Year Trailing Average	(11) Non-Investment Net Cash Flow	(12) Non-Investment Net Cash Flow Percent of Beginning of Year Assets (11)/(2[Prior Year])
2017	$ 3,802,444	$ 2,169,775	$ 1,632,669	$ 348,979	57.1%	1,089.6%	621.8%	467.8%	11.2%	N/A	$ (42,601)	(2.1)%
2018	3,981,839	2,314,530	1,667,309	351,497	58.1%	1,132.8%	658.5%	474.3%	9.2%	N/A	(51,928)	(2.4)%
2019	4,037,370	2,423,262	1,614,108	359,296	60.0%	1,123.7%	674.5%	449.2%	6.7%	N/A	(45,595)	(2.0)%
2020	4,092,098	2,361,600	1,730,498	360,852	57.7%	1,134.0%	654.4%	479.6%	-0.4%	N/A	(50,994)	(2.1)%
2021	4,344,073	3,003,925	1,340,148	355,195	69.1%	1,223.0%	845.7%	377.3%	30.0%	N/A	(57,319)	(2.4)%
2022	4,410,685	3,067,193	1,343,492	356,662	69.5%	1,236.7%	860.0%	376.7%	3.9%	N/A	(59,500)	(2.0)%
2023	4,709,391	3,281,628	1,427,763	389,325	69.7%	1,209.6%	842.9%	366.7%	8.9%	N/A	(50,324)	(1.6)%

(5) The funded ratio is the most widely known measure of a plan's financial strength, but the trend in the funded ratio is much more important than the absolute ratio. The funded ratio should trend to 100%. As it approaches 100%, it is important to re-evaluate the level of investment risk in the portfolio and potentially to re-evaluate the assumed rate of return.

(6) and (7) The ratio of liabilities and assets to payroll gives an indication of both maturity and volatility. Many systems have values between 500% and 700%. Values significantly above that range may indicate difficulty in supporting the benefit level as a level % of payroll.

(8) The ratio of unfunded liability to payroll gives an indication of the plan's sensitivity to differences between assumed and actual experience related to the employer contributions. A value above approximately 300% or 400% may indicate high volatility relative to small gains and losses.

(9) and (10) Investment return is probably the largest single risk that most systems face. The year-by-year return and the 10-year geometric average give an indicator of the realism of the System's assumed return.

(11) and (12) Non-Divestment Net Cash Flow is a measure of both risk and maturity. For a mature plan the absolute value of (12) should be in the order of the assumed real rate of return over wage inflation (currently assumed to be 4.00%). A more negative number indicates a plan that is more at risk of fund depletion and more sensitive to annual gains and losses.

 # Rates prior to the June 30, 2022 valuation were calculated by GRS. Rates on or after the June 30, 2022 valuation were provided by the System's investment consultant.

Low-Default-Risk Obligation Measure

INTRODUCTION

In December 2021, the Actuarial Standards Board (ASB) adopted a revision to Actuarial Standard of Practice (ASOP) No. 4, *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions*. The revised ASOP No. 4 requires the calculation and disclosure of a liability referred to by the ASOP as the "Low-Default-Risk Obligation Measure" (LDROM). The rationale that the ASB cited for the calculation and disclosure of the LDROM was included in the Transmittal Memorandum of ASOP No. 4 and is presented below (emphasis added):

> "The ASB believes that the calculation and disclosure of this measure provides **appropriate, useful information for the intended user regarding the funded status of a pension plan**. The calculation and disclosure of this additional measure is **not intended to suggest that this is the "right" liability measure** for a pension plan. However, the ASB does believe that **this additional disclosure provides a more complete assessment of a plan's funded status and provides additional information regarding the security of benefits that members have earned as of the measurement date.**"

COMPARING THE ACCRUED LIABILITIES AND THE LDROM

One of the fundamental financial objectives of MPERS is to finance each member's retirement benefits over the period from the member's date of hire until the member's projected date of retirement (entry age actuarial cost method) as a level percentage of payroll. To fulfill this objective, the discount rate that is used to value the accrued liabilities of MPERS is set equal to the **expected return** on the System's diversified portfolio of assets (referred to sometimes as the investment return assumption). For MPERS, the investment return assumption is 6.50%.

The LDROM is meant to approximately represent the lump sum cost to a plan to purchase low-default-risk fixed income securities whose resulting cash flows essentially replicate in timing and amount the benefits earned (or the costs accrued) as of the measurement date. The LDROM is very dependent upon market interest rates at the time of the LDROM measurement. The lower the market interest rates, the higher the LDROM, and vice versa. The LDROM results presented in this report are based on the projected unit credit actuarial cost method and discount rates based upon the March 2023 Treasury Yield Curve Spot Rates (end of month). The 1-, 5-, 10- and 30-year rates follow: 4.87%, 3.64%, 3.45% and 3.88%.

Presented below are the actuarial accrued liability and the LDROM as of June 30, 2023 for MPERS.

Type of member	Valuation AAL	LDROM
Retirees	$ 3,119,514,258	$ 4,077,460,843
Deferreds	124,632,780	219,000,354
Actives	1,465,244,369	2,337,321,499
Totals	**$ 4,709,391,407**	**$ 6,633,782,696**

Low-Default-Risk Obligation Measure

COMMENTARY REGARDING THE LDROM

Some ways in which the LDROM can assist the MPERS Board of Trustee in a decision-making process include:

(1) It provides information to potentially allow for better risk management for MPERS;
(2) It places the appropriateness of potential employer contribution rate reductions or benefit enhancements in a better context; and
(3) It provides more complete information regarding the benefit security of the membership's benefits earned as of the measurement date.

Potentially Allows for Better Risk Management: A very useful risk metric to exhibit potential contribution rate volatility (or amortization period volatility for fixed rate plans) is the ratio of assets to payroll or AAL to payroll. How could we reduce that potential contribution rate volatility (or amortization period volatility for fixed rate plans)? The LDROM and liability driven investing (LDI) are closely related concepts. Other than reducing benefits, all other things being equal, the only way to reduce that volatility is to immunize (i.e., LDI) a portion of the System's liability. This does not mean that the System needs to immunize all of the liability. For example, if they could immunize half of it, they could reduce the contribution rate volatility in half. This would require the actuary to use a cash flow matching method to value that portion of the liabilities. This means that the actuary would not use the System's investment return assumption for this portion of the liability, but the yield curve resulting from the fixed income portfolio that is being used to immunize the liability. The value of the assets (i.e., fixed income portfolio) and the value of the immunized liability would move in tandem with any changes (up or down) in future interest rates. The result being that the immunized portion of the System's liability would not have the potential of producing new unfunded actuarial accrued liabilities. However, the fixed income portfolio would still have the minor potential for credit default risk.

Places the Appropriateness of Potential Employer Contribution Rate Reductions or Benefit Enhancements in a Better Context: Many PERS have adopted a funding policy. Many funding policies already take into account the System's funded ratio (based upon the AAL) when considering whether to allow for benefit enhancements or contribution rate reductions. For example, a System may not allow for a benefit enhancement if the funded ratio does not exceed a certain threshold. Similarly, a System may not allow for an employer contribution rate reduction in some circumstances. For example, a reduction to the employer normal cost contribution may not be allowed until the System reaches a funded ratio of 120%. Given the fact that most criteria are based upon the expectation of earning the investment return assumption, a System may want to consider extending these criteria to a funded ratio based upon the LDROM in addition to the AAL.

Provides more Complete Information Regarding the Benefit Security of the Membership's Benefits Earned as of the Measurement Date: Too often a high funded ratio (e.g., 100% funded) on an AAL basis is interpreted as benefit security for the participants. The fact that this funded ratio is based upon an expected measure is many times overlooked. If the AAL and LDROM measures are relatively close, then the System at least has the opportunity to make benefits payable in the future more secure.

SECTION B

SUMMARY OF BENEFITS

Missouri Department of Transportation and Highway Patrol Employees' Retirement System
Summary of Benefit Provisions Evaluated as of June 30, 2023

Closed Plan	Year 2000 Plan	2011 Tier

Participation

Participants include:

All MPERS active members, vested terminated members, disability recipients, retirees and survivors who first became members prior to July 1, 2000 and who do not elect to transfer to the Year 2000 Plan at retirement.

Participation

Participants include:

1. All active employees who first became members on or after July 1, 2000 but prior to January 1, 2011.
2. Closed Plan active members and vested former members who elect to transfer to the Year 2000 Plan at retirement.
3. Closed Plan retirees who elected to transfer to the Year 2000 Plan during the election window from July 1, 2000 through July 1, 2001, and their survivors.
4. Closed Plan members who left state employment prior to becoming vested (not eligible for a future retirement benefit) and return to work in a benefit eligible position on or after July 1, 2000.

Participation

Participants include:

1. All employees who first become members on or after January 1, 2011.

Closed Plan	Year 2000 Plan	2011 Tier
Normal Retirement Eligibility (unreduced benefit)	**Normal Retirement Eligibility (unreduced benefit)**	**Normal Retirement Eligibility (unreduced benefit)**
Non-Uniformed Employees: The earlier of attaining: 1. Age 65 with at least 4 years of creditable service. 2. Age 60 with at least 15 years of creditable service. 3. Age 48 with age plus creditable service equal to 80 or more. 4. Age 65 with at least 5 years of service (deferred).*	***Non-Uniformed Employees:*** The earlier of attaining: 1. Age 62 with at least 5 years of creditable service. 2. Age 48 with age plus creditable service equal to 80 or more.	***Non-Uniformed Employees:*** The earlier of attaining: 1. Age 67 with at least 5 years of creditable service. 2. Age 55 with age plus creditable service equal to 90 or more.
Uniformed Patrol Employees Only: The earlier of attaining: 1. Age 55 with at least 4 years of creditable service. 2. Mandatory retirement at age 60. 3. Age 48 with age plus creditable service equal to 80 or more.	***Uniformed Patrol Employees Only:*** The earlier of attaining: 1. Mandatory retirement at age 60. 2. Age 48 with age plus creditable service equal to 80 or more.	***Uniformed Patrol Employees Only:*** The earlier of attaining: 1. Age 55 with at least 5 years of creditable service. 2. Mandatory retirement at age 60.
Final Average Pay Used for Benefit Determination	**Final Average Pay Used for Benefit Determination**	**Final Average Pay Used for Benefit Determination**
Final Average Pay is the average annual pay of a member for the three consecutive years of service during which pay was highest (overtime pay is included for purposes of determining average pay). Employees terminating after reaching retirement eligibility will receive 1/12 of a year of creditable service for every 168 hours of unused sick leave (usable only for benefit computation, not eligibility).	Final Average Pay is the average annual pay of a member for the three consecutive years of service during which pay was highest (overtime pay is included for purposes of determining average pay). All vested members will receive 1/12 of a year of creditable service for every 168 hours of unused sick leave (usable only for benefit computation, not eligibility).	Final Average Pay is the average annual pay of a member for the three consecutive years of service during which pay was highest (overtime pay is included for purposes of determining average pay). Employees terminating after reaching retirement eligibility will receive 1/12 of a year of creditable service for every 168 hours of unused sick leave (usable only for benefit computation, not eligibility).

**See Chapter 104.010.1(32) RSMo.*

Closed Plan	Year 2000 Plan	2011 Tier
Normal Retirement Benefit Amount	**Normal Retirement Benefit Amount**	**Normal Retirement Benefit Amount**
Non-Uniformed Employees: Life Benefit: 1.6% of final average pay times years of creditable service. ***Uniformed Patrol Employees:*** Life Benefit: 2.1333% of final average pay times years of creditable service. Special Benefit: $90 per month payable until age 65. Offset by any amount earned from gainful employment. This benefit does not apply to uniformed members hired on or after January 1, 1995.	***All Employees:*** Life Benefit: 1.7% of final average pay times years of creditable service. Temporary Benefit: If member retires between ages 48 and 62 with age plus creditable service equal to 80 or more, a temporary benefit is payable in the amount of 0.8% of final average pay times years of creditable service until attainment of age 62 or death, whichever occurs first. All Uniformed Patrol members are eligible for the temporary benefit until age 62.	***All Employees:*** Life Benefit: 1.7% of final average pay times years of creditable service. Temporary Benefit: If member retires between ages 55 and 62 with age plus creditable service equal to 90 or more, a temporary benefit is payable in the amount of 0.8% of final average pay times years of creditable service until attainment of age 62 or death, whichever occurs first. All Uniformed Patrol members are eligible for the temporary benefit until age 62.
Early Retirement (reduced benefit)	**Early Retirement (reduced benefit)**	**Early Retirement (reduced benefit)**
Eligibility: Non-Uniformed Employees Age 55 with at least 10 years of creditable service. ***Amount:*** Normal retirement amount reduced by 0.6% for each month that retirement precedes eligibility for normal retirement. ***Uniformed Patrol*** members are not eligible for early retirement.	***Eligibility: All Employees*** Age 57 with at least 5 years of creditable service. ***Amount:*** Normal retirement amount reduced by 0.5% for each month that retirement precedes eligibility for normal retirement.	***Eligibility: All Active Non-Uniformed Employees*** Age 62 with at least 5 years of creditable service. ***Amount:*** Normal retirement amount reduced by 0.5% for each month that retirement precedes eligibility for normal retirement. ***Uniformed Patrol*** members are not eligible for early retirement.

Closed Plan	Year 2000 Plan	2011 Tier
Vested Deferred Benefits	**Vested Deferred Benefits**	**Vested Deferred Benefits**
Eligibility: All Employees Fully vested in accrued pension with 5 years of creditable service. The benefit will commence at the age the individual is eligible for early or normal retirement, considering years of creditable service.	***Eligibility: All Employees*** Fully vested in accrued pension with 5 years of creditable service. The benefit will commence at the age the individual is eligible for early or normal retirement considering years of creditable service. Normal retirement eligibility begins at age 62.	***Eligibility: All Employees*** Fully vested in accrued pension with 5 years of creditable service. The benefit will commence at the age the individual is eligible for normal retirement considering years of creditable service. Normal retirement eligibility begins at age 67.
Minimum Base Benefit	**Minimum Base Benefit**	**Minimum Base Benefit**
Receive a monthly base benefit of no less than $15 for each full year of creditable service. Must be eligible to receive a normal or early retirement benefit the first of the month immediately following the date you leave state employment. Not required to immediately start drawing a benefit.	Same.	Same.
Death Prior to Retirement	**Death Prior to Retirement**	**Death Prior to Retirement**
The spouse of the member who dies after accruing 5 years of creditable service may elect to receive an annuity as if the employee had retired on the date of death and elected a joint and 100% survivor annuity. If no eligible spouse survives or upon the death of the spouse, 80% of the member's accrued annuity will be paid to eligible children until age 21. If the member has 3 or more, but less than 5 years of creditable service, the surviving spouse may elect to receive an annuity equal to 25% of the accrued benefit. If the death is duty-related, there is no service requirement and the minimum annuity is 50% of the final average pay (FAP) to the surviving spouse or eligible children.	The spouse of the member who dies after accruing 5 years of creditable service may elect to receive an annuity as if the employee had retired on the date of death and elected a joint and 100% survivor annuity. If no eligible spouse survives or upon the death of the spouse, 80% of the member's accrued annuity will be paid to eligible children until age 21. If the death is duty related, there is no service requirement and the minimum annuity is 50% of the final average pay (FAP) to the surviving spouse or eligible children.	**Actives:** The spouse of the member who dies after accruing 5 years of creditable service may elect to receive an annuity as if the employee had retired on the date of death and elected a joint and 100% survivor annuity. **Deferred:** The spouse of a vested former member who dies after accruing 5 years of creditable service may elect to receive an annuity on the date the member would have attained normal retirement eligibility based on a joint and 100% survivor annuity election. If no eligible spouse survives or upon the death of the spouse, 80% of the member's accrued annuity will be paid to eligible children until age 21. If the death is duty related, there is no service requirement and the minimum annuity is 50% of the final average pay (FAP) to the surviving spouse or eligible children.

Closed Plan	Year 2000 Plan	2011 Tier
Death After Retirement	**Death After Retirement**	**Death After Retirement**
The benefit payable is 50% of the benefit the retired member was receiving on the date of death (the normal form of payment), or the benefit payable under the joint and survivor or period certain form of payment, if the member elected an optional form of payment at time of retirement. A member who is not married at retirement but marries thereafter may designate a spouse as beneficiary. Additionally, a member may designate a new spouse as beneficiary in the event of the death of the spouse the member was married to at the date of retirement. The election must be completed within one year of the date of marriage. For period certain annuities, beneficiaries may be changed at any time.	The benefit payable under the joint and survivor or period certain form of payment, if the member elected an optional form of payment at time of retirement. A member who is not married at retirement but marries thereafter may designate a spouse as beneficiary. Additionally, a member may designate a new spouse as beneficiary in the event of the death of the spouse the member was married to at the date of retirement. The election must be completed within one year of the date of marriage. For period certain annuities, beneficiaries may be changed at any time.	The benefit payable under the joint and survivor or period certain form of payment, if the member elected an optional form of payment at time of retirement. A member who is not married at retirement but marries thereafter may designate a spouse as beneficiary. Additionally, a member may designate a new spouse as beneficiary in the event of the death of the spouse the member was married to at the date of retirement. The election must be completed within one year of the date of marriage. For period certain annuities, beneficiaries may be changed at any time.
Pop-Up Provision	**Pop-Up Provision**	**Pop-Up Provision**
Benefits to members who choose a reduced survivor form of payment and whose spouse precedes the member in death, will “pop-up” or revert to the amount the member would have received had he/she not elected a reduced survivor option.	Same.	Same.

Closed Plan	Year 2000 Plan	2011 Tier
$5,000 Death Benefit	**$5,000 Death Benefit**	**$5,000 Death Benefit**
MPERS provides a $5,000 death benefit for a designated beneficiary(ies) of members who retire from service or were approved for normal or work-related disability benefits after September 28, 1985. Members who die while on terminated vested status or long-term disability status do not qualify for this benefit. Long-term disability recipients who retire on or after September 28, 1985 are eligible to receive this benefit.	MPERS provides a $5,000 death benefit for a designated beneficiary(ies) of members who retire from service or were approved for work-related disability benefits. Members who die while on terminated vested status or long-term disability status do not qualify for this benefit. Long-term disability recipients who retire are eligible to receive this benefit.	MPERS provides a $5,000 death benefit for a designated beneficiary(ies) of members who retire from service or were approved for work-related disability benefits. Members who die while on terminated vested status or long-term disability status do not qualify for this benefit. Long-term disability recipients who retire are eligible to receive this benefit.
Purchase of Service	**Purchase of Service**	**Purchase of Service**
Military: Prior to retirement, qualifying members may purchase up to a maximum of 4 years military service that includes active service, and/or active and inactive duty training from which they were honorably discharged. All months the member is eligible for must be purchased. This service credit ***can*** be used to satisfy the vesting requirement. Periods of military service cannot coincide with employment in a state agency.	**Military:** Prior to retirement, qualifying members may purchase up to a maximum of 4 years military service that includes active service from which they were honorably discharged. All months the member is eligible for must be purchased. This service credit ***cannot*** be used to satisfy the vesting requirement. Periods of military service cannot coincide with employment in a state agency.	**Military:** Not available.
Police Service: Prior to retirement, uniformed patrol members only, may purchase up to a maximum of 4 years police service. Members must purchase all months of service they are eligible for.	**Police Service:** Not available.	**Police Service:** Not available.

