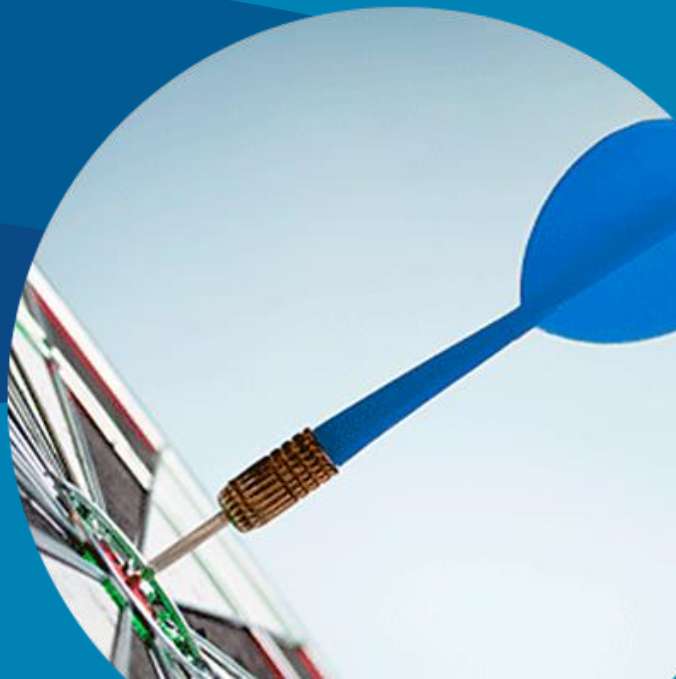
Michigan State Police Retirement System

October 1, 2017 – September 30, 2022

Experience Study



Agenda

- Introduction
- Experience Study Process
- Demographic Assumptions
- Economic Assumptions
- Actuarial Methods and Miscellaneous Assumptions
- Effect on Valuation Results

INTRODUCTION

Introduction

- Each year the actuarial liabilities of the Michigan State Police Retirement System (MSPRS) are calculated as part of the September 30th valuation
- In order to perform the valuation, we must make assumptions about the future experience of the System with regard to various risk areas
- The results of the liability calculations depend upon those assumptions

Introduction – Risk Areas

- Demographic Risk Areas
  - Rates of withdrawal
  - Rates of disability
  - Rates of retirement
  - Rates of mortality
- Economic Risk Areas
  - Investment return
  - Inflation
  - Patterns of salary increases
  - Payroll growth

Introduction

- Assumptions should be carefully chosen and continually monitored
  - Continued use of outdated assumptions can lead to ...

Introduction

- Understated costs resulting in:
  - Sharp increases in required contributions at some point in the future leading to a large burden on future taxpayers
  - In extreme cases, an inability to pay benefits when due

Introduction

- Overstated costs resulting in:
  - Benefit levels that are kept below the level that could be supported by the employer and member contribution rates
  - An unnecessarily large burden on the current generation of members, employers and taxpayers

Introduction

- No single set of assumptions will be suitable indefinitely
- Things change, and our understanding of things (whether or not they are changing) also changes
- In general, the suggested time period for reviewing assumptions is about every 4 or 5 years
- A systematic review of assumptions is called an “Experience Study”

EXPERIENCE STUDY PROCESS

Experience Study Process

- Our analysis was based upon data submitted for MSPRS:
  - Non-Mortality Assumptions: 2017 through 2022 annual valuations
  - Mortality Assumptions: 2014 through 2019 annual valuations
- Due to COVID-19, data from fiscal years 2020, 2021, and 2022 was excluded from the mortality assumption analysis

Experience Study Process

- We compared trends with those observed in prior studies
- Generally, we give confirmed trends more credibility than non-confirmed trends
- Philosophy: Do not overreact to results from any single experience period
  - It is better to make a series of small changes in the right direction, rather than a single large change that could turn out with hindsight to be in the wrong direction

Experience Study Process – Liability Weighting

- Decrement assumptions have traditionally been developed based on population-weighted crude rates
- In a plan with two members the same age, if one of them leaves, the rate of withdrawal at that age is 50% (very simplified example)
- However, certain decrements have continued to generate small gains or losses despite adjusting rates in previous experience studies
- This year, we analyzed the data to see if this could be due to a tendency for human behavior to be influenced by the relative value of liabilities
- This concept is called liability-weighting