Closed Plan	Year 2000 Plan	2011 Tier
Portability: Section 105.691 allows vested members to acquire (purchase/transfer) service credit for any non-federal, full-time public sector employment within Missouri. Service may be purchased/transferred by using the member's own money and/or using the value of the retirement benefit in the prior retirement plan if that plan has an agreement with MPERS. Any non-federal public employment **not covered** by a retirement plan must be purchased.	**Portability:** Same as Closed Plan Section 105.691.	**Portability:** Same as Closed Plan Section 105.691.
Public Employment Prior Service (Subsidized Purchase)	**Public Employment Prior Service (Subsidized Purchase)**	**Public Employment Prior Service (Subsidized Purchase)**
Section 104.040.6 allows, prior to retirement, members may purchase up to a maximum of 4 years full-time "public employment." Public employment refers to employment with a city, county, municipality, public school, or other political subdivision. Federal and out-of-state employment is not eligible. Members must purchase all months of service they are eligible for up to 4 years.	Not available.	Not available.
Disability	**Disability**	**Disability**
Benefits that may be payable during the period of disability (whether Normal, Work-related, or LTD) are administered through a separate program and were not considered for purposes of the valuation. Normal retirement benefits become payable at the time a disabled member becomes eligible for normal retirement, and are computed based on: i) the service that would have accrued to the member if active employment had continued; and ii) the member's rate of pay at the time of disability.	Benefits that may be payable during the period of disability (whether Normal, Work-related, or LTD) are administered through a separate program and were not considered for purposes of the valuation. Normal retirement benefits become payable at the time a disabled member becomes eligible for normal retirement, and are computed based on: i) the service that would have accrued to the member if active employment had continued; and ii) the member's rate of pay at the time of disability increased by 80% of CPI to the retirement date.	Benefits that may be payable during the period of disability (whether Normal, Work-related, or LTD) are administered through a separate program and were not considered for purposes of the valuation. Normal retirement benefits become payable at the time a disabled member becomes eligible for normal retirement, and are computed based on: i) the service that would have accrued to the member if active employment had continued; and ii) the member's rate of pay at the time of disability increased by 80% of CPI to the retirement date.

Closed Plan	Year 2000 Plan	2011 Tier
Post-Retirement Benefit Adjustments For active and inactive employees and current retirees hired prior to August 28, 1997, the benefits of pensioners and their beneficiaries are increased annually by 80% of the increase in the Consumer Price Index (subject to a maximum increase of 5% and a minimum of 4%). These increases are made until the total of the increases reaches 65% of initial benefit at which time the increases will have the minimum removed. For employees hired on or after August 28, 1997 the annual percentage increase is equal to the lesser of: i) 80% of the CPI-U increase, or ii) 5%.	**Post-Retirement Benefit Adjustments** Benefits are increased to retired members (including survivors) annually in accordance with the following: Annual benefit percentage increase equal to the lesser of: i) 80% of the CPI-U increase, or ii) 5%.	**Post-Retirement Benefit Adjustments** Benefits are increased to retired members (including survivors) annually* in accordance with the following: Annual benefit percentage increase equal to the lesser of: i) 80% of the CPI-U increase, or ii) 5%. ** Vested former members and their survivor benefits are increased beginning on the second anniversary of retirement.*
Member Contributions None.	**Member Contributions** None.	**Member Contributions** 4% contributions with interest credited annually at a rate equal to the investment rate published by the US Department of Treasury for 52-week treasury bill, nearest the preceding July 1st. The state of Missouri employer shall pick up and pay the contributions. A deduction shall be made from each member's compensation equal to the amount of the member's contributions picked up by the employer.

The Closed Plan and Year 2000 Plan
BackDROP Option

Legislation effective January 1, 2002 provides a Deferred Retirement Option Provision (BackDROP) to members of MPERS. It is available in both the Closed Plan and the Year 2000 Plan.

To be eligible to participate in the BackDROP, a member must have been eligible to retire under normal age and/or service conditions for at least two years. A retroactive starting date is established for BackDROP purposes which is the later of: 1) the member's normal retirement date; or 2) five years prior to the annuity starting date under the retirement plan selected by the member.

The BackDROP period for the accumulation of the BackDROP amount is from the retroactive starting date to the annuity starting date. This results in a BackDROP period of one to five years depending upon the individual situation.

A theoretical BackDROP account is accumulated that includes 90% of the value of the benefit payments that would have been paid during the BackDROP period had the member retired at the retroactive starting date. These payments include applicable post-retirement benefit increases. These payments do not include any reduction for spouse options during the BackDROP period. The member may choose the BackDROP period in 12-month increments or their maximum period, not to exceed 60 months.

The member is paid the resulting lump sum value of the BackDROP account as of the annuity starting date or as three equal annual installments beginning at the annuity starting date.

The annuity benefit payable from the actual retirement date is computed with years of service and final average pay as of the retroactive starting date for the BackDROP. Post-retirement benefit increases that occurred during the BackDROP period are applied in the calculation of the monthly annuity.

Sample Benefit Computation for Closed Plan Members
Retiring July 1, 2023
Non-Uniformed Employee

	Data	Description
A.	$40,000	Final Average Pay
B.	20	Years of Creditable Service
C.	60	Age of Retiree
D.	50%	Automatic percentage to continue to spouse after retirant's death

Sample Computation Steps

E.	Retirement Benefit Formula:	0.016 x 20 x $40,000 = $12,800

Benefit payable to:

F.	Retiree while spouse is alive (E)	$ 12,800
G.	Spouse after retiree's death (D x E)	$ 6,400
H.	Retiree after spouse's death	$ 12,800

Year Ended June 30	Annual Amount Payable if Price Inflation is 2.25% and Post-Retirement Increases are 1.8%
2023	$12,800
2024	13,030
2025	13,265
2026	13,504
2027	13,747
2028	13,994
2029	14,246
2030	14,503
2031	14,764
2032	15,029

Sample Benefit Computation for Closed Plan Members
Retiring July 1, 2023
Uniformed Patrol

	Data	Description
A.	$40,000	Final Average Pay
B.	20	Years of Creditable Service
C.	60	Age of Retiree
D.	50%	Automatic percentage to continue to spouse after retirant's death

Sample Computation Steps

E.	Retirement Benefit Formula:	0.021333 x 20 x $40,000 = $17,066

Benefit payable to:

F.	Retiree while spouse is alive (E)	$ 17,066
G.	Spouse after retiree's death (D x E)	$ 8,533
H.	Retiree after spouse's death	$ 17,066

Amounts shown below do not include the $1,080 annual supplementary benefit payable to age 65.

Year Ended June 30	Annual Amount Payable if Price Inflation is 2.25% and Post-Retirement Increases are 1.8%
2023	$17,066
2024	17,373
2025	17,686
2026	18,004
2027	18,328
2028	18,658
2029	18,994
2030	19,336
2031	19,684
2032	20,038

Sample Benefit Computation for Year 2000 Plan Members Retiring July 1, 2023

	Data	Description
A.	$40,000	Final Average Pay
B.	20	Years of Creditable Service
C.	60 (67 for 2011 Tier)	Age of Retiree
D.	0%	Automatic percentage to continue to spouse after retirant's death

E1.	Retirement Benefit Formula:	0.017 x 20 x $40,000 = $13,600
E2.	Supplemental Benefit Formula:	.008 x 20 x $40,000 = $6,400

Benefit payable to:

F1.	Retiree prior to age 62 (E1+E2)	$ 20,000
F2.	Retiree after age 62 (E1)	$ 13,600
G.	Spouse after retiree's death (D x E)	$ 0

Year Ended June 30	Annual Amount Payable if Price Inflation is 2.25% and Post-Retirement Increases are 1.8%
2023	$20,000
2024	20,360
2025	14,094
2026	14,348
2027	14,606
2028	14,869
2029	15,137
2030	15,409
2031	15,686
2032	15,969

SECTION C

FINANCIAL INFORMATION

Summary of Fund Operations

	2023	2022
Market Value of Fund Beginning of Fiscal Year	$3,067,193,086	$3,003,925,228
Post Valuation Audit Adjustment	0	0
Contributions		
Employer	232,813,995	212,711,117
Employee	6,838,152	5,899,734
Transfer from MOSERS	4,036,789	4,334,202
Service Purchase (Employee)	573,233	2,421,844
Total Contributions	$ 244,262,169	$ 225,366,897
Investment Return		
Interest	$ 63,201,787	$ 17,635,816
Dividends	6,915,593	6,774,438
Real Estate	45,117,378	34,038,345
Realized Capital Gains	1,064,856,358	1,077,912,529
Realized Capital Losses	(890,295,828)	(844,768,499)
Miscellaneous Income	0	0
Securities Lending Income	196,037	183,896
Other	0	0
Total Investment Return	$ 289,991,325	$ 291,776,525
Other Income (Rental Income and Misc.)	1,954	195
Increase (Decrease) in Unrealized Appreciation	7,203,440	(99,839,096)
Benefit Payments		
Retirement Payments	$ 266,371,260	$ 255,552,928
Retirement Payments - BackDROP	15,605,731	17,688,088
Death Benefits	1,065,000	1,130,000
Long-Term Disability Payments	8,884	14,370
Insured Disability Program	1,715,791	1,470,000
Employee Contribution Refunds	972,241	1,024,986
Service Transfer Payments - Employer	3,317,630	2,757,330
Total Benefit Payments	$ 289,056,536	$ 279,637,701
Expenses		
Investment	$ 32,438,336	$ 69,169,944
Other	5,529,258	5,229,018
Total Expenses	$ 37,967,594	$ 74,398,962
Market Value of Fund End of Fiscal Year	$3,281,627,844	$3,067,193,086

Note: Numbers may not add due to rounding.

Missouri MPERS
Development of Actuarial Value of Assets

Valuation Date of June 30	2018	2019	2020	2021	2022	2023	2024	2025
A. Actuarial value at beginning of year	$2,172,787,144	$2,274,248,122	$2,415,343,431	$2,481,329,531	$2,711,272,503	**$2,925,561,398**		
B. Market value at end of year	2,314,530,148	2,423,261,830	2,361,599,888	3,003,925,228	3,067,193,086	**3,281,627,844**		
C. Market value at beginning of year	2,169,775,040	2,314,530,148	2,423,261,830	2,361,599,888	3,003,925,228	**3,067,193,086**		
D. Cash flow								
D1. Contributions	211,824,043	218,595,641	220,902,777	217,389,128	225,366,897	**244,262,169**		
D2. Benefit Payments	(259,058,863)	(259,817,811)	(267,605,833)	(270,122,850)	(279,637,701)	**(289,056,536)**		
D3. Administrative Expenses	(4,693,492)	(4,372,966)	(4,291,028)	(4,585,473)	(5,229,018)	**(5,529,258)**		
D4. Non-Investment Net Cash Flow	(51,928,312)	(45,595,136)	(50,994,084)	(57,319,195)	(59,499,822)	**(50,323,625)**		
E. Investment income								
E1. Market total (B - C - D4)	196,683,420	154,326,818	(10,667,858)	699,644,535	122,767,680	**264,758,383**		
E2. Assumed Rate of Return	7.75%	7.00%	7.00%	7.00%	6.50%	**6.50%**	**6.50%**	
E3. Amount for Immediate Recognition (A+.5xD4)xE2	166,378,782	157,601,539	167,289,247	171,686,895	174,298,968	**188,525,973**		
E4. Amount for Phased-In Recognition	30,304,638	(3,274,721)	(177,957,105)	527,957,640	(51,531,288)	**76,232,410**		
F. Phased in recognition of investment income								
F1. Current Year (33 1/3% of E4)	10,101,546	(1,091,574)	(59,319,035)	175,985,880	(17,177,096)	**25,410,803**		
F2. First Prior Year	20,078,935	10,101,546	(1,091,574)	(59,319,035)	175,985,880	(17,177,096)	$ 25,410,803	
F3. Second Prior Year	(43,169,973)	20,078,934	10,101,546	(1,091,573)	(59,319,035)	175,985,880	(17,177,096)	$ 25,410,804
F4. Total Recognized Investment Gain (F1 + F2 + F3)	(12,989,492)	29,088,906	(50,309,063)	115,575,272	99,489,749	**184,219,587**	8,233,707	25,410,804
G. Actuarial value at end of year (A + D4 + E3 + F4)	2,274,248,122	2,415,343,431	2,481,329,531	2,711,272,503	2,925,561,398	**3,247,983,333**		
Less LTD Assets	0	0	0	0	0	**0**		
H. Preliminary Plan AVA	2,274,248,122	2,415,343,431	2,481,329,531	2,711,272,503	2,925,561,398	**3,247,983,333**		
I. Corridor (Maximum of 120% of Market Value)	2,777,436,178	2,907,914,196	2,833,919,866	3,604,710,274	3,680,631,703	**3,937,953,413**		
J. Corridor Minimum of 80% of Market Value)	1,851,624,118	1,938,609,464	1,889,279,910	2,403,140,182	2,453,754,469	**2,625,302,275**		
K. Additional Investment Gain/(Loss) recognized due to corridor	0	0	0	0	0	0		
L. Final Plan AVA after corridor adjustment, if any	2,274,248,122	2,415,343,431	2,481,329,531	2,711,272,503	2,925,561,398	**3,247,983,333**		
Difference between market and actuarial values	40,282,026	7,918,399	(119,729,643)	292,652,725	141,631,688	**33,644,511**		
Market Rate of Return#	9.17%	6.73%	(0.44)%	29.99%	3.90%	**8.9%**		
Ratio of Actuarial Value to Market Value	98.26%	99.67%	105.07%	90.26%	95.38%	**98.97%**		
Recognized actuarial rate of return	7.14%	8.29%	4.89%	11.71%	10.21%	**12.85%**		

 # Rates prior to the June 30, 2022 valuation were calculated by GRS. Rates on or after the June 30, 2022 valuation were provided by the System's investment consultant.

Allocation of Assets between Groups

The allocation of the actuarial value of assets between the Uniformed Patrol and Non-Uniformed Employee groups is in proportion to their market value of assets, as shown below:

Allocation of Actuarial Value of Assets	June 30 2023	June 30 2022
1. Actuarial Value of Assets	$3,247,983,333	$2,925,561,398
2. Reported Market Value of Assets		
a) Uniformed Patrol	962,972,186	906,225,356
b) Non-Uniformed Employees	2,318,655,658	2,160,967,730
c) Total	3,281,627,844	3,067,193,086
3. Actuarial Value of Assets Split		
a) Uniformed Patrol		
(2a) / (2c) x (1)	953,099,425	864,379,204
b) Non-Uniformed Employees		
(2b) / (2c) x (1)	2,294,883,908	2,061,182,194
4. Total Assets Allocated	3,247,983,333	2,925,561,398

SECTION D

SUMMARY OF MEMBER DATA

Civilian Patrol Closed Active Members
as of June 30, 2023
by Attained Age and Years of Service

Attained Age	Count by Completed Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20									
20-24									
25-29									
30-34									
35-39									
40-44		1			3	2		6	$ 293,422
45-49					13	16		29	1,859,879
50-54			2	1	9	27	6	45	2,682,029
55-59			3	1	7	20	15	46	2,929,963
60			1		1	3	2	7	439,653
61					1	4		5	275,219
62			1		1	2	2	6	377,187
63					2	1		3	124,746
64			1		1		2	4	189,776
65					2	1		3	128,970
66						1		1	58,756
67						1		1	45,482
68					1		1	2	149,297
69									
70									
Over 70							1	1	41,838
Totals		**1**	**8**	**2**	**41**	**78**	**29**	**159**	**$9,596,217**

Average Age: 54.5 years
Average Service: 26.9 years
Average Pay: $60,354

Civilian Patrol Year 2000 Active Members as of June 30, 2023 by Attained Age and Years of Service

Attained Age	Count by Completed Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20									
20-24									
25-29									
30-34		1	2					3	$ 159,806
35-39	1	1	25	11	1			39	2,309,814
40-44		4	11	43	17			75	4,868,920
45-49	1	4	8	27	15			55	3,487,225
50-54	1	2	11	20	16			50	2,866,206
55-59		4	8	26	16			54	2,947,222
60			2	4	2			8	453,756
61		1	2		2			5	280,911
62				2	2			4	158,734
63			1	3	1			5	378,289
64			1		1			2	76,632
65				1				1	47,584
66									
67			1		1			2	82,508
68									
69									
70									
Over 70									
Totals	**3**	**17**	**72**	**137**	**74**			**303**	**$18,117,607**

Average Age: 48.4 years
Average Service: 16.9 years
Average Pay: $59,794

Civilian Patrol 2011 Tier Active Members
as of June 30, 2023
by Attained Age and Years of Service

Attained Age	Count by Completed Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20									
20-24	37							37	$ 1,389,752
25-29	81	22						103	4,855,920
30-34	51	57	9					117	6,092,472
35-39	20	30	21					71	3,670,802
40-44	21	26	6					53	2,497,661
45-49	20	17	9					46	2,306,449
50-54	28	23	5					56	2,395,582
55-59	23	21	7					51	2,299,060
60	4	3	2					9	375,455
61	5	2						7	265,183
62	7	5						12	425,436
63	2	4						6	256,149
64	2		1					3	108,130
65	2	3	1					6	235,518
66		4	1					5	227,900
67			1					1	50,120
68	2							2	70,566
69									
70									
Over 70			1					1	49,368
Totals	**305**	**217**	**64**					**586**	**$27,571,523**

Average Age: 40.8 years
Average Service: 5.0 years
Average Pay: $47,050

MoDOT Closed Active Members
as of June 30, 2023
by Attained Age and Years of Service

Attained Age	Count by Completed Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20									
20-24									
25-29									
30-34									
35-39									
40-44			1	2	22	1		26	$ 1,463,456
45-49			2	1	108	63	2	176	12,147,936
50-54		1	3	3	63	183	50	303	21,671,271
55-59			3	6	57	71	76	213	14,391,976
60	1		2		4	11	15	33	2,013,769
61				1	3	6	10	20	1,421,112
62					5	8	9	22	1,471,996
63					6	13	9	28	1,637,835
64	1				2	2	7	12	836,657
65					1	4	4	9	557,700
66						1		1	66,514
67					2	3	2	7	438,001
68						1	1	2	131,931
69					1	2		3	209,419
70					1	1		2	138,233
Over 70							3	3	301,816
Totals	**2**	**1**	**11**	**13**	**275**	**370**	**188**	**860**	**$58,899,622**

Average Age: 53.8 years
Average Service: 27.3 years
Average Pay: $68,488

MoDOT Year 2000 Active Members
as of June 30, 2023
by Attained Age and Years of Service

Attained Age	Count by Completed Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20									
20-24									
25-29									
30-34	1	1	7					9	$ 426,404
35-39	5	9	49	71				134	7,826,681
40-44	10	6	42	155	66			279	17,087,061
45-49	8	12	40	96	93			249	15,105,099
50-54	11	12	36	107	69	2		237	13,641,791
55-59	3	4	24	81	67			179	9,853,317
60		3	7	15	10			35	1,960,262
61	1	1	2	20	8	1		33	1,646,233
62		1	9	18	7			35	1,851,004
63	1		4	6	7			18	939,015
64			1	7	2			10	544,432
65			6	9	2			17	898,751
66			2	9	1			12	597,497
67				2	1			3	148,997
68			2	3				5	272,036
69				1	1			2	141,490
70				2				2	116,454
Over 70					2			2	92,357
Totals	**40**	**49**	**231**	**602**	**336**	**3**		**1,261**	**$73,148,881**

Average Age: 49.3 years
Average Service: 17.1 years
Average Pay: $58,009

MoDOT 2011 Tier Active Members
as of June 30, 2023
by Attained Age and Years of Service

Attained Age	Count by Completed Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20	6							6	$ 224,752
20-24	153	2						155	6,419,511
25-29	274	92						366	18,156,469
30-34	199	186	13					398	20,077,074
35-39	165	142	35					342	16,606,822
40-44	143	110	24					277	13,011,802
45-49	105	81	8					194	9,396,393
50-54	128	89	11					228	10,668,024
55-59	95	86	18		1			200	9,449,759
60	14	12	3					29	1,322,225
61	13	17	5					35	1,571,750
62	13	12	1					26	1,229,817
63	14	8	5					27	1,171,306
64	6	17	1					24	1,085,591
65	2	5						7	303,575
66	2	2						4	176,969
67	1	1	1					3	132,041
68	3	2	1					6	265,266
69			1					1	61,503
70									
Over 70	1	1						2	91,140
Totals	**1,337**	**865**	**127**		**1**			**2,330**	**$111,421,789**

Average Age: 40.0 years
Average Service: 4.7 years
Average Pay: $47,821

Uniformed Patrol Closed Active Members
as of June 30, 2023
by Attained Age and Years of Service

Attained Age	Count by Completed Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20									
20-24									
25-29									
30-34									
35-39									
40-44			1		2			3	$ 243,551
45-49					25	45		70	6,724,505
50-54				1	13	129	24	167	16,212,928
55-59	1				1	29	23	54	5,241,727
60						1		1	85,739
61									
62									
63									
64									
65									
66									
67									
68									
69									
70									
Over 70									
Totals	**1**		**1**	**1**	**41**	**204**	**47**	**295**	**$28,508,450**