Experience Study Process – Liability Weighting Example

- Consider the same plan with only two members (who are both the same age) and the withdrawal rate of 50%
- Suppose one member has liability of $10k and the other has liability of $90k
- Even though the decrement rate of withdrawal is 50%, the net gain or loss to the system will be less if the $10k liability member leaves than if the $90k liability member leaves
- Perhaps if the person with $10k liability leaves, we should set the withdrawal rate at 10% since only 10% of the liability has left

Experience Study Process – Liability Weighting

- The analysis seemed to indicate that people with lower accrued benefit levels and lower liabilities are more likely to quit than other people of the same age
- Therefore, we developed some decrements based on a liability-weighting analysis as opposed to a population-weighting analysis

Experience Study Process – Benefits Weighting

- An analogous benefits-weighting approach was employed in the analysis of post-retirement mortality
- The analysis seemed to indicate that people with higher accrued benefit levels generally live longer than other people of the same age
- In recognition of these results, we developed post-retirement mortality rates based on a benefits-weighting analysis

Experience Study Process

- Per Section 11(3) of the MSPRS statute (Act 182 of the Public Acts of 1986, as amended) the actuarial assumptions are adopted by the Retirement Board and the Department of Technology, Management and Budget after consultation with the actuary and the State Treasurer
- The recommended changes are proposed for the September 30, 2023 and later valuations

DEMOGRAPHIC ASSUMPTIONS

Demographic Assumptions – Rates of Retirement

- Age based retirements were analyzed
  - Tier 1 (Non-Hybrid) employees may retire at age 50 with 10 years of service
  - Tier 2 (Hybrid) employees may retire at age 60 with 10 years of service or at age 55 with 25 years
  - There were no retirements from the Hybrid plan during the study period
- Tier 1 (Non-Hybrid) employees i.e., those hired before 6/10/2012 may also retire with 25 or more years of service
  - The 25 & out service retirements were studied separately
- Generally speaking, more retirements being observed over the experience study period than anticipated by the actuarial assumptions results in an actuarial loss

Demographic Assumptions – Rates of Retirement

- The following retirement experience was observed during the study period
  - Age 50 with 10 years of service: More retirements than expected
  - 25 & Out: More retirements than expected

Demographic Assumptions – Rates of Retirement

- The following changes are recommended:
  - Increase some of the age-based retirement rates
  - No change to the service-based retirement rates for Tier 1 (25 & Out)

Demographic Assumptions – Withdrawal

- The withdrawal assumption was analyzed based on both age and service
- The use of a service-based (i.e., first 2 years of service) and age-based (i.e., for service greater than 2 years) approach is still reasonable
- Generally speaking, more withdrawals being observed over the experience study period than anticipated by the actuarial assumptions results in an actuarial gain

Demographic Assumptions – Withdrawal

- We recommend that ultimate withdrawal rates be developed based on a liability-weighted approach
- For withdrawals in the first 2 years of employment, the following experience was observed (population-weighted approach)
  - More withdrawals than expected
- For withdrawals after 2 years of service, the following experience was observed (liability-weighted approach)
  - Fewer withdrawals than expected in total

Demographic Assumptions – Withdrawal

- The following changes are recommended:
  - Increase the rate of withdrawal during the first year of service
  - Increase the ultimate withdrawal rates at younger ages and decrease the rates at older ages
- The same withdrawal rates will be used for both the pension and retiree health actuarial valuations

Demographic Assumptions – Disability

- Experience related to disabilities was close to assumed experience
- Therefore, no changes are recommended to the disability rates

Demographic Assumptions – Summary of Changes (# Counts)

Decrement Risk Area	Actual Number	Expected Number		
		Present Assumptions	Proposed Assumptions	Change
Age and Service Retirement				
Age Based - *Population-Weighted Results*	268	235.0	259.0	24.0
Age Based - *Liability-Weighted Results* [(1)]	1,905	1,449.4	1,596.9	147.5
Service Based - 25 Years of Service - *Population-Weighted Results*	202	184.5	184.5	0.0
Service Based - 25 Years of Service - *Liability-Weighted Results* [(1)]	1,728	1,578.5	1,578.5	0.0
Withdrawal				
First 2 Years of Service - *Population-Weighted Results*	222	132.5	158.2	25.7
After 2 Years of Service - *Population-Weighted Results*	109	49.3	79.7	30.4
After 2 Years of Service - *Liability-Weighted Results* [(1)]	103	117.8	112.8	(5.0)
Disability				
Non-Duty Disability - *Population-Weighted Results*	3	8.1	8.1	0.0
Duty Disability - *Population-Weighted Results*	11	15.2	15.2	0.0