Average Age: 51.7 years
Average Service: 27.5 years
Average Pay: $96,639

Uniformed Patrol Year 2000 Active Members as of June 30, 2023 by Attained Age and Years of Service

Attained Age	Count by Completed Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20									
20-24									
25-29									
30-34			3					3	$ 256,893
35-39			46	41				87	7,303,820
40-44			14	86	24			124	11,111,148
45-49	1		7	23	58			89	8,064,024
50-54			4	12	20	1		37	3,294,351
55-59				5	3			8	676,327
60									
61									
62									
63									
64									
65									
66									
67									
68									
69									
70									
Over 70									
Totals	**1**		**74**	**167**	**105**	**1**		**348**	**$30,706,563**

Average Age: 43.3 years
Average Service: 17.7 years
Average Pay: $88,237

Uniformed Patrol 2011 Tier Active Members as of June 30, 2023 by Attained Age and Years of Service

Attained Age	Count by Completed Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20									
20-24	40							40	$ 2,499,689
25-29	116	34						150	9,399,878
30-34	53	87	31					171	11,211,182
35-39	18	28	41					87	6,092,683
40-44		9	10					19	1,330,293
45-49		3	4					7	484,852
50-54	1	1	2					4	267,567
55-59			1					1	67,946
60									
61									
62									
63									
64									
65									
66									
67									
68									
69									
70									
Over 70									
Totals	**228**	**162**	**89**					**479**	**$31,354,090**

Average Age: 31.4 years
Average Service: 6.0 years
Average Pay: $65,457

Growth of Active Member Payroll

Growth of Active Member Payroll

Actuarial Valuation for June 30,	Number	Covered Payroll	Average Pay	% Change in Average Pay from Prior Year
1989	8,181	$194,452,400	$23,769	(0.5)%
1990	8,256	211,414,753	25,607	7.7 %
1991	8,308	220,856,988	26,584	3.8 %
1992	8,591	228,503,592	26,598	0.1 %
1993	8,658	236,236,082	27,285	2.6 %
1994	8,849	242,864,780	27,445	0.6 %
1995	8,904	250,529,253	28,137	2.5 %
1996	9,023	264,196,115	29,280	4.1 %
1997	8,997	280,209,116	31,145	6.4 %
1998	8,871	284,889,796	32,115	3.1 %
1999	9,140	298,673,247	32,678	1.8 %
2000	9,171	312,532,009	34,078	4.3 %
2001	9,087	327,049,257	35,991	5.6 %
2002	8,695	312,747,492	35,969	(0.1)%
2003	8,892	318,744,192	35,846	(0.3)%
2004	9,002	328,210,887	36,460	1.7 %
2005	9,193	345,695,867	37,604	3.1 %
2006	9,033	348,614,699	38,593	2.6 %
2007	8,640	360,842,421	41,764	8.2 %
2008	8,599	369,424,653	42,961	2.9 %
2009	8,784	377,652,245	42,993	0.1 %
2010	8,457	369,911,252	43,740	1.7 %
2011	8,231	361,639,001	43,936	0.4 %
2012	7,458	329,293,168	44,153	0.5 %
2013	7,319	323,205,767	44,160	0.0 %
2014	7,390	332,085,689	44,937	1.8 %
2015	7,358	334,400,980	45,447	1.1 %
2016	7,441	339,799,379	45,666	0.5 %
2017	7,456	348,979,212	46,805	2.5 %
2018	7,391	351,496,555	47,557	1.6 %
2019	7,421	359,296,056	48,416	1.8 %
2020	7,355	360,851,545	49,062	1.3 %
2021	7,219	355,194,571	49,203	0.3 %
2022	6,874	356,662,243	51,886	5.5 %
2023	6,621	389,324,744	58,802	13.3 %
			Ten-Year Average:	3.0 %

Count and Total Monthly Benefits
Civilian Patrol Closed Retired (Non-Disabled)
Members and Survivors
as of June 30, 2023
by Attained Age

Age	Number	Monthly Benefit Amount
Less than 20		
20-24		
25-29		
30-34		
35-39		
40-44		
45-49	1	$ 723
50-54	2	4,113
55-59	27	47,408
60-64	61	134,655
65-69	74	133,169
70-74	82	165,273
75-79	67	105,180
80-84	57	121,018
85-89	67	134,821
90-94	37	70,308
95-99	4	5,951
100-104		
105 & Over		
TOTAL	**479**	**$ 922,619**

Note: Totals may not add due to rounding.

Count and Total Monthly Benefits of Civilian Patrol Year 2000 Retired (Non-Disabled) Members and Survivors as of June 30, 2023 by Attained Age

Age	Number	Monthly Benefit Amount
Less than 20	2	$ 978
20-24		
25-29		
30-34		
35-39		
40-44		
45-49		
50-54	8	27,866
55-59	65	155,924
60-64	126	197,892
65-69	163	241,958
70-74	162	244,804
75-79	119	180,102
80-84	43	71,885
85-89	4	2,053
90-94	1	2,455
95-99		
100-104		
105 & Over		
TOTAL	**693**	**$ 1,125,916**

Note: Totals may not add due to rounding.

Count and Total Monthly Benefits of Civilian Patrol 2011 Tier Retired (Non-Disabled) Members and Survivors as of June 30, 2023 by Attained Age

Age	Number	Monthly Benefit Amount
Less than 20	1	$ 374
20-24		
25-29		
30-34		
35-39	1	298
40-44		
45-49		
50-54		
55-59		
60-64	1	405
65-69	10	3,443
70-74	4	1,173
75-79		
80-84		
85-89		
90-94		
95-99		
100-104		
105 & Over		
TOTAL	**17**	**$ 5,692**

Note: Totals may not add due to rounding.

Count and Total Monthly Benefits of MoDOT Closed Retired (Non-Disabled) Members and Survivors as of June 30, 2023 by Attained Age

Age	Number	Monthly Benefit Amount
Less than 20		
20-24		
25-29		
30-34		
35-39	1	$ 206
40-44	2	1,289
45-49	10	7,822
50-54	33	59,366
55-59	138	271,316
60-64	324	608,713
65-69	414	725,185
70-74	379	664,891
75-79	372	718,741
80-84	536	1,405,328
85-89	565	1,531,736
90-94	238	570,896
95-99	58	126,960
100-104	4	5,783
105 & Over		
TOTAL	**3,074**	**$ 6,698,231**

Note: Totals may not add due to rounding.

Count and Total Monthly Benefits of MoDOT Year 2000 Retired (Non-Disabled) Members and Survivors as of June 30, 2023 by Attained Age

Age	Number	Monthly Benefit Amount
Less than 20	7	$ 2,711
20-24	2	500
25-29	1	262
30-34	2	588
35-39	2	1,470
40-44	1	306
45-49	7	7,795
50-54	102	319,903
55-59	402	1,154,858
60-64	910	1,772,344
65-69	936	1,493,341
70-74	807	1,384,452
75-79	615	1,206,212
80-84	218	446,810
85-89	17	27,997
90-94	6	9,776
95-99	4	7,794
100-104	1	924
105 & Over		
TOTAL	**4,040**	**$ 7,838,043**

Note: Totals may not add due to rounding.

Count and Total Monthly Benefits of MoDOT Year 2011 Tier Retired (Non-Disabled) Members and Survivors as of June 30, 2023 by Attained Age

Age	Number	Monthly Benefit Amount
Less than 20		
20-24		
25-29		
30-34		
35-39		
40-44		
45-49	1	$ 466
50-54		
55-59		
60-64	6	2,707
65-69	17	6,828
70-74	6	2,282
75-79	3	955
80-84		
85-89		
90-94		
95-99		
100-104		
105 & Over		
TOTAL	**33**	**$ 13,238**

Note: Totals may not add due to rounding.

Count and Total Monthly Benefits of Uniformed Patrol Closed Retired (Non-Disabled) Members and Survivors as of June 30, 2023 by Attained Age

Age	Number	Monthly Benefit Amount
Less than 20		
20-24		
25-29		
30-34		
35-39		
40-44	2	$ 3,805
45-49	6	18,166
50-54	64	284,050
55-59	184	765,502
60-64	182	949,263
65-69	149	868,331
70-74	165	902,390
75-79	154	788,380
80-84	128	683,937
85-89	65	323,362
90-94	19	81,623
95-99	10	45,890
100-104		
105 & Over		
TOTAL	**1,128**	**$ 5,714,698**

Note: Totals may not add due to rounding.

Count and Total Monthly Benefits of Uniformed Patrol Year 2000 Retired (Non-Disabled) Members and Survivors as of June 30, 2023 by Attained Age

Age	Number	Monthly Benefit Amount
Less than 20	2	$ 443
20-24		
25-29		
30-34		
35-39	1	1,804
40-44		
45-49	2	2,867
50-54		
55-59	4	12,646
60-64	2	7,515
65-69	1	1,028
70-74		
75-79		
80-84		
85-89		
90-94		
95-99		
100-104		
105 & Over		
TOTAL	**12**	**$ 26,303**

Note: Totals may not add due to rounding.

Count and Total Monthly Benefits of Uniformed Patrol Year 2011 Tier Retired (Non-Disabled) Members and Survivors as of June 30, 2023 by Attained Age

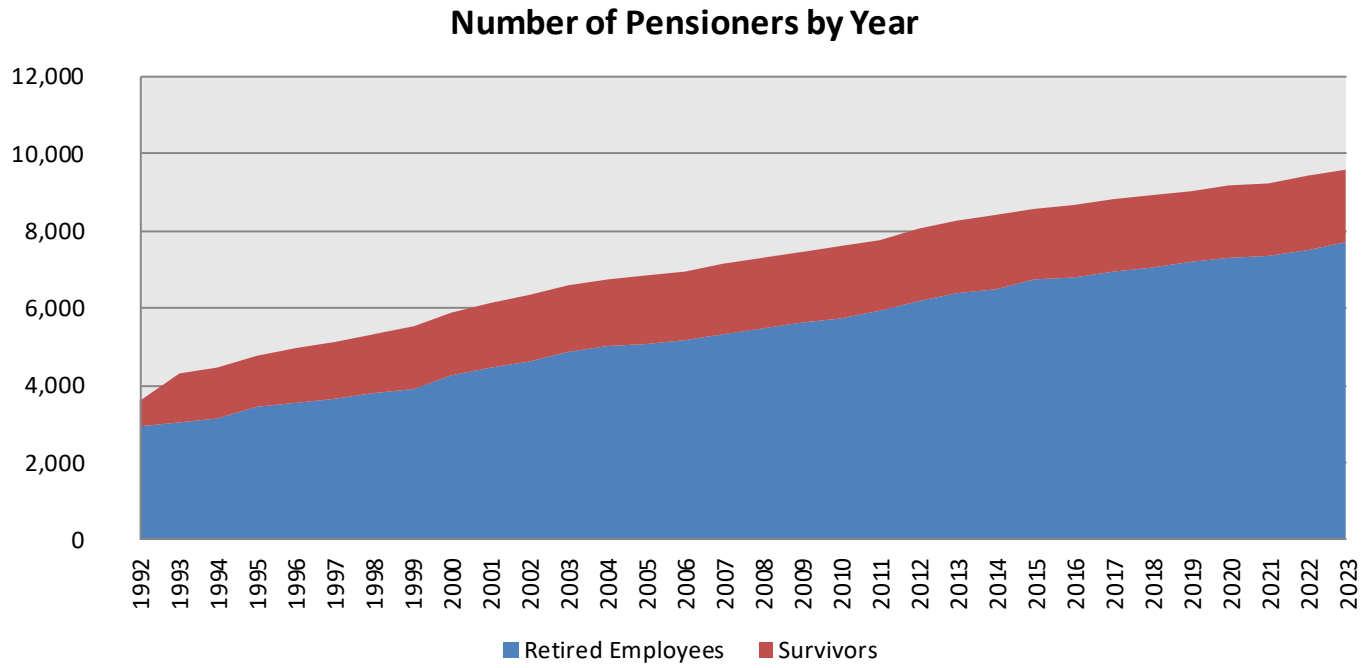
Age	Number	Monthly Benefit Amount
Less than 20		
20-24		
25-29	1	$ 460
30-34		
35-39		
40-44		
45-49		
50-54		
55-59		
60-64		
65-69		
70-74		
75-79		
80-84		
85-89		
90-94		
95-99		
100-104		
105 & Over		
TOTAL	**1**	**$ 460**

Note: Totals may not add due to rounding.

Growth of Pension Population by Year

Year	Retired Employees	Survivors	Total	% Increase	Annual Benefits	Active Payroll	Benefits as a % of Payroll
1992	2,908	699	3,607	4.7%			
1993	3,047	1,269	4,316	19.7%			
1994	3,156	1,307	4,463	3.4%			
1995	3,419	1,365	4,784	7.2%			
1996	3,536	1,405	4,941	3.3%			
1997	3,646	1,486	5,132	3.9%			
1998	3,781	1,549	5,330	3.9%	$ 80,686,152	$284,889,796	28.3%
1999	3,924	1,600	5,524	3.6%	91,512,311	298,673,247	30.6%
2000	4,236	1,621	5,857	6.0%	100,794,676	312,532,009	32.3%
2001	4,482	1,663	6,145	4.9%	115,998,915	327,049,257	35.5%
2002	4,623	1,716	6,339	3.2%	125,623,460	312,747,492	40.2%
2003	4,845	1,751	6,596	4.1%	136,320,125	318,744,192	42.8%
2004	4,996	1,735	6,731	2.0%	142,359,307	328,210,887	43.4%
2005	5,068	1,761	6,829	1.5%	148,340,170	345,695,867	42.9%
2006	5,164	1,790	6,954	1.8%	155,230,301	348,614,699	44.5%
2007	5,336	1,805	7,141	2.7%	164,048,455	360,842,421	45.5%
2008	5,496	1,829	7,325	2.6%	172,112,941	369,424,653	46.6%
2009	5,604	1,866	7,470	2.0%	179,850,466	377,652,245	47.6%
2010	5,739	1,867	7,606	1.8%	187,267,535	369,911,252	50.6%
2011	5,926	1,849	7,775	2.2%	191,892,660	361,639,001	53.1%
2012	6,172	1,883	8,055	3.6%	201,906,768	329,293,168	61.3%
2013	6,382	1,908	8,290	2.9%	210,904,464	323,205,767	65.3%
2014	6,507	1,894	8,401	1.3%	217,149,528	332,085,689	65.4%
2015	6,720	1,868	8,588	2.2%	223,021,512	334,400,980	66.7%
2016	6,814	1,870	8,684	1.1%	227,218,908	339,799,379	66.9%
2017	6,969	1,862	8,831	1.7%	231,168,516	348,979,212	66.2%
2018	7,064	1,852	8,916	1.0%	235,395,456	351,496,555	67.0%
2019	7,180	1,855	9,035	1.3%	241,935,168	359,296,056	67.3%
2020	7,318	1,864	9,182	1.6%	249,197,664	360,851,545	69.1%
2021	7,339	1,896	9,235	0.6%	252,148,236	355,194,571	71.0%
2022	7,518	1,908	9,426	2.1%	257,882,316	356,662,243	72.3%
2023	7,690	1,914	9,604	4.0%	270,729,868	389,324,744	69.5%

Growth of Pension Population by Year



Self-Insured Disabled Retired Members as of June 30, 2023

Age	Number	Monthly Benefit Amount
Less than 20		
20-24		
25-29		
30-34		
35-39		
40-44		
45-49	1	$ 4,707
50-54	2	4,357
55-59	3	4,949
60-64	8	8,553
65-69	7	8,115
70-74	8	5,948
75-79	7	6,481
80-84	3	1,959
85-89		
90-94	1	122
95-99		
100-104		
105 & Over		
TOTAL	**40**	**$ 45,192**

Note: Totals may not add due to rounding.

These members became disabled prior to outsourcing disability claims. Liabilities for these members include benefits payable during and after the period of disability.

Fully Insured Disabled Retired Members as of June 30, 2023

Age	Number	Monthly Benefit Amount
Less than 20		
20-24		
25-29		
30-34	1	$ 2,559
35-39	4	8,970
40-44	6	14,352
45-49	17	56,953
50-54	18	36,014
55-59	22	32,844
60-64	18	18,485
65-69		
70-74	1	253
75-79		
80-84		
85-89		
90-94		
95-99		
100-104		
105 & Over		
TOTAL	**87**	**$ 170,429**

Note: Totals may not add due to rounding.

These members became disabled after disability claims became outsourced. Liabilities for these members during the period of disability are an obligation of the insurance company and not included in this valuation. Liabilities for these members after the period of disability are included in the valuation.

Vested Terminated Members
as of June 30, 2023

Age	Number	Monthly Benefit Amount
Less than 20		
20-24		
25-29	31	$ 10,448
30-34	118	54,904
35-39	234	124,341
40-44	345	222,345
45-49	429	291,619
50-54	530	358,922
55-59	366	218,973
60-64	177	82,140
65-69	9	3,573
70-74		
75-79		
80-84		
85-89		
90-94		
95-99		
100-104		
105 & Over		
TOTAL	**2,239**	**$ 1,367,264**

Note: Totals may not add due to rounding.

Data Reconciliation
as of June 30, 2023

Non-Uniformed	Active Members	Vested Terminated Members	Retired
Number at Start of Year	5,692	2,063	8,349
Increase (Decrease) From			
New Entrants/Rehires	518	(18)	(8)
Service Retirement	(214)	(93)	307
Vested Terminations	(152)	154	(2)
Deaths/Removals	(1)	(48)	(341)
Surviving Beneficiaries			134
Disability Retirement	(17)		17
Non-Vested Terminations	(327)		
Number at End of Year	**5,499**	**2,058**	**8,456**

Uniformed	Active Members	Vested Terminated Members	Retired
Number at Start of Year	1,182	184	1,077
Increase (Decrease) From			
New Entrants/Rehires	38	(1)	
Service Retirement	(69)	(12)	81
Vested Terminations	(14)	14	0
Deaths/Removals		(4)	(25)
Surviving Beneficiaries			14
Disability Retirement	(1)		1
Non-Vested Terminations	(14)		
Number at End of Year	**1,122**	**181**	**1,148**

SECTION E

ASSUMPTIONS USED IN THE VALUATION AND GLOSSARY

Summary of Valuation Method and Assumptions
June 30, 2023

The actuarial assumptions used in the valuation are shown in this section of the report unless stated otherwise. The assumptions were established for the June 30, 2023 actuarial valuation, following a five-year actuarial investigation covering the period July 1, 2017 through June 30, 2022. Assumptions were adopted by the Board.

An actuarial valuation is based upon an actuarial cost method, an asset valuation method, and actuarial assumptions. These methods and assumptions are chosen by the Board of Trustees after consultation with the Actuary and other advisors.

The actuarial cost method is called the Entry Age Actuarial Cost Method. This method is consistent with the Board's level percent-of-payroll funding objective. With this method, the level percent-of-payroll is determined that will fund a member's retirement benefit over the member's entire working lifetime, from date of hire (Entry Age) to date of exit from the active member population. Differences in the past between assumed and actual experience become part of unfunded actuarial accrued liabilities and are amortized with level percent-of-payroll contributions. This cost method was first used in the ***June 30, 1999*** valuation.

The asset valuation method is a three-year smoothed market value method in which assumed investment return is recognized immediately each year and differences between actual and assumed investment return are phased-in over a closed three-year period. This asset valuation method is intended to give recognition to the long-term accuracy of market values while filtering out and dampening short term market swings. This method was first used in the ***June 30, 1999*** valuation.

Economic Assumptions

The assumed investment return rate used in making the valuations was 6.50% per year, compounded annually (net after investment expenses). The ***wage inflation rate*** was assumed to be 3.00%. The real rate of return over wage growth is defined to be the portion of total investment return, which is more than the rate of wage inflation. The 6.50% investment return rate and 3.00% wage inflation rate translate to an assumed real rate of return over wage growth net of expenses of 3.50%. Based upon other assumptions, the net real rate of return over price inflation is 4.25%.

Pay increase assumptions for merit and seniority for individual active members are shown on page E-7. Part of the total assumed pay increase at each age is for merit and/or seniority, and the other 3.00% recognizes wage inflation. ***The active member payroll*** for all members is assumed to increase 3.00% annually for all years.

The price inflation rate is assumed to be 2.25% annually. This is the inflation rate upon which the post-retirement increases are based. The difference between wage and price inflation of 0.75% is attributable to overall productivity increases and macroeconomic factors.