[(1)] *Actual and expected results and exposures for benefits-weighted and liability-weighted involve a scaling factor of $100,000.*

Demographic Assumptions – Retiree Mortality

- Post-retirement mortality is an important, but relatively stable ingredient in cost calculations. This assumption should be updated from time to time to reflect longevity improvements.
- ASOP No. 35 states with regard to the mortality assumption:
  - "The disclosure of the mortality assumption should contain sufficient detail to permit another qualified actuary to understand the provision made for future mortality improvement. If the actuary assumes zero mortality improvement after the measurement date, the actuary should state that no provision was made for future mortality improvement."
- Starting with the previous experience study, a "generational" approach to the mortality rates was implemented
  - Assumes that future mortality rates will continue to decline with each generation
  - Any static margin is removed from the base tables and a mortality improvement scale is applied to project rates getting lower each year in the future. This means that next year's 65-year-old will have a slightly longer life expectancy than this year's, etc.

Demographic Assumptions – Retiree Mortality

- In 2019, the Society of Actuaries (SOA) published a mortality study specific to public sector retirement systems
  - Included numerous mortality tables by classification (General members, Public Safety, Teachers, Survivors, Juvenile, headcount-weighted, benefit-weighted, above median, below median)
- SOA updates mortality projection scales annually
  - The latest published table is called the MP-2021 Projection Scale
  - SOA recommends use of "fully generational" (2-dimensional) projection scales
- Due to COVID-19, data from fiscal years 2020, 2021, and 2022 was excluded from the experience study
  - Replaced with data from fiscal years 2015, 2016, and 2017

Demographic Assumptions – Retiree Mortality

- Recommendation:
  - PubS-2010 Retiree Mortality Tables
    - These are Safety member tables and are amount-weighted
  - Scaling 89% of male table and 99% of female table
  - Projected with mortality improvements using the fully generational MP-2021 projection scale
- We recommend maintaining the MP-2021 improvement scales until the next experience study

Demographic Assumptions – Retiree Life Expectancy

Sample Attained Ages	Future Life Expectancy (years)							
	Present		Proposed 2022[(1)]		Proposed 2027[(1)]		Proposed 2032[(1)]	
	Men	Women	Men	Women	Men	Women	Men	Women
45	40.37	42.36	41.69	42.83	42.10	43.24	42.53	43.66
50	35.43	37.35	36.54	37.61	36.95	38.03	37.37	38.44
55	30.65	32.41	31.46	32.50	31.87	32.91	32.28	33.32
60	26.03	27.63	26.54	27.59	26.93	27.99	27.33	28.38
65	21.63	23.06	21.89	22.95	22.24	23.29	22.61	23.66
70	17.49	18.72	17.54	18.56	17.84	18.85	18.16	19.17
75	13.64	14.67	13.56	14.48	13.79	14.74	14.06	15.01
80	10.20	11.01	10.04	10.87	10.23	11.08	10.44	11.30

(1) Life expectancy in future years are determined by the fully generational MP-2021 projection scale.

Demographic Assumptions – Disabled Mortality

- Disabled mortality experience during the study period was not sufficient to adjust the published tables
- Recommendation:
  - PubNS-2010 Disabled Retiree Mortality Tables
    - These are Non-Safety member tables and are amount-weighted
  - 100% scaling of both male and female mortality tables
  - Projected with mortality improvements using the fully generational MP-2021 projection scale

Demographic Assumptions – Active Mortality

- Active mortality experience during the study period was not sufficient to adjust the published tables
- Recommendation:
  - PubS-2010 Employee Mortality Tables
    - These are Safety member tables and are amount-weighted
  - 100% scaling of both male and female mortality tables
  - Projected with mortality improvements using the fully generational MP-2021 projection scale

Demographic Assumptions – Summary of Mortality Experience Results

Decrement Risk Area	Actual Number	Expected Number		
		Present Assumptions	Proposed Assumptions	Change
Mortality - Population Weighted Results [2]				
Non-Disabled Retired Lives - Male	213	264.5	235.8	(28.7)
- Female	3	4.0	3.2	(0.8)
Disabled Retired Lives - Male	12	28.0	23.7	(4.3)
- Female	0	3.5	3.5	0.0
Active Members - Male	5	7.2	5.5	(1.7)
- Female	0	0.5	0.4	(0.1)
Mortality - Benefits Weighted Results [1],[2]				
Non-Disabled Retired Lives - Male	72	99.2	86.0	(13.2)
- Female	1	1.8	1.4	(0.4)
Disabled Retired Lives - Male	3	8.3	7.1	(1.2)
- Female	0	1.0	1.2	0.2

[1] *Actual and expected results and exposures for benefits-weighted and liability-weighted involve a scaling factor of $100,000.*

[2] *The study period used in the mortality analysis is for the period covering October 1, 2014 through September 30, 2019.*

Demographic Assumptions – Impact of Demographic Changes on Liability

- Impact of proposed changes on actuarial accrued liabilities

Decrement Risk Area	Relative Liability Impact
Age and Service Retirement	
Age Based	Small Increase
Service Based - 25 Years of Service	No Change
Withdrawal	
First 2 Years of Service	Small Decrease
After 2 Years of Service	Small Increase
Disability	
Non-Duty Disability	No Change
Duty-Disability	No Change

Demographic Assumptions – Impact of Demographic Changes on Liability

- Impact of proposed changes on actuarial accrued liabilities

Decrement Risk Area	Relative Liability Impact
Mortality	
Non-Disabled Retired Lives - Male	Small Increase
- Female	Small Increase
Disabled Retired Lives - Male	Small Increase
- Female	Small Increase
Pre-Retirement Lives - Male	Small Decrease
- Female	Small Decrease

ECONOMIC ASSUMPTIONS

Economic Assumptions – Current

- The economic assumptions currently in place are presented below:
  - Investment Return:
    - Pension (Tier 1): 6.15%
    - Pension (Tier 2): 6.15%
    - Retiree Health: 6.25%
    - All pension and retiree health investment returns net of investment expenses
  - Wage Inflation – 2.75%
  - Price Inflation – 2.25%
  - Payroll Growth Assumption – 0.75% (prescribed in accordance with Public Act 674 of 2018)

Economic Assumptions – ASOP No. 27

- Guidance regarding the selection of economic assumptions is governed by Actuarial Standard of Practice (ASOP) No. 27
- ASOP No. 27 requires that the selected economic assumptions be individually reasonable and consistent with one another
- That is, the selection of the price inflation assumption should be consistent with the selection of the wage inflation and investment return assumptions

Economic Assumptions – Data

- Sources of information used to establish economic assumption recommendations:
  - Price Inflation
    - Congressional Budget Office
    - Philadelphia Federal Reserve quarterly survey of Society of Professional Forecasters
    - Comparison of Treasury yields and TIPS
    - Federal Reserve Bank of Cleveland inflation expectations
  - Investment Return
    - Future capital market expectations of 11 investment firms that GRS monitors
  - Wage Inflation, Merit and Seniority
  - Actual MSPRS experience over the Experience Study Period (i.e., merit and seniority pay increases)
    - Historical observations of inflation statistics (both price and wage inflation and the relationship between them) both nationally and for MSPRS

Economic Assumptions – Price Inflation

- Congressional Budget Office provides an inflation expectation for the next 10 years
  - The Budget and Economic Outlook: 2023 to 2033 report released in February 2023 indicates a 2.57% expectation
- Philadelphia Federal Reserve conducts a quarterly survey of the Society of Professional Forecasters
  - 10-year inflation expectation from second quarter 2023 indicates a 2.36% inflation expectation
- A comparison of nominal Treasury yields and TIPS provided an approximation for market price inflation expectations over various time horizons (based upon data from the Federal Reserve Bank of St. Louis)
  - 10-year expectation is 2.27% (July 6, 2023)
  - 20-year expectation is 2.48% (June 2023)
  - 30-year expectation is 2.23% (June 2023)
- Federal Reserve Bank of Cleveland inflation expectations as of June 1, 2023 over various time horizons
  - 10-year expectation is 1.66%
  - 20-year expectation is 1.88%
  - 30-year expectation is 2.05%
- GRS' preferred price inflation assumption is 2.35%

Economic Assumptions – Wage Inflation

- Wage inflation consists of two components
  - A portion due to pure price inflation (i.e., increases due to changes in the CPI); and
  - Increases in average salary levels in excess of pure price inflation

Economic Assumptions – Wage Inflation

- Below shows the annual compound rate of average salary increase rate of active members over various periods:
  - 5 years ending September 30, 2012: 0.16%
  - 5 years ending September 30, 2017: -0.13%
  - 5 years ending September 30, 2022: 2.47%