The total number of active members is assumed to continue at the present total number.

Summary of Valuation Method and Assumptions
June 30, 2023 (Continued)

Reviewing the Investment Return Assumption

The analysis of the investment return assumption in this report is based on forward-looking measures of expected investment return outcomes for the asset classes in the System's current investment policy. For purposes of this analysis, we have analyzed the System's investment policy with the capital market assumptions from twelve nationally recognized investment advisors.

Our analysis is based on the GRS Capital Market Assumption Modeler (CMAM). Because GRS is a benefits consulting firm and does not develop or maintain our own capital market expectations, we request and monitor forward-looking expectations developed by several major investment advisory firms. We update our CMAM on an annual basis. The capital market assumptions in the 2023 CMAM are from the following investment firms (in alphabetical order): Aon Hewitt, Blackrock, BNY Mellon, Callan, Cambridge, JPMorgan, Meketa, Mercer, NEPC, Verus, and Wilshire. We believe that the benefit of performing this analysis using multiple investment advisory firms is to recognize the uncertain nature of the items affecting the selection of the investment return assumption. While there may be differences in asset classes, investment horizons, inflation assumptions, treatment of investment expenses, excess manager performance (i.e., alpha), etc., we have attempted to align the various assumption sets from the different investment advisors to be as consistent as possible.

To the best of our ability, we have adapted the System's investment policy to fit with the advisors' assumptions adjusting for these known differences in assumptions and methodology. In the following charts, to the extent possible all returns are net of passive investment expenses and have no assumption for excess manager performance (alpha) in excess of active management fees.

For purposes of this analysis, we have been provided with the following asset allocation from System staff:

Asset Classes	Current Policy
Cash	0.00%
U.S. Stock - Large Cap	20.30%
U.S. Stock - Small Cap	2.70%
Int'l Equity	12.00%
Emerging Mkts Eq	5.00%
U.S. Corporate Bonds	9.00%
Government Bonds	13.50%
TIPS	0.00%
High Yield	7.50%
Int'l Debt	0.00%
Real Estate	20.00%
Private Equity	10.00%
Hedge Funds	0.00%
Other Alternatives	0.00%
Total	**100.00%**

Summary of Valuation Method and Assumptions
June 30, 2023 (Continued)

Investment Consultant	Investment Consultant Expected Nominal Return	Investment Consultant Inflation Assumption	Expected Real Return (2)–(3)	Actuary Inflation Assumption	Expected Nominal Return (4)+(5)	Investment Expenses	Expected Nominal Return Net of Expenses (6)-(7)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	6.94%	2.90%	4.04%	2.25%	6.29%	0.00%	6.29%
2	6.75%	2.50%	4.25%	2.25%	6.50%	0.00%	6.50%
3	7.28%	2.90%	4.38%	2.25%	6.63%	0.00%	6.63%
4	7.50%	2.51%	4.99%	2.25%	7.24%	0.00%	7.24%
5	7.56%	2.50%	5.06%	2.25%	7.31%	0.00%	7.31%
6	7.53%	2.41%	5.12%	2.25%	7.37%	0.00%	7.37%
7	7.62%	2.31%	5.31%	2.25%	7.56%	0.00%	7.56%
8	7.70%	2.26%	5.44%	2.25%	7.69%	0.00%	7.69%
9	7.70%	2.28%	5.43%	2.25%	7.68%	0.00%	7.68%
10	8.06%	2.62%	5.44%	2.25%	7.69%	0.00%	7.69%
11	8.48%	2.54%	5.94%	2.25%	8.19%	0.00%	8.19%
Average	**7.56%**	**2.52%**	**5.04%**	**2.25%**	**7.29%**	**0.00%**	**7.29%**
					Average from last 3 CMAMs		**6.40%**

Summary of Valuation Method and Assumptions
June 30, 2023 (Continued)

Investment Consultant	Distribution of 20-Year Average Geometric Net Nominal Return			Probability of Exceeding 6.50%	Probability of Exceeding 6.25%	Probability of Exceeding 6.00%
	40th	50th	60th			
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	4.97%	5.79%	6.62%	41.42%	44.42%	47.46%
2	4.91%	5.85%	6.80%	43.07%	45.71%	48.37%
3	5.07%	5.99%	6.93%	44.51%	47.20%	49.91%
4	5.57%	6.54%	7.52%	50.42%	53.01%	55.59%
5	5.87%	6.75%	7.63%	52.85%	55.72%	58.57%
6	5.93%	6.81%	7.69%	53.51%	56.37%	59.20%
7	6.03%	6.94%	7.86%	54.88%	57.62%	60.32%
8	5.99%	6.97%	7.97%	54.81%	57.34%	59.85%
9	6.08%	7.02%	7.97%	55.57%	58.21%	60.82%
10	6.39%	7.21%	8.03%	58.69%	61.71%	64.66%
11	6.54%	7.51%	8.48%	60.45%	62.98%	65.45%
Average	**5.76%**	**6.67%**	**7.59%**	**51.84%**	**54.57%**	**57.29%**
Average from last 3 CMAMs		**5.80%**				
Current CMAM average over 20- to 30-year		**6.89%**				

Based on the current asset allocation policy as well as the current price inflation assumption, the investment return assumption is reasonable. Both the price inflation assumption and the investment return assumption are reviewed on an annual basis. While we have stated that the assumptions are reasonable for this valuation, that may not continue in the future if recent trends in forward looking expectations continue.

Investment Return with Policy Allocation

CMAM Year	Mean	Median
2015	6.73%	6.15%
2016	7.13%	6.55%
2017	6.59%	6.03%
2018	6.53%	5.94%
2019	7.02%	6.44%
2020	6.54%	5.96%
2021	6.07%	5.46%
2022	5.85%	5.25%
2023	7.29%	6.67%

Generally, we recommend an investment return assumption between the arithmetic mean and the geometric median of our most recent capital market assumption modeler. Because the results of the most recent CMAMs are not trending in a single direction, we would broaden our range slightly for a recommendation.

Summary of Valuation Method and Assumptions
June 30, 2023 (Continued)

Non-Economic Assumptions

Post-Retirement Healthy Mortality Rates are used to measure the probabilities of members dying after retirement. The rates currently in use are from the Pub-2010 General, Healthy Retiree, Amount-Weighted, Below-Median Income tables for males and females for Non-Uniformed members and Pub-2010 Public Safety Healthy Retiree, Amount-Weighted, tables for males and females for Uniformed members. Rates are decreased by 5% for non-uniform males and increased by 4% for uniform males. The assumed rates are adjusted for mortality improvement back to the observation period base year of 2010 and then projected generationally from 2010 to 2019 using scale MP-2021 and 90% of scale MP-2021 for years following 2019. Sample rates are shown on pages E-8 and E-9.

Post-Retirement Disabled Mortality Rates. The rates currently in use for disabled lives are the Pub-2010 General Disabled Retiree, Amount-Weighted tables for males and females for Non-Uniformed members and the Pub-2010 Public Safety Disabled Retiree, Amount-Weighted tables for males and females for Uniformed members. The assumed rates are adjusted for mortality improvement back to the observation period base year of 2010 and then projected generationally from 2010 to 2019 using scale MP-2021 and 90% of scale MP-2021 for years following 2019. Sample rates are shown on page E-10 and E-11.

Pre-Retirement Mortality Rates. The rates currently in use for active lives are the Pub-2010 General, Employee, Amount-Weighted, Below-Median Income tables for males and females for Non-Uniformed members and the Pub-2010 Public Safety Employee, Amount-Weighted, tables for males and females for Uniformed members. The assumed rates are adjusted for mortality improvement back to the observation period base year of 2010 and then projected generationally from 2010 to 2019 using scale MP-2021 and 90% of scale MP-2021 for years following 2019. Sample rates are shown on page E-12 and E-13.

The probabilities of age and service retirement are shown on page E-15. Upon retirement, members are assumed to pick the BackDROP period that when combined with the remaining annuity produces the highest liability.

The probabilities of disability are shown on page E-16.

The probabilities of withdrawal from service are shown on page E-17.

Employer contributions were assumed to be ***paid in equal installments*** throughout the employer fiscal year.

Present assets (cash & investments) were used with a market value adjustment. Assets may be used in the valuation prior to the final audit. The exact method is shown on page C-2.

Summary of Valuation Method and Assumptions
June 30, 2023 (Concluded)

The data about persons now covered and about present assets were furnished by the System's administrative staff. Although examined for general reasonableness, the data was not audited by the Actuary. Data was furnished as of May 31 and assumed to be statistically equivalent to June 30.

The actuarial valuation computations were made by or under the supervision of a Member of the American Academy of Actuaries (MAAA) who has experience performing public plan valuations.

Service-Based Salary Scale

% Merit Increases in Salaries Next Year		
Service Index	Uniformed Members	Non-Uniformed Members
1	6.00%	7.50%
2	4.00%	3.80%
3	3.00%	2.80%
4	2.00%	1.50%
5	2.00%	1.00%
6	1.90%	0.80%
7	1.80%	0.00%
8	1.70%	0.00%
9	1.60%	0.00%
10	1.50%	0.00%
11	1.40%	0.00%
12	1.30%	0.00%
13	1.20%	0.00%
14	1.10%	0.00%
15	1.00%	0.00%
16	0.90%	0.00%
17	0.85%	0.00%
18	0.70%	0.00%
19	0.60%	0.00%
20	0.50%	0.00%
21	0.00%	0.00%
22	0.00%	0.00%
23	0.00%	0.00%
24	0.00%	0.00%
25	0.00%	0.00%

Post-Retirement Mortality

Non-Uniform Retired Lives Mortality Rates

Age in 2023	% Dying Next Year	
	Male	Female
20	0.0405%	0.0141%
21	0.0422%	0.0144%
22	0.0421%	0.0136%
23	0.0433%	0.0139%
24	0.0437%	0.0131%
25	0.0463%	0.0147%
26	0.0504%	0.0163%
27	0.0547%	0.0180%
28	0.0592%	0.0212%
29	0.0652%	0.0230%
30	0.0699%	0.0262%
31	0.0759%	0.0294%
32	0.0817%	0.0311%
33	0.0873%	0.0355%
34	0.0938%	0.0381%
35	0.0983%	0.0419%
36	0.1048%	0.0438%
37	0.1090%	0.0479%
38	0.1147%	0.0502%
39	0.1193%	0.0532%
40	0.1240%	0.0558%
41	0.1277%	0.0579%
42	0.1329%	0.0598%
43	0.1371%	0.0626%
44	0.1429%	0.0663%
45	0.1815%	0.0874%
46	0.2316%	0.1164%
47	0.2972%	0.1548%
48	0.3837%	0.2079%
49	0.4985%	0.2815%
50	0.6520%	0.3833%
51	0.6771%	0.3957%
52	0.7076%	0.4103%
53	0.7432%	0.4271%
54	0.7821%	0.4453%
55	0.8254%	0.4642%
56	0.8722%	0.4819%
57	0.9203%	0.4995%
58	0.9697%	0.5162%
59	1.0182%	0.5341%
60	1.0655%	0.5519%
61	1.1097%	0.5711%
62	1.1504%	0.5916%
63	1.1892%	0.6138%
64	1.2253%	0.6367%
65	1.2627%	0.6616%
66	1.3519%	0.7175%
67	1.4546%	0.7812%
68	1.5697%	0.8555%
69	1.7016%	0.9408%
70	1.8506%	1.0405%
71	2.0192%	1.1562%
72	2.2097%	1.2892%
73	2.4274%	1.4434%
74	2.6755%	1.6201%
75	2.9586%	1.8224%
76	3.2813%	2.0518%
77	3.6468%	2.3122%
78	4.0620%	2.6102%
79	4.5325%	2.9477%
80	5.0640%	3.3335%
81	5.6677%	3.7758%
82	6.3453%	4.2798%
83	7.0992%	4.8557%
84	7.9350%	5.5128%
85	8.8529%	6.2620%
86	9.8491%	7.1139%
87	10.9198%	8.0753%
88	12.0687%	9.1491%
89	13.2950%	10.3271%
90	14.5853%	11.5947%
91	15.9067%	12.9080%
92	17.2330%	14.2328%
93	18.5605%	15.5669%
94	19.8974%	16.9060%
95	21.2462%	18.2808%
96	22.7482%	19.7956%
97	24.3350%	21.4143%
98	26.0215%	23.1571%
99	27.8244%	25.0298%
100	29.7134%	27.0312%
101	31.6572%	29.1207%
102	33.5969%	31.2400%
103	35.5231%	33.3661%
104	37.4062%	35.4783%
105	39.2316%	37.5671%
106	41.0032%	39.5974%
107	42.7156%	41.5730%
108	44.3306%	43.4775%
109	45.8759%	45.2895%
110	47.1318%	47.0087%
111	47.2887%	48.6348%
112	47.4457%	49.5509%
113	47.6117%	49.6909%
114	47.7797%	49.8178%
115	47.9381%	49.9540%
116	47.9650%	49.9770%
117	47.9827%	49.9865%
118	47.9957%	50.0000%
119	48.0000%	50.0000%
120	100.0000%	100.0000%

Post-Retirement Mortality

Uniform Retired Lives Mortality Rates

Age in 2023	% Dying Next Year	
	Male	Female
20	0.0443%	0.0174%
21	0.0452%	0.0188%
22	0.0450%	0.0193%
23	0.0450%	0.0209%
24	0.0454%	0.0226%
25	0.0457%	0.0245%
26	0.0487%	0.0264%
27	0.0519%	0.0284%
28	0.0551%	0.0317%
29	0.0585%	0.0338%
30	0.0603%	0.0372%
31	0.0634%	0.0392%
32	0.0663%	0.0424%
33	0.0689%	0.0454%
34	0.0711%	0.0480%
35	0.0743%	0.0502%
36	0.0770%	0.0520%
37	0.0774%	0.0546%
38	0.0801%	0.0553%
39	0.0821%	0.0570%
40	0.0905%	0.0605%
41	0.0990%	0.0647%
42	0.1076%	0.0685%
43	0.1177%	0.0730%
44	0.1279%	0.0783%
45	0.1384%	0.0845%
46	0.1452%	0.0918%
47	0.1540%	0.1001%
48	0.1642%	0.1099%
49	0.1767%	0.1221%
50	0.1899%	0.1360%
51	0.2070%	0.1537%
52	0.2261%	0.1734%
53	0.2484%	0.1965%
54	0.2752%	0.2236%
55	0.3066%	0.2548%
56	0.3427%	0.2898%
57	0.3844%	0.3279%
58	0.4327%	0.3696%
59	0.4866%	0.4138%

Age in 2023	% Dying Next Year	
	Male	Female
60	0.5466%	0.4618%
61	0.6128%	0.5105%
62	0.6839%	0.5612%
63	0.7599%	0.6148%
64	0.8418%	0.6717%
65	0.9302%	0.7330%
66	1.0256%	0.7984%
67	1.1304%	0.8724%
68	1.2455%	0.9567%
69	1.3752%	1.0521%
70	1.5214%	1.1630%
71	1.6887%	1.2893%
72	1.8782%	1.4351%
73	2.0954%	1.6024%
74	2.3449%	1.7936%
75	2.6293%	2.0127%
76	2.9551%	2.2602%
77	3.3267%	2.5399%
78	3.7515%	2.8568%
79	4.2352%	3.2117%
80	4.7848%	3.6106%
81	5.4097%	4.0586%
82	6.1156%	4.5581%
83	6.9049%	5.1152%
84	7.7915%	5.7373%
85	8.7813%	6.4302%
86	9.8807%	7.2007%
87	11.0963%	8.0601%
88	12.4429%	9.0189%
89	13.9318%	10.0834%
90	15.5670%	11.2620%
91	17.2406%	12.5225%
92	18.8810%	13.8338%
93	20.4623%	15.1900%
94	21.9876%	16.5811%
95	23.4654%	18.0259%
96	25.0692%	19.6166%
97	26.7440%	21.3065%
98	28.5283%	23.1054%
99	30.4538%	25.0154%

Age in 2023	% Dying Next Year	
	Male	Female
100	32.4991%	27.0312%
101	34.6251%	29.1207%
102	36.7466%	31.2400%
103	38.8534%	33.3661%
104	40.9130%	35.4783%
105	42.9096%	37.5671%
106	44.8473%	39.5974%
107	46.7202%	41.5730%
108	48.4866%	43.4775%
109	50.1768%	45.2895%
110	51.5504%	47.0087%
111	51.7221%	48.6348%
112	51.8937%	49.5509%
113	52.0753%	49.6909%
114	52.2590%	49.8178%
115	52.4323%	49.9540%
116	52.4617%	49.9770%
117	52.4811%	49.9865%
118	52.4953%	50.0000%
119	52.5000%	50.0000%
120	100.0000%	100.0000%

Post-Retirement Mortality (Disability)

Non-Uniform Disabled Retired Lives Mortality Rates

Age in 2023	% Dying Next Year	
	Male	Female
20	0.4245%	0.2529%
21	0.4046%	0.2384%
22	0.3771%	0.2201%
23	0.3479%	0.2046%
24	0.3284%	0.1955%
25	0.3271%	0.2006%
26	0.3563%	0.2248%
27	0.3875%	0.2526%
28	0.4214%	0.2842%
29	0.4577%	0.3179%
30	0.4957%	0.3545%
31	0.5347%	0.3936%
32	0.5740%	0.4341%
33	0.6127%	0.4767%
34	0.6526%	0.5183%
35	0.6896%	0.5596%
36	0.7268%	0.5990%
37	0.7632%	0.6375%
38	0.7992%	0.6743%
39	0.8340%	0.7107%
40	0.8684%	0.7465%
41	0.9041%	0.7825%
42	0.9425%	0.8198%
43	0.9842%	0.8602%
44	1.0331%	0.9055%
45	1.0881%	0.9570%
46	1.1531%	1.0151%
47	1.2272%	1.0821%
48	1.3114%	1.1602%
49	1.4059%	1.2509%
50	1.5119%	1.3535%
51	1.5992%	1.4124%
52	1.6941%	1.4798%
53	1.7962%	1.5565%
54	1.9046%	1.6378%
55	2.0172%	1.7206%
56	2.1317%	1.8000%
57	2.2440%	1.8725%
58	2.3553%	1.9346%
59	2.4619%	1.9851%

Age in 2023	% Dying Next Year	
	Male	Female
60	2.5653%	2.0254%
61	2.6645%	2.0543%
62	2.7631%	2.0777%
63	2.8628%	2.0991%
64	2.9622%	2.1203%
65	3.0610%	2.1475%
66	3.1598%	2.1832%
67	3.2609%	2.2334%
68	3.3657%	2.3013%
69	3.4793%	2.3905%
70	3.6049%	2.5045%
71	3.7499%	2.6438%
72	3.9166%	2.8120%
73	4.1119%	3.0102%
74	4.3383%	3.2419%
75	4.6007%	3.5106%
76	4.9004%	3.8158%
77	5.2431%	4.1618%
78	5.6313%	4.5521%
79	6.0703%	4.9885%
80	6.5618%	5.4742%
81	7.1132%	6.0145%
82	7.7222%	6.6107%
83	8.3879%	7.2659%
84	9.1152%	7.9839%
85	9.9011%	8.7694%
86	10.7453%	9.5887%
87	11.6502%	10.4281%
88	12.6264%	11.2813%
89	13.8490%	12.1445%
90	15.1930%	13.0254%
91	16.5695%	13.9481%
92	17.9510%	14.9229%
93	19.3339%	15.9734%
94	20.7265%	17.1071%
95	22.1315%	18.3502%
96	23.6960%	19.7966%
97	25.3490%	21.4143%
98	27.1057%	23.1571%
99	28.9837%	25.0298%

Age in 2023	% Dying Next Year	
	Male	Female
100	30.9515%	27.0312%
101	32.9763%	29.1207%
102	34.9968%	31.2400%
103	37.0032%	33.3661%
104	38.9648%	35.4783%
105	40.8663%	37.5671%
106	42.7117%	39.5974%
107	44.4954%	41.5730%
108	46.1777%	43.4775%
109	47.7874%	45.2895%
110	49.0956%	47.0087%
111	49.2591%	48.6348%
112	49.4226%	49.5509%
113	49.5955%	49.6909%
114	49.7705%	49.8178%
115	49.9355%	49.9540%
116	49.9635%	49.9770%
117	49.9820%	49.9865%
118	49.9955%	50.0000%
119	50.0000%	50.0000%
120	100.0000%	100.0000%