Economic Assumptions – Wage Inflation

- We are generally comfortable with the wage inflation assumption exceeding the price inflation assumption by 0.25% to 1.00%
- Given our preferred price inflation assumption of 2.35%, our preferred assumption is for the wage inflation assumption to exceed the price inflation assumption by 0.40%
- This would result in a wage inflation assumption of 2.75%

Economic Assumptions – Merit and Seniority

- Total pay increases for an individual consist of a portion due to wage inflation and a portion due to an individual's on the job performance (i.e., merit and seniority)
- The merit and seniority portion of the pay increase assumption was analyzed over the 3-year period from October 1, 2017 through September 30, 2020
- Continued use of the current age-based structure of the assumption was deemed to remain appropriate based upon the analysis performed
- Minor changes are being recommended to, in general, increase the merit and seniority assumptions based upon the experience over the observed period

Economic Assumptions – Investment Return

- The investment return assumption is the actuarial assumption that has the largest effect on actuarial valuation results
- As more of the actuarial accrued liabilities are related to non-active members, the nominal (as opposed to real) investment return assumption becomes a more prominent factor
- Since one of MSPRS' fundamental financial objectives is the receipt of level contributions from one year to the next, the discount rate assumption is based upon the investment return assumption

Economic Assumptions – Investment Return

- GRS is a benefits consulting firm and does not develop or maintain its own capital market expectations
- Based upon the current target asset allocations, future return expectations of various investment firms that GRS monitors were analyzed using the GRS Capital Market Assumptions Modeler (CMAM)
- The next slide shows the results of the analysis
  - Capital market expectations are already net of passive investment expenses
  - A contribution for administrative expenses (based upon the actual administrative expenses incurred during the previous year) is included in the normal cost
  - Final expected nominal investment return results are based upon the recommended 2.35% price inflation assumption

Economic Assumptions – Investment Return

Summary of GRS 2023 CMAM Analysis	
10-Year Capital Market Expectations Average of 11 Investment Firms	
1-Year Expected Return	7.94%
Standard Deviation of 1-Year Expected Return	13.03%
Short-Term Expected Median Return (i.e., 50th Percentile)	7.16%
20- to 30-Year Capital Market Expectations Average of 7 Investment Firms	
Long-Term Expected Median Return (i.e., 50th Percentile)	7.43%

Economic Assumptions – Investment Return – ASOP No. 27

- The preferred assumption in the actuarial community is the expected median return (i.e., 50th percentile) over a particular time horizon
  - Based on the average of the calendar year 2023 results for each of the investment firms, this would lead to an investment return assumption of:
    - 7.16% (based upon short-term expectations)
    - 7.43% (based upon long-term expectations)

Economic Assumptions – Investment Return

- One item to note is that the 10-year expected median return based upon calendar year 2023 capital market expectations has increased significantly over the past few years
  - 10-year expected median return based upon capital market assumptions in calendar year 2019 through 2023:

    2019 – 6.81%
    2020 – 6.36%
    2021 – 6.02%
    2022 – 5.81%
    2023 – 7.16%

Economic Assumptions – Investment Return

- While it is true that retirement plans are generally long-term investors, SPRS has significant liability commitments over the next 10-15 years
  - Total Present Value of Future Benefits for SPRS as of September 30, 2022: $2,992 million
    - Approximately 25% associated with benefit payments in the first 5 years
    - Approximately 46% associated with benefit payments in the first 10 years
    - Approximately 61% associated with benefit payments in the first 15 years
  - As a result of observations, we tend to put more weight on the short-term expectations

Economic Assumptions – Investment Return

- In accordance with modifications to the Dedicated Gains Policy, the Dedicated Gains Policy cannot lower the investment return assumption below 6.00%
- Based upon the results of analysis and the current elevated levels of future capital market expectations (i.e., 2023 capital market expectations versus those in 2019 through 2022), we believe that the current pension investment return assumption of 6.15% and the current OPEB investment return assumption of 6.25% are reasonable
  - Recommending no change to the pension or OPEB investment return assumptions

ACTUARIAL METHODS AND MISCELLANEOUS ASSUMPTIONS

Actuarial Methods – Recommendations

- Continue using the entry age actuarial cost method for all benefits
- No change to the amortization policy
  - Presumes the Office of Retirement Services is working with each of the Systems to adopt a funding policy that addresses the amortization policy
- Continue use of the current asset valuation method with a 30% corridor for pension and OPEB valuation purposes