Post-Retirement Mortality (Disability)

Uniform Disabled Retired Lives Mortality Rates

Age in 2023	% Dying Next Year	
	Male	Female
20	0.1247%	0.0575%
21	0.1268%	0.0621%
22	0.1264%	0.0658%
23	0.1255%	0.0697%
24	0.1261%	0.0739%
25	0.1294%	0.0795%
26	0.1379%	0.0879%
27	0.1456%	0.0954%
28	0.1536%	0.1044%
29	0.1630%	0.1136%
30	0.1708%	0.1228%
31	0.1797%	0.1331%
32	0.1879%	0.1428%
33	0.1953%	0.1518%
34	0.2015%	0.1610%
35	0.2078%	0.1689%
36	0.2139%	0.1764%
37	0.2195%	0.1823%
38	0.2246%	0.1866%
39	0.2291%	0.1919%
40	0.2343%	0.1946%
41	0.2377%	0.1987%
42	0.2434%	0.2022%
43	0.2478%	0.2065%
44	0.2538%	0.2108%
45	0.2615%	0.2167%
46	0.2703%	0.2252%
47	0.2814%	0.2346%
48	0.2951%	0.2463%
49	0.3127%	0.2606%
50	0.3325%	0.2774%
51	0.3484%	0.3036%
52	0.3681%	0.3348%
53	0.3927%	0.3701%
54	0.4224%	0.4104%
55	0.4580%	0.4553%
56	0.5007%	0.5041%
57	0.5521%	0.5557%
58	0.6121%	0.6112%
59	0.6794%	0.6669%

Age in 2023	% Dying Next Year	
	Male	Female
60	0.7533%	0.7238%
61	0.8342%	0.7806%
62	0.9186%	0.8368%
63	1.0074%	0.8934%
64	1.0981%	0.9501%
65	1.1926%	1.0100%
66	1.2905%	1.0730%
67	1.3946%	1.1431%
68	1.5052%	1.2210%
69	1.6260%	1.3083%
70	1.7622%	1.4089%
71	1.9174%	1.5224%
72	2.0998%	1.6512%
73	2.3157%	1.7971%
74	2.5719%	1.9601%
75	2.8719%	2.1425%
76	3.2162%	2.3467%
77	3.6058%	2.5764%
78	4.0352%	2.8568%
79	4.4998%	3.2117%
80	4.9990%	3.6106%
81	5.5433%	4.0586%
82	6.1426%	4.5581%
83	6.8089%	5.1152%
84	7.5653%	5.7373%
85	8.4345%	6.4302%
86	9.4102%	7.2007%
87	10.5679%	8.0601%
88	11.8504%	9.0189%
89	13.2684%	10.0834%
90	14.8257%	11.2620%
91	16.4196%	12.5225%
92	17.9819%	13.8338%
93	19.4879%	15.1900%
94	20.9406%	16.5811%
95	22.3480%	18.0259%
96	23.8754%	19.6166%
97	25.4705%	21.3065%
98	27.1698%	23.1054%
99	29.0036%	25.0154%

Age in 2023	% Dying Next Year	
	Male	Female
100	30.9515%	27.0312%
101	32.9763%	29.1207%
102	34.9968%	31.2400%
103	37.0032%	33.3661%
104	38.9648%	35.4783%
105	40.8663%	37.5671%
106	42.7117%	39.5974%
107	44.4954%	41.5730%
108	46.1777%	43.4775%
109	47.7874%	45.2895%
110	49.0956%	47.0087%
111	49.2591%	48.6348%
112	49.4226%	49.5509%
113	49.5955%	49.6909%
114	49.7705%	49.8178%
115	49.9355%	49.9540%
116	49.9635%	49.9770%
117	49.9820%	49.9865%
118	49.9955%	50.0000%
119	50.0000%	50.0000%
120	100.0000%	100.0000%

Pre-Retirement Mortality

Non-Uniform Death-in-Service Mortality Rates

Age in 2023	% Dying Next Year	
	Male	Female
20	0.0422%	0.0141%
21	0.0440%	0.0144%
22	0.0439%	0.0136%
23	0.0451%	0.0139%
24	0.0455%	0.0131%
25	0.0482%	0.0147%
26	0.0525%	0.0163%
27	0.0570%	0.0180%
28	0.0617%	0.0212%
29	0.0679%	0.0230%
30	0.0728%	0.0262%
31	0.0791%	0.0294%
32	0.0851%	0.0311%
33	0.0909%	0.0355%
34	0.0977%	0.0381%
35	0.1024%	0.0419%
36	0.1092%	0.0438%
37	0.1135%	0.0479%
38	0.1195%	0.0502%
39	0.1243%	0.0532%
40	0.1292%	0.0558%
41	0.1330%	0.0579%
42	0.1384%	0.0598%
43	0.1428%	0.0626%
44	0.1489%	0.0663%
45	0.1545%	0.0700%
46	0.1622%	0.0738%
47	0.1709%	0.0779%
48	0.1808%	0.0833%
49	0.1922%	0.0902%
50	0.2053%	0.0977%
51	0.2205%	0.1058%
52	0.2376%	0.1156%
53	0.2571%	0.1272%
54	0.2800%	0.1404%
55	0.3054%	0.1551%
56	0.3341%	0.1710%
57	0.3651%	0.1890%
58	0.4000%	0.2065%
59	0.4380%	0.2261%

Age in 2023	% Dying Next Year	
	Male	Female
60	0.4776%	0.2464%
61	0.5176%	0.2671%
62	0.5594%	0.2887%
63	0.6013%	0.3114%
64	0.6428%	0.3349%
65	0.6858%	0.3617%
66	0.7293%	0.3899%
67	0.7771%	0.4221%
68	0.8271%	0.4586%
69	0.8844%	0.5009%
70	0.9472%	0.5487%
71	1.0193%	0.6029%
72	1.1009%	0.6659%
73	1.1936%	0.7369%
74	1.2988%	0.8170%
75	1.4169%	0.9086%
76	1.5497%	1.0109%
77	1.6984%	1.1254%
78	1.8641%	1.2531%
79	2.0484%	1.3952%
80	2.2530%	1.5538%
81	2.8995%	2.0054%
82	3.7326%	2.5869%
83	4.8041%	3.3348%
84	6.1857%	4.2959%
85	7.9667%	5.5299%
86	10.2595%	7.1139%
87	11.3748%	8.0753%
88	12.5716%	9.1491%
89	13.8490%	10.3271%
90	15.1930%	11.5947%
91	16.5695%	12.9080%
92	17.9510%	14.2328%
93	19.3339%	15.5669%
94	20.7265%	16.9060%
95	22.1315%	18.2808%
96	23.6960%	19.7956%
97	25.3490%	21.4143%
98	27.1057%	23.1571%
99	28.9837%	25.0298%

Age in 2023	% Dying Next Year	
	Male	Female
100	30.9515%	27.0312%
101	32.9763%	29.1207%
102	34.9968%	31.2400%
103	37.0032%	33.3661%
104	38.9648%	35.4783%
105	40.8663%	37.5671%
106	42.7117%	39.5974%
107	44.4954%	41.5730%
108	46.1777%	43.4775%
109	47.7874%	45.2895%
110	49.0956%	47.0087%
111	49.2591%	48.6348%
112	49.4226%	49.5509%
113	49.5955%	49.6909%
114	49.7705%	49.8178%
115	49.9355%	49.9540%
116	49.9635%	49.9770%
117	49.9820%	49.9865%
118	49.9955%	50.0000%
119	50.0000%	50.0000%
120	100.0000%	100.0000%

Pre-Retirement Mortality

Uniform Death-in-Service Mortality Rates

Age in 2023	% Dying Next Year	
	Male	Female
20	0.0422%	0.0174%
21	0.0430%	0.0188%
22	0.0429%	0.0193%
23	0.0429%	0.0209%
24	0.0432%	0.0226%
25	0.0435%	0.0245%
26	0.0464%	0.0264%
27	0.0494%	0.0284%
28	0.0525%	0.0317%
29	0.0557%	0.0338%
30	0.0574%	0.0372%
31	0.0604%	0.0392%
32	0.0631%	0.0424%
33	0.0656%	0.0454%
34	0.0677%	0.0480%
35	0.0708%	0.0502%
36	0.0733%	0.0520%
37	0.0737%	0.0546%
38	0.0763%	0.0553%
39	0.0782%	0.0570%
40	0.0794%	0.0582%
41	0.0801%	0.0591%
42	0.0828%	0.0609%
43	0.0838%	0.0615%
44	0.0857%	0.0632%
45	0.0886%	0.0651%
46	0.0915%	0.0672%
47	0.0955%	0.0705%
48	0.0997%	0.0733%
49	0.1062%	0.0774%
50	0.1130%	0.0831%
51	0.1205%	0.0893%
52	0.1305%	0.0960%
53	0.1412%	0.1035%
54	0.1527%	0.1123%
55	0.1670%	0.1215%
56	0.1840%	0.1318%
57	0.2018%	0.1430%
58	0.2230%	0.1528%
59	0.2464%	0.1639%

Age in 2023	% Dying Next Year	
	Male	Female
60	0.2706%	0.1740%
61	0.2970%	0.1828%
62	0.3251%	0.1925%
63	0.3536%	0.2010%
64	0.3820%	0.2093%
65	0.4123%	0.2170%
66	0.4602%	0.2438%
67	0.5116%	0.2735%
68	0.5702%	0.3090%
69	0.6346%	0.3498%
70	0.7079%	0.3973%
71	0.7914%	0.4532%
72	0.8872%	0.5192%
73	0.9969%	0.5961%
74	1.1228%	0.6862%
75	1.2689%	0.7919%
76	1.4355%	0.9147%
77	1.6276%	1.0578%
78	1.8481%	1.2244%
79	2.1009%	1.4160%
80	2.3888%	1.6376%
81	3.0009%	2.1000%
82	3.7714%	2.6905%
83	4.7389%	3.4446%
84	5.9563%	4.4072%
85	7.4878%	5.6351%
86	9.4102%	7.2007%
87	10.5679%	8.0601%
88	11.8504%	9.0189%
89	13.2684%	10.0834%
90	14.8257%	11.2620%
91	16.4196%	12.5225%
92	17.9819%	13.8338%
93	19.4879%	15.1900%
94	20.9406%	16.5811%
95	22.3480%	18.0259%
96	23.8754%	19.6166%
97	25.4705%	21.3065%
98	27.1698%	23.1054%
99	29.0036%	25.0154%

Age in 2023	% Dying Next Year	
	Male	Female
100	30.9515%	27.0312%
101	32.9763%	29.1207%
102	34.9968%	31.2400%
103	37.0032%	33.3661%
104	38.9648%	35.4783%
105	40.8663%	37.5671%
106	42.7117%	39.5974%
107	44.4954%	41.5730%
108	46.1777%	43.4775%
109	47.7874%	45.2895%
110	49.0956%	47.0087%
111	49.2591%	48.6348%
112	49.4226%	49.5509%
113	49.5955%	49.6909%
114	49.7705%	49.8178%
115	49.9355%	49.9540%
116	49.9635%	49.9770%
117	49.9820%	49.9865%
118	49.9955%	50.0000%
119	50.0000%	50.0000%
120	100.0000%	100.0000%

Illustrative Annuity Values
(6.50% Interest)

Non-Uniform

Sample Attained Ages in 2023	Single Life Retirement Values					
	Present Value of $1 Monthly for Life		Percent Dying Next Year		Future Life Expectancy (years)	
	Male	Female	Male	Female	Male	Female
50	$155.47	$164.57	0.6520%	0.3833%	32.62	37.02
55	147.73	157.98	0.8254%	0.4642%	28.27	32.35
60	138.27	149.42	1.0655%	0.5519%	24.07	27.75
65	126.50	138.16	1.2627%	0.6616%	19.98	23.19
70	111.76	123.74	1.8506%	1.0405%	16.01	18.75
75	94.90	106.60	2.9586%	1.8224%	12.37	14.60
80	76.89	87.55	5.0640%	3.3335%	9.18	10.89

Uniform

Sample Attained Ages in 2023	Single Life Retirement Values					
	Present Value of $1 Monthly for Life		Percent Dying Next Year		Future Life Expectancy (years)	
	Male	Female	Male	Female	Male	Female
50	$163.07	$166.54	0.1899%	0.1360%	34.92	37.38
55	154.16	158.50	0.3066%	0.2548%	29.91	32.31
60	142.95	148.56	0.5466%	0.4618%	25.08	27.44
65	129.55	136.60	0.9302%	0.7330%	20.53	22.82
70	113.85	122.18	1.5214%	1.1630%	16.30	18.45
75	95.94	105.29	2.6293%	2.0127%	12.45	14.40
80	76.77	86.87	4.7848%	3.6106%	9.09	10.82

The present values shown above are for illustrative purposes only. They are straight life amounts and do not include the value of future post-retirement increases.

Rates of Retirement

	% of Active Participants Retiring								
	Closed and Year 2000 Plans					2011 Tier			
	Non-Uniformed Members					Non-Uniformed Members			
	Male		Female		Uniformed	Normal			Uniformed
Age	Normal	Early	Normal	Early	Normal	Age & Service	Rule of 90	Early	Normal
50	39%		25%		45%				
51	35%		19%		15%				
52	27%		23%		18%				
53	22%		21%		16%				
54	21%		23%		19%				
55	25%	3%	28%	3%	26%		30%		30%
56	27%	3%	29%	3%	30%		30%		30%
57	24%	3%	29%	4%	28%		30%		30%
58	21%	3%	26%	4%	30%		30%		30%
59	22%	3%	29%	5%	40%		30%		30%
60	21%	5%	23%	5%	100%		30%		100%
61	19%	5%	22%	5%	100%		30%		100%
62	32%	28%	33%	20%	100%		30%	10%	100%
63	32%	25%	22%	20%	100%		30%	10%	100%
64	22%	21%	16%	20%	100%		30%	10%	100%
65	30%		39%		100%		30%	10%	100%
66	40%		45%		100%		30%	10%	100%
67	40%		40%		100%	50%	30%		100%
68	30%		40%		100%	50%	30%		100%
69	30%		40%		100%	50%	30%		100%
70	40%		50%		100%	100%	100%		100%
71	50%		50%		100%	100%	100%		100%
72	50%		100%		100%	100%	100%		100%
73	50%		100%		100%	100%	100%		100%
74	100%		100%		100%	100%	100%		100%

Rates of Disability

All Plan Participants

Age	% of Active Participants Becoming Disabled			
	Uniformed Members		Non-Uniformed Members	
	Male	Female	Male	Female
20	0.10%	0.10%	0.06%	0.06%
21	0.10%	0.10%	0.06%	0.06%
22	0.10%	0.10%	0.07%	0.07%
23	0.10%	0.10%	0.07%	0.07%
24	0.10%	0.10%	0.07%	0.07%
25	0.10%	0.10%	0.08%	0.08%
26	0.10%	0.10%	0.08%	0.08%
27	0.10%	0.10%	0.09%	0.09%
28	0.10%	0.10%	0.09%	0.09%
29	0.10%	0.10%	0.09%	0.09%
30	0.10%	0.10%	0.09%	0.09%
31	0.10%	0.10%	0.09%	0.09%
32	0.10%	0.10%	0.10%	0.10%
33	0.10%	0.10%	0.10%	0.10%
34	0.10%	0.10%	0.11%	0.11%
35	0.10%	0.10%	0.12%	0.12%
36	0.10%	0.10%	0.12%	0.12%
37	0.10%	0.10%	0.13%	0.13%
38	0.10%	0.10%	0.14%	0.14%
39	0.10%	0.10%	0.14%	0.14%
40	0.10%	0.10%	0.16%	0.16%
41	0.10%	0.10%	0.18%	0.18%
42	0.10%	0.10%	0.20%	0.20%
43	0.10%	0.10%	0.21%	0.21%
44	0.10%	0.10%	0.23%	0.23%
45	0.10%	0.10%	0.26%	0.26%
46	0.10%	0.10%	0.28%	0.28%
47	0.10%	0.10%	0.31%	0.31%
48	0.10%	0.10%	0.34%	0.34%
49	0.10%	0.10%	0.38%	0.38%
50	0.10%	0.10%	0.43%	0.43%
51	0.10%	0.10%	0.49%	0.49%
52	0.10%	0.10%	0.56%	0.56%
53	0.10%	0.10%	0.64%	0.64%
54	0.10%	0.10%	0.72%	0.72%
55	0.10%	0.10%	0.82%	0.82%
56	0.10%	0.10%	0.92%	0.92%
57	0.10%	0.10%	1.03%	1.03%
58	0.10%	0.10%	1.15%	1.15%
59	0.10%	0.10%	1.28%	1.28%
60	0.10%	0.10%	1.41%	1.41%
61	0.10%	0.10%	1.55%	1.55%
62	0.10%	0.10%	1.70%	1.70%
63	0.10%	0.10%	1.86%	1.86%
64	0.10%	0.10%	2.03%	2.03%
65	0.10%	0.10%	0.00%	0.00%
66	0.10%	0.10%	0.00%	0.00%
67	0.10%	0.10%	0.00%	0.00%
68	0.10%	0.10%	0.00%	0.00%
69	0.10%	0.10%	0.00%	0.00%
70	0.10%	0.10%	0.00%	0.00%
71	0.10%	0.10%	0.00%	0.00%
72	0.10%	0.10%	0.00%	0.00%

Rates of Separation from Active Employment

All Plan Participants

Age	Service	% of Active Participants Withdrawing			
		Uniformed Members		Non-Uniformed Members	
		Male	Female	Male	Female
	0-1	10.00%	10.00%	28.00%	22.00%
	1-2	6.00%	6.00%	18.50%	15.00%
	2-3	3.25%	3.25%	12.50%	14.00%
	3-4	3.00%	3.00%	9.00%	12.00%
	4-5	2.75%	2.75%	8.00%	7.00%
25	5 & Up	3.51%	3.51%	9.04%	10.40%
26		3.51%	3.51%	9.04%	10.40%
27		3.51%	3.51%	9.04%	10.40%
28		3.51%	3.51%	8.71%	10.08%
29		3.51%	3.51%	8.38%	9.75%
30		3.51%	3.51%	8.05%	9.43%
31		3.51%	3.51%	7.73%	9.10%
32		3.39%	3.39%	7.41%	8.78%
33		3.07%	3.07%	7.10%	8.35%
34		2.77%	2.77%	6.79%	7.92%
35		2.49%	2.49%	6.48%	7.49%
36		2.22%	2.22%	6.18%	7.06%
37		1.97%	1.97%	5.89%	6.63%
38		1.76%	1.76%	5.60%	6.33%
39		1.59%	1.59%	5.31%	6.03%
40		1.47%	1.47%	5.04%	5.73%
41		1.37%	1.37%	4.77%	5.43%
42		1.28%	1.28%	4.51%	5.14%
43		1.19%	1.19%	4.26%	4.97%
44		1.11%	1.11%	4.02%	4.80%
45		1.02%	1.02%	3.78%	4.63%
46		0.94%	0.94%	3.55%	4.46%
47		0.85%	0.85%	3.34%	4.29%
48		0.76%	0.76%	3.14%	4.17%
49		0.67%	0.67%	2.95%	4.06%
50		0.59%	0.59%	2.76%	3.94%
51		0.50%	0.50%	2.60%	3.82%
52		0.43%	0.43%	2.43%	3.71%
53		0.38%	0.38%	2.29%	3.71%
54		0.36%	0.36%	2.15%	3.71%
55		0.30%	0.30%	2.02%	3.71%
56		0.32%	0.32%	1.93%	3.71%
57		0.24%	0.24%	1.83%	3.71%
58		0.24%	0.24%	1.75%	3.71%
59		0.23%	0.23%	1.68%	3.71%
60		0.22%	0.22%	1.64%	3.71%

Miscellaneous and Technical Assumptions

Administrative Expenses:	1.340% of payroll, based upon actual results from previous year.
Disability Expenses:	0.475% of payroll included in contribution. Retirement system pays premium directly to an outside insurance company or TPA.
Marriage Assumption:	90% of participants are assumed to be married for purposes of death-in-service benefits. Applies to disabled members entitled to future retirement benefits also. Male spouses are assumed to be 3 years older than females if beneficiary information is not available. For purposes of valuing the 50% death after retirement benefit, 100% of closed active members are assumed to be married.
Pay Increase Timing:	Beginning of (Fiscal) year. This is equivalent to assuming that reported pays represent amounts paid to members during the year ended on the valuation date.
Decrement Timing:	Decrements of all types are assumed to occur mid-year.
Eligibility Testing:	Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.
Benefit Service:	Exact fractional service is used to determine the amount of benefit payable.
Decrement Relativity:	Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.
Normal Form of Benefit:	The assumed normal form of benefit is a 50% joint & survivor benefit for married members in the Closed plan and a straight life benefit for all other members.
Optional Benefit Factors:	Optional Benefit Factors are in accordance with tables adopted by the Board. We believe these factors are reasonably close to actuarial equivalence based on valuation assumptions. The reduction for the Y2K and 2011 Tier benefits was calculated in accordance with 104.1027 RSMo.
Deferred Joint and Survivor:	It was assumed that all deferred members eligible for the Closed plan would choose Closed plan benefits at retirement.
Other:	Turnover decrements do not operate during retirement eligibility.
Miscellaneous Adjustments:	The calculated normal and early retirement benefits were increased by 3.75% for Uniformed and 2.3% for Non-Uniformed to account for the inclusion of unused sick leave in the calculation of Average Pay. The calculated normal and early retirement benefits were further increased by 2% for the Closed and Year 2000 plan Uniform members for end of career increases in compensation. Post-disability benefit liabilities were increased by 25% for all future disabilities to account for potential survivor benefits payable by the retirement system during the period of disability. Current self-insured disability retirant liabilities are increased by 12% to account for future survivor benefits.

Miscellaneous and Technical Assumptions

Miscellaneous Adjustments:	Liabilities for future deferred members were increased by 3% to account for potential survivor benefits payable if the member dies during the deferred period. We have otherwise not modeled this benefit for future deferred members.
COLA:	The COLA is assumed to be 80% of the price inflation assumption of 2.25%. This results in a 1.80% annual COLA assumption (Closed Plan members hired prior to August 28, 1997 receive a minimum 4% COLA. These increases are made until the total of the increases reaches 65% of initial benefit at which time the increases will have the minimum removed). All COLAs are assumed to be paid on the anniversary of retirement.
Contribution Stabilization Reserve Fund:	The contribution stabilization reserve fund affects the total amount of UAAL financed and is assumed to grow at the investment return rate.
Death Prior to Retirement:	100% of deaths in service are assumed to be non-duty.
Gainful Employment Offset:	30% of the $90 per month special benefit is assumed to be offset by gainful employment.
Minimum Benefit Eligibility:	Death prior to retirement benefits are assumed to be eligible for the minimum base benefit along with normal and early retirement benefits.
Active Plan Choice:	It was assumed that active members eligible for the Closed plan would choose the Closed plan benefits at retirement.
Member Contribution Interest:	Member contributions are assumed to be credited with 3.0% interest.

Data

Active and retired member data was reported as of May 31. It was brought forward to June 30 by adding one month of service for all active members and otherwise making no other adjustments. It was assumed that the population as of May 31 was statistically equivalent to the population as of June 30. Financial information is reported as of June 30.

Active Member Data: No Adjustments.

Salary Adjustments: Salary from data as provided in prior valuations was used for sixteen active members on leave. Salary for new hires was annualized.

Disabled Member Data: Y2K and 2011 Tier data as provided are increased by 80% of CPI from date of disability to the valuation date and projected increases from the valuation date to the retirement date at 2.0% annually. For purposes of valuing these benefits, the 2.0% projected annual increases are backed out and replaced with 1.8% (80% of the current 2.25% CPI assumption) projected annual increases.

Deferred Member Data: Nine Terminated Vested members were indicated to have a refund request in progress. As a result, we removed them from the Terminated Vested data file.

Reconciliation and Review: Reported data was reconciled to data reported for the prior year and reviewed for completeness and reasonableness. Any questions arising from this review were discussed with System staff. Upon completion of the review, control totals (see page 1) were shared with the Executive Director and discussed to ensure MPERS also agreed that the data was reasonable.

Method of Financing Future Benefits for Present Active Members

The valuation was prepared in accordance with Section 104.1066 of the Missouri Revised Statutes, which requires the use of the entry-age normal actuarial cost method for determining normal cost and level percent-of-payroll financing of unfunded actuarial accrued liabilities. Details of the application of these methods are described below.

Normal cost and the allocation of present values between service rendered before and after the valuation date were determined using an individual entry-age actuarial cost method having the following characteristics:

(i) The annual normal cost for each individual active member, payable from the date of employment to the date of retirement, is sufficient to accumulate the value of the member's benefit at the time of retirement; and

(ii) Each annual normal cost is a constant percentage of the member's year by year projected covered pay.

The ***Value of Future Benefits*** was calculated using the benefits assumed to be payable in the future to current active, terminated vested and retired members. It was assumed that current active and retired Uniformed Patrol members hired prior to July 1, 2000 would elect to retain the benefits under the current plan. Computed costs were increased in accordance with the adjustments described on page E-18.

The ***Present Value of Future Normal Costs*** was defined as the average normal cost rate multiplied by the present value of future payroll for the group.

The ***Actuarial Accrued Liabilities*** were defined as the difference between the present value of future benefits and the present value of future normal costs.

The ***Contribution Stabilization Reserve Fund (CSR)*** is set by the Board based on deferred recognition of gains in an effort to stabilize employer contributions from year to year. The fund is capped at $250,000,000.

Actuarial Accrued Liabilities, less pension assets as of June 30, 2023, resulted in ***Unfunded Actuarial Accrued Liabilities (UAAL).*** The UAAL plus the CSR was amortized using the following funding policy.

The total contribution is based on normal cost plus a 1-year amortization period for unfunded retiree liabilities and a 16-year amortization period for other unfunded liabilities. Both amortization periods are closed periods starting July 1, 2024.

Post-Valuation Date Activity: No other adjustments were made to the valuation results to reflect other post-valuation date activity.

Glossary

Actuarial Accrued Liability. The difference between (i) the actuarial present value of future plan benefits, and (ii) the actuarial present value of future normal cost. Sometimes referred to as "accrued liability" or "past service liability."

Accrued Service. The service credited under the plan which was rendered before the date of the actuarial valuation.

Actuarial Assumptions. Estimates of future plan experience with respect to rates of mortality, disability, turnover, retirement, rate or rates of investment income and salary increases. Decrement assumptions (rates of mortality, disability, turnover and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (salary increases and investment income) consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation.

Actuarial Cost Method. A mathematical budgeting procedure for allocating the dollar amount of the "actuarial present value of future plan benefits" between the actuarial present value of future normal cost and the actuarial accrued liability. Sometimes referred to as the "actuarial funding method."

Actuarial Equivalent. A series of payments is called an actuarial equivalent of another series of payments if the two series have the same actuarial present value.

Actuarial Present Value. The amount of funds presently required to provide a payment or series of payments in the future. It is determined by discounting the future payments at a predetermined rate of interest, taking into account the probability of payment.

Actuarial value of Assets. Also referred to as funding value of assets, smoothed market value of assets, or valuation assets.

Valuation assets recognize assumed investment return fully each year. Differences between actual and assumed investment return are phased-in over a closed three-year period. This treatment helps remove the timing of investment activities from the valuation process. During periods when investment performance exceeds the assumed rate, valuation assets will tend to be less than market value. During periods when investment performance is less than the assumed rate, valuation assets will tend to be greater than market value. If assumed rates are exactly realized for three consecutive years, valuation assets will become equal to market value.

Actuary. A person who is trained in the applications of probability and compound interest to problems in business and finance that involve payment of money in the future, contingent upon the occurrence of future events. Most actuaries in the United States are Members of the American Academy of Actuaries. The Society of Actuaries is an international research, education and membership organization for actuaries in the life and health insurance, employee benefits, and pension fields. It administers a series of examinations leading initially to Associateship and the designation ASA and ultimately to Fellowship with the designation FSA.

Glossary (Concluded)

Amortization. Paying off an interest-bearing liability by means of periodic payments of interest and principal, as opposed to paying it off with a lump sum payment.

Experience Gain (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, in accordance with the actuarial cost method being used.

Normal Cost. The annual cost assigned, under the actuarial funding method, to current and subsequent plan years. Sometimes referred to as "current service cost." Any payment toward the unfunded actuarial accrued liability is not part of the normal cost.

Plan Termination Liability. The actuarial present value of future plan benefits based on the assumption that there will be no further accruals for future service and salary. The termination liability will generally be less than the liabilities computed on a "going concern" basis and is not normally determined in a routine actuarial valuation.

Reserve Account. An account used to indicate that funds have been set aside for a specific purpose and are not generally available for other uses.

Unfunded Actuarial Accrued Liability. The difference between the actuarial accrued liability and actuarial value of assets. Sometimes referred to as "unfunded accrued liability."

The existence of unfunded actuarial accrued liabilities is not in itself bad, any more than a mortgage on a house is bad. Unfunded actuarial accrued liabilities do not represent a debt that is payable today. What is important is the ability to amortize the unfunded actuarial accrued liabilities and the trend in their amount (after due allowance for devaluation of the dollar).

Valuation Payroll. Active member payroll that is intended to reflect the annual salary considered as covered compensation for Retirement System benefits.

SECTION F

FINANCIAL PRINCIPLES AND OPERATIONAL TECHNIQUES

Financial Principles and Operational Techniques of the Retirement System

Promises Made, and To Be Paid For. As each year is completed, the Retirement System in effect hands an "IOU" to each member then acquiring a year of service credit -- the "IOU" says: "The Missouri Department of Transportation and Highway Patrol Employees' Retirement System owes you one year's worth of retirement benefits, payments in cash commencing when you qualify for retirement."

The principal related financial question is: When shall the money required to cover the "IOU" be contributed? This year, when the benefit of the member's service is received? Or, some future year when the "IOU" becomes a cash demand?

The objective of level percent-of-payroll financing is that this year's taxpayers contribute the money to cover the IOUs being handed out this year. By following this objective, ***the employer contribution rate will remain approximately level from year to year*** --- and will not have to be increased for future generations of taxpayers. However, "Level percent-of-payroll" does NOT mean "Fixed percent-of-payroll." The level percent-of-payroll is an estimate that may change from one year to the next.

(There are systems which have a design for deferring contributions to future taxpayers, lured by a lower contribution rate now and putting aside the consequence that the contribution rate must then relentlessly grow much greater over decades of time.)

An inevitable by-product of the level-cost design is the accumulation of reserve assets, for decades, and the income produced when the assets are invested. ***Invested assets are a by-product and not the objective.*** Investment income becomes the 3rd contributor for benefits to employees, and is interlocked with the contribution amounts required from employees and employer.

Financial Principles and Operational Techniques of the Retirement System (Concluded)

Translated to actuarial terminology, this level-cost objective means that the contribution rates must total at least the following:

Normal Cost (the value assigned to service being rendered this year)

. . . plus . . .

Interest on Unfunded Actuarial Accrued Liabilities (the difference between liabilities for service already rendered and the accrued assets of the Retirement System).

Computing Contributions to Support System Benefits. From a given schedule of benefits and from the employee data and asset data furnished by the system, the actuary determines the contribution rates to support the benefits, by means of ***an actuarial valuation.***

An actuarial valuation has a number of ingredients such as: the rate of investment return which plan assets will earn; the rates of withdrawal of active members who leave covered employment; the rates of mortality; the rates of disability; the rates of pay increases and the assumed age or ages at actual retirement.

In an actuarial valuation the actuary must assume what the above rates will be, for the next year and for decades in the future. Only the subsequent actual experience of the plan can indicate the degree of accuracy of the assumptions.

Reconciling Differences Between Assumed Experience and Actual Experience. Once actual experience has occurred and has been observed, it will not coincide exactly with assumed experience, regardless of the skill of the actuary and the many calculations made. Most retirement systems cope with such differences by having annual actuarial valuations. Each actuarial valuation is a complete recalculation of assumed future experience, taking into account all past differences between assumed and actual experience. The result is ***continuing adjustments to the financial position.***

Actuarial Valuation Process

The ***actuarial valuation*** is the mathematical process by which the contribution rate is determined, and the flow of activity constituting the valuation may be summarized as follows:

A . ***Covered people data*** furnished by plan administrator, including:

Retired lives now receiving benefits

Former employees with vested benefits not yet payable

Active employees

B . + ***Asset data*** (cash & investments), furnished by the plan administrator

C . + ***Benefit provisions*** which specify eligibility and amounts of pensions

D . + ***Assumptions concerning future experience in various risk areas,*** which are established by the Retirement Board after consulting with the actuary

E . + ***The funding method*** for employer contributions (the long-term, planned pattern for employer contributions)

F . + ***Mathematically combining the assumptions, the funding method, and the data***

G . = Determination of:

Plan Financial Position and/or

New Employer Contribution Rate

Meaning of "Unfunded Actuarial Accrued Liabilities"

"Actuarial accrued liabilities" are the portion of the present value of plan promises to pay benefits in the future that are not covered by future normal cost contributions. A liability has been established ("accrued") because the service has been rendered but the resulting monthly cash benefit may not be payable until years in the future. Actuarial accrued liabilities are the result of complex mathematical calculations, which are made by the plan's actuary.

If "actuarial accrued liabilities" exceed the plan's accrued assets (cash & investments), the difference is ***"unfunded actuarial accrued liabilities."*** This is the usual condition. If the plan's assets equaled the plan's "actuarial accrued liabilities," then the plan would be termed "fully funded." This is an unusual condition.

Each time a plan adds a new benefit, which applies to service already rendered, an "actuarial accrued liability" is created, which is also an "unfunded actuarial accrued liability" because the plan can't print instant cash to cover the value of the new benefit promises. Payment for such unfunded actuarial accrued liabilities is spread over a period of years, commonly in the 20- 30-year range.

Unfunded actuarial accrued liabilities can occur in another way: if actual plan experience is less favorable than assumed plan experience, the difference is added to unfunded actuarial accrued liabilities. In plans where benefits are directly related to an employee's pay near time of retirement, unfunded actuarial accrued liabilities rose dramatically during the 1970s. Unexpected rates of pay increase created additional actuarial accrued liabilities, which could not be matched by reasonable investment results. More recent experience has generally been more favorable with some reductions in unfunded actuarial accrued liabilities.

The existence of unfunded actuarial accrued liabilities is not bad, but the changes from year to year in the amount of unfunded actuarial accrued liabilities are important, --- "bad" or "good" or somewhere in between.

Even though unfunded actuarial accrued liabilities don't constitute a bill payable immediately, it is important that policy-makers prevent the amount from becoming unreasonably high and ***it is vital for plans to have a sound method for making payments toward them*** so that they are controlled.

SECTION G

SUPPLEMENTAL INFORMATION FOR ANNUAL COMPREHENSIVE FINANCIAL REPORTING

800.521.0498 | P: 248.799.9000 | www.grsconsulting.com

September 14, 2023

Retirement Board
Missouri Department of Transportation
and Highway Patrol Employees' Retirement System
1913 William Street
Jefferson City, Missouri 65102

Ladies and Gentlemen:

This report was prepared at the request of the Board and is intended for use by the Retirement System and those designated or approved by the Board. This report may be provided to parties other than the System only in its entirety and only with the permission of the Board. GRS is not responsible for unauthorized use of this report. This report should not be relied on for any purpose other than the purpose described.

The basic financial objective of the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS) is to establish and receive contributions which:

(1) When expressed in terms of percents of active member payroll, will remain approximately level from generation to generation of Missouri citizens; and

(2) When combined with present assets and future investment returns, will be sufficient to meet the present and future financial obligations of MPERS.

In order to measure progress toward this fundamental objective, MPERS has annual actuarial valuations performed. The valuations: (i) measure the present financial position; and (ii) establish contribution rates that provide for the current cost and level percent-of-payroll amortization of unfunded actuarial liabilities over a reasonable period. An actuarial valuation was performed based upon benefit conditions, data and assumptions as of June 30, 2023. This valuation indicates that contribution rates for the period beginning July 1, 2024 that are at least equal to the calculated contribution rates will meet the Board's financial objective. The calculated contribution rates are 52.01% of payroll for the 5,499 Non-Uniformed employees and 58.49% of payroll for the 1,122 Uniformed Patrol employees.

The plan administrative staff provides the actuary with data for the actuarial valuation. The actuary relies on the data after reviewing it for internal and year to year consistency. Member data was not audited by the actuary. The actuary summarizes and tabulates population data in order to analyze longer term trends. We are not responsible for the accuracy or completeness of the data provided by MPERS.

Gabriel, Roeder, Smith & Company was responsible for the following schedules found in the Actuarial Section:

- Summary of Actuarial Assumptions and Methods
  - Probabilities of Separation from Active Employment
  - Individual Salary Increases
  - Joint Life Retirement Values
  - Probabilities of Retirement for Members
  - Probabilities of Disability for Members
- Summary of Member Data Included in Valuations
  - Active Members by Attained Age and Years of Service
  - Schedule of Active Member Valuation Data
- Solvency Test
- Derivation of Financial Experience
- Schedule of Retirees and Beneficiaries Added and Removed
- Summary of Plan Provisions
- Legislative Changes

Gabriel, Roeder, Smith & Company was responsible for the following schedules found in the Financial Section:

- Schedule of Changes in the Employer's Net Pension Liability
- Schedule of Employer's Net Pension Liability
- Schedule of Employer Contributions
- Schedule of the Actuarially Determined Contributions

Actuarial valuations are based upon assumptions regarding future activity in specific risk areas including the rates of investment return and payroll growth, eligibility for the various classes of benefits, and longevity among retired lives. These assumptions are adopted by the Board. The assumptions and the methods comply with the requirements of the Governmental Accounting Standards Board (GASB). Each actuarial valuation takes into account all prior differences between actual and assumed experience in each risk area and adjusts the contribution rates as needed. Actuarial methods and assumptions were adopted by the Board pursuant to the June 30, 2022 Experience Study. Gabriel, Roeder, Smith & Company has produced the following reports as of June 30, 2023:

- Annual Actuarial Valuation Report
- GASB Statement Nos. 67 and 68 Valuation Report

In order to gain a full understanding of the condition of this Plan, these reports should be read in their entirety.

To the best of our knowledge, this report is complete and accurate and was made in accordance with standards of practice promulgated by the Actuarial Standards Board. The assumptions and methods used for funding purposes meet the parameters set by Actuarial Standards of Practice. The actuarial assumptions used for this valuation produce results which, individually and in the aggregate, are reasonable.

The employer contributions determined in this report are based on the Board funding policy. This policy is discussed on page 4 of the annual actuarial valuation report. We commend the Board for its aggressive monitoring and updating of the funding policy over the recent past. However, continued employer contributions at the current level do not guarantee benefit security. We, therefore, encourage the Board to continue to routinely monitor and update its funding policy and to continue to consider benefit security when doing so.

The annual actuarial valuation report includes risk measures on pages A-13 and A-14, but does not include a more robust assessment of the risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment. We recommend that the Board consider performing an analysis to assess risk related to investment and payroll.

This report was prepared using our proprietary valuation model and related software which in our professional judgment has the capability to provide results that are consistent with the purposes of the valuation and has no material limitations or known weaknesses. We performed tests to ensure that the model reasonably represents that which is intended to be modeled.

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 (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law.

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. Heidi G. Barry and Jamal Adora are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

The signing actuaries are independent of the plan sponsor.

Based upon the valuation results, it is our opinion that the Missouri Department of Transportation and Highway Patrol Employees' Retirement System continues to operate in accordance with actuarial principles of level percent-of-payroll financing. It is important to the well-being of the System that it continues to receive contributions at the actuarially determined levels. It is also important to continue to monitor both the total funded status and the funded status of the retiree liabilities to ensure that the funding policy is consistent with the expected life span of the respective unfunded obligation.