Miscellaneous Actuarial Assumptions – Recommendations

- We analyzed the DROP election rate
  - Tier 1 members with 25 or more years of service can enter the DROP
  - During the study period, 69% of eligible Tier 1 members entered the DROP
  - The current assumption is 70%
- We recommend continued use of the current assumption

Miscellaneous Actuarial Assumptions – Recommendations

- We analyzed the length of DROP participation
  - DROP members may remain in the DROP for up to 6 years
  - For individuals who left the DROP during the study period, the average length of DROP participation was 4.89 years
  - The current assumption is that members remain in the DROP for 4 years
- We recommend continued use of the current assumption

Miscellaneous Actuarial Assumptions – Recommendations

- We analyzed the retiree health coverage elections among new retirees during the study period
  - The election rate of 2-person/family coverage among males was over 88% which is generally consistent with the current assumption (85%)
  - The election rate of 2-person/family coverage among females was approximately 55% which is lower than the current assumption (70%)
  - We also reviewed the incidence of "opt-out" among new retirees during the study period
  - We found that just over 6% of new, eligible retirees during the study period elected to not receive the employer paid retiree health subsidy
- We recommend continued use of the current "opt-out" assumption and no change to the male coverage election rate and a 60% 2-person/family coverage election rate for females

EFFECT ON VALUATION RESULTS

Effect on Valuation Results

- In this section, September 30, 2022 pension and retiree health (i.e., OPEB) actuarial valuation results are presented based on the proposed demographic assumptions and proposed alternate economic assumptions
- It is our expectation that the proposed set of actuarial assumptions would first be used for the September 30, 2023 valuation

Effect on Valuation Results – Pension Valuation as of September 30, 2022

	Present Assumptions	Alternate Assumptions
Investment Return Assumption	**6.15%**	**6.15%**
Wage Inflation Assumption	**2.75%**	**2.75%**
All Other Assumptions	**Present**	**Proposed**
Total Normal Cost of Benefits (as a % of pay)	19.05%	20.84%
Member Contribution %	3.42%	3.42%
Employer Normal Cost %[(2)]	15.63%	17.42%
Employer Normal Cost $	$ 23,820,976	$ 26,529,178
Total Actuarial Accrued Liability	$2,675,777,102	$2,697,406,415
Funding Value of Assets	1,780,094,178	1,780,094,178
Unfunded Actuarial Accrued Liability (UAAL)	895,682,924	917,312,237
Funded Percentage	66.5%	66.0%
Amortization Payment $	87,038,067	89,162,787
Total Computed Employer Contribution[(1)]	$ 110,859,043	$ 115,691,965

(1) Contribution amounts presented above would be for fiscal year (FY) 2025 but are illustrative only. Actual FY 2025 contribution amounts are based upon pre-experience study results. Our expectation is that the proposed set of actuarial assumptions would first be used for the September 30, 2023 valuation.

(2) Includes administrative expense load.

GRS

Effect on Valuation Results – OPEB Valuation as of September 30, 2022

	Present Assumptions	Alternate Assumptions
Investment Return Assumption	**6.25%**	**6.25%**
Wage Inflation Assumption	**2.75%**	**2.75%**
All Other Assumptions	**Present**	**Proposed**
Employer Normal Cost $[(2)]	$ 8,400,884	$ 8,806,296
Total Actuarial Accrued Liability	$727,495,068	$732,904,523
Funding Value of Assets	405,564,628	405,564,628
Unfunded Actuarial Accrued Liability	321,930,440	327,339,895
Funded Percentage	55.7%	55.3%
Amortization Payment	$ 28,004,826	$ 28,764,232
Total Computed Employer Contribution[(1)]	$ 36,405,710	$ 37,570,528

(1) Contribution amounts presented above would be for fiscal year (FY) 2025 but are illustrative only. Actual FY 2025 contribution amounts are based upon pre-experience study results. Our expectation is that the proposed set of actuarial assumptions would first be used for the September 30, 2023 valuation.

(2) Includes administrative expense load.

Disclosures

- This presentation shall not be construed to provide tax advice, legal advice or investment advice.
- Mita Drazilov and Louise Gates are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.
- Additional information regarding actuarial assumptions and methods, and important additional disclosures are provided in the report titled “Michigan State Police Retirement System 5-Year Experience Study – October 1, 2017 through September 30, 2022.”
- If you need additional information to make an informed decision about the contents of this presentation, or if anything appears to be missing or incomplete please contact us before using this presentation.