Respectfully submitted,
Gabriel, Roeder, Smith & Company

Heidi G. Barry, ASA, FCA, MAAA

Jamal Adora, ASA, EA, MAAA

Solvency Test

The MPERS funding objective is to meet long-term benefit promises through contributions that remain approximately level from year to year as a percent of member payroll. If the contributions to the System are level in concept and soundly executed, the System will ***pay all promised benefits when due – the ultimate test of financial soundness.***

A solvency test is one means of checking a system's progress under its funding program. In a solvency test for a non-contributory plan, the plan's present assets (cash and investments) are compared with: 1) the liabilities for future benefits to present retired lives, and 2) the liabilities for service already rendered by members. In a system that has been following the discipline of level percent-of-payroll financing, the liabilities for future benefits to present retired lives (liability 1) will be fully covered by present assets (except in rare circumstances). In addition, the liabilities for service already rendered by members (liability 2) will be partially covered by the remainder of present assets. The larger the funded portion of liability 2, the stronger the condition of the system.

The schedule below illustrates the history of liability 2 of the System.

Val. Date June 30	(1) Member Contributions	(2) Retirees and Benef.	(3) Active and Inactive Members	Present Valuation Assets	Portion of Present Values Covered by Present Assets			
					(1)	(2)	(3)	Total
	----------$ Millions----------							
2014	2	2,384	1,264	1,795	100%	75%	0%	49%
2015	3	2,444	1,269	1,967	100%	80%	0%	53%
2016	5	2,470	1,287	2,087	100%	84%	0%	55%
2017	8	2,488	1,306	2,173	100%	87%	0%	57%
2018#	11	2,598	1,373	2,274	100%	87%	0%	57%
2019	14	2,656	1,367	2,415	100%	90%	0%	60%
2020	18	2,726	1,348	2,481	100%	90%	0%	61%
2021#	21	2,882	1,441	2,711	100%	93%	0%	62%
2022	24	2,952	1,435	2,926	100%	98%	0%	66%
2023#	29	3,120	1,560	3,248	100%	100%	6%	69%

 # New assumptions and/or methods adopted.

Derivation of Experience Gain/(Loss)

Actual experience will never coincide exactly with assumed experience (except by coincidence). Gains and losses may offset each other over a period of years, but sizeable year-to-year variations from assumed experience are common. Detail on the derivation of the experience gain/(loss) is shown below:

	$ Millions
UAAL Beginning of Year (at July 1)	$ 1,485,123,649
Normal Cost	53,219,149
Transfer In and Service Purchase - Liability	4,610,022
Contributions	(244,262,169)
Interest	90,473,965
Net Change in LTD Assets	-
Expected UAAL Before Any Changes	1,389,164,616
Effect of Benefit Changes	-
Effect of Changes in Assumptions & Methods	44,379,018
Effect of Adjustment	-
Expected UAAL After Changes	1,433,543,634
End of Year UAAL (at June 30)	$ 1,461,408,074
Gain/(Loss) for Year	$ (27,864,440)
Gain/(Loss) as a percent of actuarial accrued liabilities at start of year ($4,410.7 million)	(0.6)%

Valuation Date June 30	Experience Gain/(Loss) as % of Beginning Accrued Liability
2014	2.1 %
2015	2.4 %
2016	1.1 %
2017	0.1 %
2018	0.6 %
2019	0.7 %
2020	(1.2)%
2021	3.6 %
2022	1.9 %
2023	**(0.6)%**

Summary of Actuarial Assumptions and Methods

Valuation Date:	June 30, 2023
Actuarial Cost Method:	Entry Age
Amortized Method:	Closed, level percent-of-payroll
Remaining Amortization Period:	16 years
Asset Valuation Method:	3-year smoothed fair value; 20% Corridor
Actuarial Assumptions:	
Investment Rate of Return:	6.50%
Projected Salary Increase:	3.00% to 10.50%
Cost-of-Living Adjustments:	1.80% Compound
Includes Wage Inflation at:	3.00%

An actuarial valuation is based upon an actuarial cost method, an asset valuation method, and actuarial assumptions. These methods and assumptions are chosen by the Board of Trustees after consultation with the Actuary and other advisors.

The actuarial cost method is called the Entry Age Actuarial Cost Method. This method is consistent with the Board's level percent-of-payroll funding objective. With this method, the level percent-of-payroll is determined that will fund a member's retirement benefit over the member's entire working lifetime, from date of hire (Entry Age) to date of exit from the active member population. Differences in the past between assumed and actual experience become part of unfunded actuarial accrued liabilities and are amortized with level percent-of-payroll contributions. This cost method was first used in the ***June 30, 1999*** valuation.

The asset valuation method is a three-year smoothed fair value method in which assumed investment return is recognized immediately each year and differences between actual and assumed investment return are phased-in over a closed three-year period. This asset valuation method is intended to give recognition to the long-term accuracy of market values while filtering out and dampening short-term market swings. This method was first used in the ***June 30, 1999*** valuation.

The actuarial assumptions used in producing the valuation fall into two broad classes: economic assumptions, and demographic assumptions. Economic assumptions refer to long-term rates of investment return, wage growth, covered population growth, and inflation. Demographic assumptions refer to retirement rates, turnover rates, disability rates, merit and seniority pay increases, and mortality rates. The current assumptions are based upon a 2017-2022 study of experience. The assumptions are reviewed from time to time to keep them reasonably current with expected experience. The next experience study is scheduled to follow the June 30, 2027 valuation.

Economic Assumptions

The investment return rate used in making the valuation was 6.50% per year, compounded annually (net after administrative expenses). This rate of return is not the assumed real rate of return. The real rate of return over wage inflation is defined to be the portion of investment return which is more than the wage inflation rate. Considering wage inflation recognition of 3.00%, the 6.50% rate translates to an assumed real rate of return over wage inflation of 3.50%. This rate was first used for the ***June 30, 2021*** valuation.

Summary of Actuarial Assumptions and Methods (Concluded)

Pay increase assumptions for individual active members are shown on Table I. Part of the assumption for each year of service is for a merit and/or seniority increase, and the other 3.00% recognizes wage inflation. These rates were first used for the **June 30, 2023** valuation.

Price Inflation is assumed to be 2.25%. The COLA is assumed to be 80% of the price inflation assumption. This results in a 1.80% annual COLA assumption (Closed Plan members hired prior to August 28, 1997 receive a minimum 4% COLA. These increases are made until the total of the increases reaches 65% of initial benefit at which time the increases will have the minimum removed). It is assumed that the 1.8% COLA will always be paid. All COLAs are assumed to be paid on the anniversary of retirement.

The Active Member Group size is assumed to remain constant at its present level.

The active member payroll for all members is assumed to increase 3.00% annually.

Non-Economic Assumptions

Post-Retirement Healthy Mortality Rates are used to measure the probabilities of members dying after retirement. The rates currently in use are from the Pub-2010 General, Healthy Retiree, Amount-Weighted, Below-Median Income tables for males and females for Non-Uniformed members and Pub-2010 Public Safety Healthy Retiree, Amount-Weighted, tables for males and females for Uniformed members. Rates are decreased by 5% for non-uniform males and increased by 4% for uniform males. The assumed rates are adjusted for mortality improvement back to the observation period base year of 2010 and then projected generationally from 2010 to 2019 using scale MP-2021 and 90% of scale MP-2021 for years following 2019. Sample rates are shown on Tables II and III. These rates were first used in the **June 30, 2023** valuation.

Post-Retirement Disabled Mortality Rates. The rates currently in use for disabled lives are the Pub-2010 General Disabled Retiree, Amount-Weighted tables for males and females for Non-Uniformed members and the Pub-2010 Public Safety Disabled Retiree, Amount-Weighted tables for males and females for Uniformed members. The assumed rates are adjusted for mortality improvement back to the observation period base year of 2010 and then projected generationally from 2010 to 2019 using scale MP-2021 and 90% of scale MP-2021 for years following 2019. Sample rates are shown on Table IV and V. These rates were first used in the **June 30, 2023** valuation.

Pre-Retirement Mortality Rates. The rates currently in use for active lives are the Pub-2010 General, Employee, Amount-Weighted, Below-Median Income tables for males and females for Non-Uniformed members and the Pub-2010 Public Safety Employee, Amount-Weighted, tables for males and females for Uniformed members. The assumed rates are adjusted for mortality improvement back to the observation period base year of 2010 and then projected generationally from 2010 to 2019 using scale MP-2021 and 90% of scale MP-2021 for years following 2019. Sample rates are shown on Table VI and VII. These rates were first used in the **June 30, 2023** valuation.

The probabilities of retirement for members eligible to retire are shown on Table IX. The rates for full retirement were first used in the **June 30, 2023** valuation. The rates for reduced retirement were first used in the **June 30, 2023** valuation. Upon retirement, members are assumed to pick the BackDROP period that when combined with the remaining annuity produces the highest liability.

The probabilities of disability for members eligible to retire are shown on Table X. The rates for disability were first used in the **June 30, 2023** valuation.

The probabilities of withdrawal from service, death-in-service and disability are shown for sample ages on Table XI. The death-in-service and disability rates were first used in the **June 30, 2023** valuation. The withdrawal rates were first used in the **June 30, 2023** valuation.

The data about persons now covered and about present assets was furnished by the System's administrative staff. Although examined for general reasonableness, the data was not audited by the Actuary. Data was furnished as of May 31 and assumed to be statistically equivalent to June 30.

The actuarial valuation computations were made by or under the supervision of a Member of the American Academy of Actuaries (MAAA).

Table I
Service Based Salary Scale

% Merit Increases in Salaries Next Year		
Service Index	**Uniformed Members**	**Non-Uniformed Members**
1	6.00%	7.50%
2	4.00%	3.80%
3	3.00%	2.80%
4	2.00%	1.50%
5	2.00%	1.00%
6	1.90%	0.80%
7	1.80%	0.00%
8	1.70%	0.00%
9	1.60%	0.00%
10	1.50%	0.00%
11	1.40%	0.00%
12	1.30%	0.00%
13	1.20%	0.00%
14	1.10%	0.00%
15	1.00%	0.00%
16	0.90%	0.00%
17	0.85%	0.00%
18	0.70%	0.00%
19	0.60%	0.00%
20	0.50%	0.00%
21	0.00%	0.00%
22	0.00%	0.00%
23	0.00%	0.00%
24	0.00%	0.00%
25	0.00%	0.00%

Table II
Post-Retirement Mortality

Non-Uniform Retired Lives Mortality Rates

Age in 2023	% Dying Next Year	
	Male	Female
20	0.0405%	0.0141%
21	0.0422%	0.0144%
22	0.0421%	0.0136%
23	0.0433%	0.0139%
24	0.0437%	0.0131%
25	0.0463%	0.0147%
26	0.0504%	0.0163%
27	0.0547%	0.0180%
28	0.0592%	0.0212%
29	0.0652%	0.0230%
30	0.0699%	0.0262%
31	0.0759%	0.0294%
32	0.0817%	0.0311%
33	0.0873%	0.0355%
34	0.0938%	0.0381%
35	0.0983%	0.0419%
36	0.1048%	0.0438%
37	0.1090%	0.0479%
38	0.1147%	0.0502%
39	0.1193%	0.0532%
40	0.1240%	0.0558%
41	0.1277%	0.0579%
42	0.1329%	0.0598%
43	0.1371%	0.0626%
44	0.1429%	0.0663%
45	0.1815%	0.0874%
46	0.2316%	0.1164%
47	0.2972%	0.1548%
48	0.3837%	0.2079%
49	0.4985%	0.2815%
50	0.6520%	0.3833%
51	0.6771%	0.3957%
52	0.7076%	0.4103%
53	0.7432%	0.4271%
54	0.7821%	0.4453%
55	0.8254%	0.4642%
56	0.8722%	0.4819%
57	0.9203%	0.4995%
58	0.9697%	0.5162%
59	1.0182%	0.5341%
60	1.0655%	0.5519%
61	1.1097%	0.5711%
62	1.1504%	0.5916%
63	1.1892%	0.6138%
64	1.2253%	0.6367%
65	1.2627%	0.6616%
66	1.3519%	0.7175%
67	1.4546%	0.7812%
68	1.5697%	0.8555%
69	1.7016%	0.9408%
70	1.8506%	1.0405%
71	2.0192%	1.1562%
72	2.2097%	1.2892%
73	2.4274%	1.4434%
74	2.6755%	1.6201%
75	2.9586%	1.8224%
76	3.2813%	2.0518%
77	3.6468%	2.3122%
78	4.0620%	2.6102%
79	4.5325%	2.9477%
80	5.0640%	3.3335%
81	5.6677%	3.7758%
82	6.3453%	4.2798%
83	7.0992%	4.8557%
84	7.9350%	5.5128%
85	8.8529%	6.2620%
86	9.8491%	7.1139%
87	10.9198%	8.0753%
88	12.0687%	9.1491%
89	13.2950%	10.3271%
90	14.5853%	11.5947%
91	15.9067%	12.9080%
92	17.2330%	14.2328%
93	18.5605%	15.5669%
94	19.8974%	16.9060%
95	21.2462%	18.2808%
96	22.7482%	19.7956%
97	24.3350%	21.4143%
98	26.0215%	23.1571%
99	27.8244%	25.0298%
100	29.7134%	27.0312%
101	31.6572%	29.1207%
102	33.5969%	31.2400%
103	35.5231%	33.3661%
104	37.4062%	35.4783%
105	39.2316%	37.5671%
106	41.0032%	39.5974%
107	42.7156%	41.5730%
108	44.3306%	43.4775%
109	45.8759%	45.2895%
110	47.1318%	47.0087%
111	47.2887%	48.6348%
112	47.4457%	49.5509%
113	47.6117%	49.6909%
114	47.7797%	49.8178%
115	47.9381%	49.9540%
116	47.9650%	49.9770%
117	47.9827%	49.9865%
118	47.9957%	50.0000%
119	48.0000%	50.0000%
120	100.0000%	100.0000%

Table III
Post-Retirement Mortality

Uniform Retired Lives Mortality Rates

Age in 2023	% Dying Next Year	
	Male	Female
20	0.0443%	0.0174%
21	0.0452%	0.0188%
22	0.0450%	0.0193%
23	0.0450%	0.0209%
24	0.0454%	0.0226%
25	0.0457%	0.0245%
26	0.0487%	0.0264%
27	0.0519%	0.0284%
28	0.0551%	0.0317%
29	0.0585%	0.0338%
30	0.0603%	0.0372%
31	0.0634%	0.0392%
32	0.0663%	0.0424%
33	0.0689%	0.0454%
34	0.0711%	0.0480%
35	0.0743%	0.0502%
36	0.0770%	0.0520%
37	0.0774%	0.0546%
38	0.0801%	0.0553%
39	0.0821%	0.0570%
40	0.0905%	0.0605%
41	0.0990%	0.0647%
42	0.1076%	0.0685%
43	0.1177%	0.0730%
44	0.1279%	0.0783%
45	0.1384%	0.0845%
46	0.1452%	0.0918%
47	0.1540%	0.1001%
48	0.1642%	0.1099%
49	0.1767%	0.1221%
50	0.1899%	0.1360%
51	0.2070%	0.1537%
52	0.2261%	0.1734%
53	0.2484%	0.1965%
54	0.2752%	0.2236%
55	0.3066%	0.2548%
56	0.3427%	0.2898%
57	0.3844%	0.3279%
58	0.4327%	0.3696%
59	0.4866%	0.4138%

Age in 2023	% Dying Next Year	
	Male	Female
60	0.5466%	0.4618%
61	0.6128%	0.5105%
62	0.6839%	0.5612%
63	0.7599%	0.6148%
64	0.8418%	0.6717%
65	0.9302%	0.7330%
66	1.0256%	0.7984%
67	1.1304%	0.8724%
68	1.2455%	0.9567%
69	1.3752%	1.0521%
70	1.5214%	1.1630%
71	1.6887%	1.2893%
72	1.8782%	1.4351%
73	2.0954%	1.6024%
74	2.3449%	1.7936%
75	2.6293%	2.0127%
76	2.9551%	2.2602%
77	3.3267%	2.5399%
78	3.7515%	2.8568%
79	4.2352%	3.2117%
80	4.7848%	3.6106%
81	5.4097%	4.0586%
82	6.1156%	4.5581%
83	6.9049%	5.1152%
84	7.7915%	5.7373%
85	8.7813%	6.4302%
86	9.8807%	7.2007%
87	11.0963%	8.0601%
88	12.4429%	9.0189%
89	13.9318%	10.0834%
90	15.5670%	11.2620%
91	17.2406%	12.5225%
92	18.8810%	13.8338%
93	20.4623%	15.1900%
94	21.9876%	16.5811%
95	23.4654%	18.0259%
96	25.0692%	19.6166%
97	26.7440%	21.3065%
98	28.5283%	23.1054%
99	30.4538%	25.0154%

Age in 2023	% Dying Next Year	
	Male	Female
100	32.4991%	27.0312%
101	34.6251%	29.1207%
102	36.7466%	31.2400%
103	38.8534%	33.3661%
104	40.9130%	35.4783%
105	42.9096%	37.5671%
106	44.8473%	39.5974%
107	46.7202%	41.5730%
108	48.4866%	43.4775%
109	50.1768%	45.2895%
110	51.5504%	47.0087%
111	51.7221%	48.6348%
112	51.8937%	49.5509%
113	52.0753%	49.6909%
114	52.2590%	49.8178%
115	52.4323%	49.9540%
116	52.4617%	49.9770%
117	52.4811%	49.9865%
118	52.4953%	50.0000%
119	52.5000%	50.0000%
120	100.0000%	100.0000%

Table IV
Post-Retirement Mortality

Non-Uniform Disabled Retired Lives Mortality Rates

Age in 2023	% Dying Next Year	
	Male	Female
20	0.4245%	0.2529%
21	0.4046%	0.2384%
22	0.3771%	0.2201%
23	0.3479%	0.2046%
24	0.3284%	0.1955%
25	0.3271%	0.2006%
26	0.3563%	0.2248%
27	0.3875%	0.2526%
28	0.4214%	0.2842%
29	0.4577%	0.3179%
30	0.4957%	0.3545%
31	0.5347%	0.3936%
32	0.5740%	0.4341%
33	0.6127%	0.4767%
34	0.6526%	0.5183%
35	0.6896%	0.5596%
36	0.7268%	0.5990%
37	0.7632%	0.6375%
38	0.7992%	0.6743%
39	0.8340%	0.7107%
40	0.8684%	0.7465%
41	0.9041%	0.7825%
42	0.9425%	0.8198%
43	0.9842%	0.8602%
44	1.0331%	0.9055%
45	1.0881%	0.9570%
46	1.1531%	1.0151%
47	1.2272%	1.0821%
48	1.3114%	1.1602%
49	1.4059%	1.2509%
50	1.5119%	1.3535%
51	1.5992%	1.4124%
52	1.6941%	1.4798%
53	1.7962%	1.5565%
54	1.9046%	1.6378%
55	2.0172%	1.7206%
56	2.1317%	1.8000%
57	2.2440%	1.8725%
58	2.3553%	1.9346%
59	2.4619%	1.9851%

Age in 2023	% Dying Next Year	
	Male	Female
60	2.5653%	2.0254%
61	2.6645%	2.0543%
62	2.7631%	2.0777%
63	2.8628%	2.0991%
64	2.9622%	2.1203%
65	3.0610%	2.1475%
66	3.1598%	2.1832%
67	3.2609%	2.2334%
68	3.3657%	2.3013%
69	3.4793%	2.3905%
70	3.6049%	2.5045%
71	3.7499%	2.6438%
72	3.9166%	2.8120%
73	4.1119%	3.0102%
74	4.3383%	3.2419%
75	4.6007%	3.5106%
76	4.9004%	3.8158%
77	5.2431%	4.1618%
78	5.6313%	4.5521%
79	6.0703%	4.9885%
80	6.5618%	5.4742%
81	7.1132%	6.0145%
82	7.7222%	6.6107%
83	8.3879%	7.2659%
84	9.1152%	7.9839%
85	9.9011%	8.7694%
86	10.7453%	9.5887%
87	11.6502%	10.4281%
88	12.6264%	11.2813%
89	13.8490%	12.1445%
90	15.1930%	13.0254%
91	16.5695%	13.9481%
92	17.9510%	14.9229%
93	19.3339%	15.9734%
94	20.7265%	17.1071%
95	22.1315%	18.3502%
96	23.6960%	19.7966%
97	25.3490%	21.4143%
98	27.1057%	23.1571%
99	28.9837%	25.0298%

Age in 2023	% Dying Next Year	
	Male	Female
100	30.9515%	27.0312%
101	32.9763%	29.1207%
102	34.9968%	31.2400%
103	37.0032%	33.3661%
104	38.9648%	35.4783%
105	40.8663%	37.5671%
106	42.7117%	39.5974%
107	44.4954%	41.5730%
108	46.1777%	43.4775%
109	47.7874%	45.2895%
110	49.0956%	47.0087%
111	49.2591%	48.6348%
112	49.4226%	49.5509%
113	49.5955%	49.6909%
114	49.7705%	49.8178%
115	49.9355%	49.9540%
116	49.9635%	49.9770%
117	49.9820%	49.9865%
118	49.9955%	50.0000%
119	50.0000%	50.0000%
120	100.0000%	100.0000%

Table V
Post-Retirement Mortality

Non-Uniform Disabled Retired Lives Mortality Rates

Age in 2023	% Dying Next Year	
	Male	Female
20	0.1247%	0.0575%
21	0.1268%	0.0621%
22	0.1264%	0.0658%
23	0.1255%	0.0697%
24	0.1261%	0.0739%
25	0.1294%	0.0795%
26	0.1379%	0.0879%
27	0.1456%	0.0954%
28	0.1536%	0.1044%
29	0.1630%	0.1136%
30	0.1708%	0.1228%
31	0.1797%	0.1331%
32	0.1879%	0.1428%
33	0.1953%	0.1518%
34	0.2015%	0.1610%
35	0.2078%	0.1689%
36	0.2139%	0.1764%
37	0.2195%	0.1823%
38	0.2246%	0.1866%
39	0.2291%	0.1919%
40	0.2343%	0.1946%
41	0.2377%	0.1987%
42	0.2434%	0.2022%
43	0.2478%	0.2065%
44	0.2538%	0.2108%
45	0.2615%	0.2167%
46	0.2703%	0.2252%
47	0.2814%	0.2346%
48	0.2951%	0.2463%
49	0.3127%	0.2606%
50	0.3325%	0.2774%
51	0.3484%	0.3036%
52	0.3681%	0.3348%
53	0.3927%	0.3701%
54	0.4224%	0.4104%
55	0.4580%	0.4553%
56	0.5007%	0.5041%
57	0.5521%	0.5557%
58	0.6121%	0.6112%
59	0.6794%	0.6669%

Age in 2023	% Dying Next Year	
	Male	Female
60	0.7533%	0.7238%
61	0.8342%	0.7806%
62	0.9186%	0.8368%
63	1.0074%	0.8934%
64	1.0981%	0.9501%
65	1.1926%	1.0100%
66	1.2905%	1.0730%
67	1.3946%	1.1431%
68	1.5052%	1.2210%
69	1.6260%	1.3083%
70	1.7622%	1.4089%
71	1.9174%	1.5224%
72	2.0998%	1.6512%
73	2.3157%	1.7971%
74	2.5719%	1.9601%
75	2.8719%	2.1425%
76	3.2162%	2.3467%
77	3.6058%	2.5764%
78	4.0352%	2.8568%
79	4.4998%	3.2117%
80	4.9990%	3.6106%
81	5.5433%	4.0586%
82	6.1426%	4.5581%
83	6.8089%	5.1152%
84	7.5653%	5.7373%
85	8.4345%	6.4302%
86	9.4102%	7.2007%
87	10.5679%	8.0601%
88	11.8504%	9.0189%
89	13.2684%	10.0834%
90	14.8257%	11.2620%
91	16.4196%	12.5225%
92	17.9819%	13.8338%
93	19.4879%	15.1900%
94	20.9406%	16.5811%
95	22.3480%	18.0259%
96	23.8754%	19.6166%
97	25.4705%	21.3065%
98	27.1698%	23.1054%
99	29.0036%	25.0154%

Age in 2023	% Dying Next Year	
	Male	Female
100	30.9515%	27.0312%
101	32.9763%	29.1207%
102	34.9968%	31.2400%
103	37.0032%	33.3661%
104	38.9648%	35.4783%
105	40.8663%	37.5671%
106	42.7117%	39.5974%
107	44.4954%	41.5730%
108	46.1777%	43.4775%
109	47.7874%	45.2895%
110	49.0956%	47.0087%
111	49.2591%	48.6348%
112	49.4226%	49.5509%
113	49.5955%	49.6909%
114	49.7705%	49.8178%
115	49.9355%	49.9540%
116	49.9635%	49.9770%
117	49.9820%	49.9865%
118	49.9955%	50.0000%
119	50.0000%	50.0000%
120	100.0000%	100.0000%

Table VI
Pre-Retirement Mortality

Non-Uniform Death-in-Service Mortality Rates

Age in 2023	% Dying Next Year	
	Male	Female
20	0.0422%	0.0141%
21	0.0440%	0.0144%
22	0.0439%	0.0136%
23	0.0451%	0.0139%
24	0.0455%	0.0131%
25	0.0482%	0.0147%
26	0.0525%	0.0163%
27	0.0570%	0.0180%
28	0.0617%	0.0212%
29	0.0679%	0.0230%
30	0.0728%	0.0262%
31	0.0791%	0.0294%
32	0.0851%	0.0311%
33	0.0909%	0.0355%
34	0.0977%	0.0381%
35	0.1024%	0.0419%
36	0.1092%	0.0438%
37	0.1135%	0.0479%
38	0.1195%	0.0502%
39	0.1243%	0.0532%
40	0.1292%	0.0558%
41	0.1330%	0.0579%
42	0.1384%	0.0598%
43	0.1428%	0.0626%
44	0.1489%	0.0663%
45	0.1545%	0.0700%
46	0.1622%	0.0738%
47	0.1709%	0.0779%
48	0.1808%	0.0833%
49	0.1922%	0.0902%
50	0.2053%	0.0977%
51	0.2205%	0.1058%
52	0.2376%	0.1156%
53	0.2571%	0.1272%
54	0.2800%	0.1404%
55	0.3054%	0.1551%
56	0.3341%	0.1710%
57	0.3651%	0.1890%
58	0.4000%	0.2065%
59	0.4380%	0.2261%

Age in 2023	% Dying Next Year	
	Male	Female
60	0.4776%	0.2464%
61	0.5176%	0.2671%
62	0.5594%	0.2887%
63	0.6013%	0.3114%
64	0.6428%	0.3349%
65	0.6858%	0.3617%
66	0.7293%	0.3899%
67	0.7771%	0.4221%
68	0.8271%	0.4586%
69	0.8844%	0.5009%
70	0.9472%	0.5487%
71	1.0193%	0.6029%
72	1.1009%	0.6659%
73	1.1936%	0.7369%
74	1.2988%	0.8170%
75	1.4169%	0.9086%
76	1.5497%	1.0109%
77	1.6984%	1.1254%
78	1.8641%	1.2531%
79	2.0484%	1.3952%
80	2.2530%	1.5538%
81	2.8995%	2.0054%
82	3.7326%	2.5869%
83	4.8041%	3.3348%
84	6.1857%	4.2959%
85	7.9667%	5.5299%
86	10.2595%	7.1139%
87	11.3748%	8.0753%
88	12.5716%	9.1491%
89	13.8490%	10.3271%
90	15.1930%	11.5947%
91	16.5695%	12.9080%
92	17.9510%	14.2328%
93	19.3339%	15.5669%
94	20.7265%	16.9060%
95	22.1315%	18.2808%
96	23.6960%	19.7956%
97	25.3490%	21.4143%
98	27.1057%	23.1571%
99	28.9837%	25.0298%

Age in 2023	% Dying Next Year	
	Male	Female
100	30.9515%	27.0312%
101	32.9763%	29.1207%
102	34.9968%	31.2400%
103	37.0032%	33.3661%
104	38.9648%	35.4783%
105	40.8663%	37.5671%
106	42.7117%	39.5974%
107	44.4954%	41.5730%
108	46.1777%	43.4775%
109	47.7874%	45.2895%
110	49.0956%	47.0087%
111	49.2591%	48.6348%
112	49.4226%	49.5509%
113	49.5955%	49.6909%
114	49.7705%	49.8178%
115	49.9355%	49.9540%
116	49.9635%	49.9770%
117	49.9820%	49.9865%
118	49.9955%	50.0000%
119	50.0000%	50.0000%
120	100.0000%	100.0000%

Table VII
Pre-Retirement Mortality

Uniform Death-in-Service Mortality Rates

Age in 2023	% Dying Next Year	
	Male	Female
20	0.0422%	0.0174%
21	0.0430%	0.0188%
22	0.0429%	0.0193%
23	0.0429%	0.0209%
24	0.0432%	0.0226%
25	0.0435%	0.0245%
26	0.0464%	0.0264%
27	0.0494%	0.0284%
28	0.0525%	0.0317%
29	0.0557%	0.0338%
30	0.0574%	0.0372%
31	0.0604%	0.0392%
32	0.0631%	0.0424%
33	0.0656%	0.0454%
34	0.0677%	0.0480%
35	0.0708%	0.0502%
36	0.0733%	0.0520%
37	0.0737%	0.0546%
38	0.0763%	0.0553%
39	0.0782%	0.0570%
40	0.0794%	0.0582%
41	0.0801%	0.0591%
42	0.0828%	0.0609%
43	0.0838%	0.0615%
44	0.0857%	0.0632%
45	0.0886%	0.0651%
46	0.0915%	0.0672%
47	0.0955%	0.0705%
48	0.0997%	0.0733%
49	0.1062%	0.0774%
50	0.1130%	0.0831%
51	0.1205%	0.0893%
52	0.1305%	0.0960%
53	0.1412%	0.1035%
54	0.1527%	0.1123%
55	0.1670%	0.1215%
56	0.1840%	0.1318%
57	0.2018%	0.1430%
58	0.2230%	0.1528%
59	0.2464%	0.1639%
60	0.2706%	0.1740%
61	0.2970%	0.1828%
62	0.3251%	0.1925%
63	0.3536%	0.2010%
64	0.3820%	0.2093%
65	0.4123%	0.2170%
66	0.4602%	0.2438%
67	0.5116%	0.2735%
68	0.5702%	0.3090%
69	0.6346%	0.3498%
70	0.7079%	0.3973%
71	0.7914%	0.4532%
72	0.8872%	0.5192%
73	0.9969%	0.5961%
74	1.1228%	0.6862%
75	1.2689%	0.7919%
76	1.4355%	0.9147%
77	1.6276%	1.0578%
78	1.8481%	1.2244%
79	2.1009%	1.4160%
80	2.3888%	1.6376%
81	3.0009%	2.1000%
82	3.7714%	2.6905%
83	4.7389%	3.4446%
84	5.9563%	4.4072%
85	7.4878%	5.6351%
86	9.4102%	7.2007%
87	10.5679%	8.0601%
88	11.8504%	9.0189%
89	13.2684%	10.0834%
90	14.8257%	11.2620%
91	16.4196%	12.5225%
92	17.9819%	13.8338%
93	19.4879%	15.1900%
94	20.9406%	16.5811%
95	22.3480%	18.0259%
96	23.8754%	19.6166%
97	25.4705%	21.3065%
98	27.1698%	23.1054%
99	29.0036%	25.0154%
100	30.9515%	27.0312%
101	32.9763%	29.1207%
102	34.9968%	31.2400%
103	37.0032%	33.3661%
104	38.9648%	35.4783%
105	40.8663%	37.5671%
106	42.7117%	39.5974%
107	44.4954%	41.5730%
108	46.1777%	43.4775%
109	47.7874%	45.2895%
110	49.0956%	47.0087%
111	49.2591%	48.6348%
112	49.4226%	49.5509%
113	49.5955%	49.6909%
114	49.7705%	49.8178%
115	49.9355%	49.9540%
116	49.9635%	49.9770%
117	49.9820%	49.9865%
118	49.9955%	50.0000%
119	50.0000%	50.0000%
120	100.0000%	100.0000%

Table VIII
Illustrative Annuity Values
(6.50% Interest)

Non-Uniform

Sample Attained Ages in 2023	Single Life Retirement Values					
	Present Value of $1 Monthly for Life		Percent Dying Next Year		Future Life Expectancy (years)	
	Male	Female	Male	Female	Male	Female
50	$155.47	$164.57	0.6520%	0.3833%	32.62	37.02
55	147.73	157.98	0.8254%	0.4642%	28.27	32.35
60	138.27	149.42	1.0655%	0.5519%	24.07	27.75
65	126.50	138.16	1.2627%	0.6616%	19.98	23.19
70	111.76	123.74	1.8506%	1.0405%	16.01	18.75
75	94.90	106.60	2.9586%	1.8224%	12.37	14.60
80	76.89	87.55	5.0640%	3.3335%	9.18	10.89

Uniform

Sample Attained Ages in 2023	Single Life Retirement Values					
	Present Value of $1 Monthly for Life		Percent Dying Next Year		Future Life Expectancy (years)	
	Male	Female	Male	Female	Male	Female
50	$163.07	$166.54	0.1899%	0.1360%	34.92	37.38
55	154.16	158.50	0.3066%	0.2548%	29.91	32.31
60	142.95	148.56	0.5466%	0.4618%	25.08	27.44
65	129.55	136.60	0.9302%	0.7330%	20.53	22.82
70	113.85	122.18	1.5214%	1.1630%	16.30	18.45
75	95.94	105.29	2.6293%	2.0127%	12.45	14.40
80	76.77	86.87	4.7848%	3.6106%	9.09	10.82

The present values shown above are for illustrative purposes only. They are straight life amounts and do not include the value of future post-retirement increases.

Table IX
Rates of Retirement

	% of Active Participants Retiring								
	Closed and Year 2000 Plans					2011 Tier			
	Non-Uniformed Members					Non-Uniformed Members			
	Male		Female		Uniformed	Normal			Uniformed
Age	Normal	Early	Normal	Early	Normal	Age & Service	Rule of 90	Early	Normal
50	39%		25%		45%				
51	35%		19%		15%				
52	27%		23%		18%				
53	22%		21%		16%				
54	21%		23%		19%				
55	25%	3%	28%	3%	26%		30%		30%
56	27%	3%	29%	3%	30%		30%		30%
57	24%	3%	29%	4%	28%		30%		30%
58	21%	3%	26%	4%	30%		30%		30%
59	22%	3%	29%	5%	40%		30%		30%
60	21%	5%	23%	5%	100%		30%		100%
61	19%	5%	22%	5%	100%		30%		100%
62	32%	28%	33%	20%	100%		30%	10%	100%
63	32%	25%	22%	20%	100%		30%	10%	100%
64	22%	21%	16%	20%	100%		30%	10%	100%
65	30%		39%		100%		30%	10%	100%
66	40%		45%		100%		30%	10%	100%
67	40%		40%		100%	50%	30%		100%
68	30%		40%		100%	50%	30%		100%
69	30%		40%		100%	50%	30%		100%
70	40%		50%		100%	100%	100%		100%
71	50%		50%		100%	100%	100%		100%
72	50%		100%		100%	100%	100%		100%
73	50%		100%		100%	100%	100%		100%
74	100%		100%		100%	100%	100%		100%

Table X
Rates of Disability

All Plan Participants

Age	% of Active Participants Becoming Disabled			
	Uniformed Members		Non-Uniformed Members	
	Male	Female	Male	Female
20	0.10%	0.10%	0.06%	0.06%
21	0.10%	0.10%	0.06%	0.06%
22	0.10%	0.10%	0.07%	0.07%
23	0.10%	0.10%	0.07%	0.07%
24	0.10%	0.10%	0.07%	0.07%
25	0.10%	0.10%	0.08%	0.08%
26	0.10%	0.10%	0.08%	0.08%
27	0.10%	0.10%	0.09%	0.09%
28	0.10%	0.10%	0.09%	0.09%
29	0.10%	0.10%	0.09%	0.09%
30	0.10%	0.10%	0.09%	0.09%
31	0.10%	0.10%	0.09%	0.09%
32	0.10%	0.10%	0.10%	0.10%
33	0.10%	0.10%	0.10%	0.10%
34	0.10%	0.10%	0.11%	0.11%
35	0.10%	0.10%	0.12%	0.12%
36	0.10%	0.10%	0.12%	0.12%
37	0.10%	0.10%	0.13%	0.13%
38	0.10%	0.10%	0.14%	0.14%
39	0.10%	0.10%	0.14%	0.14%
40	0.10%	0.10%	0.16%	0.16%
41	0.10%	0.10%	0.18%	0.18%
42	0.10%	0.10%	0.20%	0.20%
43	0.10%	0.10%	0.21%	0.21%
44	0.10%	0.10%	0.23%	0.23%
45	0.10%	0.10%	0.26%	0.26%
46	0.10%	0.10%	0.28%	0.28%
47	0.10%	0.10%	0.31%	0.31%
48	0.10%	0.10%	0.34%	0.34%
49	0.10%	0.10%	0.38%	0.38%
50	0.10%	0.10%	0.43%	0.43%
51	0.10%	0.10%	0.49%	0.49%
52	0.10%	0.10%	0.56%	0.56%
53	0.10%	0.10%	0.64%	0.64%
54	0.10%	0.10%	0.72%	0.72%
55	0.10%	0.10%	0.82%	0.82%
56	0.10%	0.10%	0.92%	0.92%
57	0.10%	0.10%	1.03%	1.03%
58	0.10%	0.10%	1.15%	1.15%
59	0.10%	0.10%	1.28%	1.28%
60	0.10%	0.10%	1.41%	1.41%
61	0.10%	0.10%	1.55%	1.55%
62	0.10%	0.10%	1.70%	1.70%
63	0.10%	0.10%	1.86%	1.86%
64	0.10%	0.10%	2.03%	2.03%
65	0.10%	0.10%	0.00%	0.00%
66	0.10%	0.10%	0.00%	0.00%
67	0.10%	0.10%	0.00%	0.00%
68	0.10%	0.10%	0.00%	0.00%
69	0.10%	0.10%	0.00%	0.00%
70	0.10%	0.10%	0.00%	0.00%
71	0.10%	0.10%	0.00%	0.00%
72	0.10%	0.10%	0.00%	0.00%

Table XI
Table Rates of Separation from Active Employment

All Plan Participants

Age	Service	% of Active Participants Withdrawing			
		Uniformed Members		Non-Uniformed Members	
		Male	Female	Male	Female
	0-1	10.00%	10.00%	28.00%	22.00%
	1-2	6.00%	6.00%	18.50%	15.00%
	2-3	3.25%	3.25%	12.50%	14.00%
	3-4	3.00%	3.00%	9.00%	12.00%
	4-5	2.75%	2.75%	8.00%	7.00%
25	5 & Up	3.51%	3.51%	9.04%	10.40%
26		3.51%	3.51%	9.04%	10.40%
27		3.51%	3.51%	9.04%	10.40%
28		3.51%	3.51%	8.71%	10.08%
29		3.51%	3.51%	8.38%	9.75%
30		3.51%	3.51%	8.05%	9.43%
31		3.51%	3.51%	7.73%	9.10%
32		3.39%	3.39%	7.41%	8.78%
33		3.07%	3.07%	7.10%	8.35%
34		2.77%	2.77%	6.79%	7.92%
35		2.49%	2.49%	6.48%	7.49%
36		2.22%	2.22%	6.18%	7.06%
37		1.97%	1.97%	5.89%	6.63%
38		1.76%	1.76%	5.60%	6.33%
39		1.59%	1.59%	5.31%	6.03%
40		1.47%	1.47%	5.04%	5.73%
41		1.37%	1.37%	4.77%	5.43%
42		1.28%	1.28%	4.51%	5.14%
43		1.19%	1.19%	4.26%	4.97%
44		1.11%	1.11%	4.02%	4.80%
45		1.02%	1.02%	3.78%	4.63%
46		0.94%	0.94%	3.55%	4.46%
47		0.85%	0.85%	3.34%	4.29%
48		0.76%	0.76%	3.14%	4.17%
49		0.67%	0.67%	2.95%	4.06%
50		0.59%	0.59%	2.76%	3.94%
51		0.50%	0.50%	2.60%	3.82%
52		0.43%	0.43%	2.43%	3.71%
53		0.38%	0.38%	2.29%	3.71%
54		0.36%	0.36%	2.15%	3.71%
55		0.30%	0.30%	2.02%	3.71%
56		0.32%	0.32%	1.93%	3.71%
57		0.24%	0.24%	1.83%	3.71%
58		0.24%	0.24%	1.75%	3.71%
59		0.23%	0.23%	1.68%	3.71%
60		0.22%	0.22%	1.64%	3.71%