

# Missouri Department of Transportation and Highway Patrol Employees' Retirement System

GASB Statement Nos. 67 and 68 Accounting and Financial  
Reporting for Pension Plans

June 30, 2019



October 8, 2019

Retirement Board  
Missouri Department of Transportation  
and Highway Patrol Employees' Retirement System  
1913 William Street  
Jefferson City, Missouri 65109

Dear Board Members:

This report provides accounting and financial reporting information that is intended to comply with the Governmental Accounting Standards Board (GASB) Statement Nos. 67 and 68 for the Missouri Department of Transportation and Highway Patrol Employees' Retirement System ("MPERS"). These calculations have been made on a basis that is consistent with our understanding of these accounting standards.

GASB Statement No. 67 is the accounting standard that applies to the stand-alone financial reports issued by retirement systems. GASB Statement No. 68 establishes accounting and financial reporting for State and local government employers who provide their employees (including former employees) pension benefits through a trust.

Our calculation of the liability associated with the benefits described in this report was performed for the purpose of providing reporting and disclosure information that satisfies the requirements of GASB Statement Nos. 67 and 68. The calculation of the plan's liability for this report may not be applicable for funding purposes of the plan. A calculation of the plan's liability for purposes other than satisfying the requirements of GASB No. 67 may produce significantly different results. This report may be provided to parties other than MPERS only in its entirety and only with the permission of the Retirement Board. GRS is not responsible for unauthorized use of this report.

This report is based upon information, furnished to us by Retirement System staff, concerning retirement and ancillary benefits, active members, deferred vested members, retirees and beneficiaries, and financial data. If your understanding of this information is different, please let us know. This information was checked for internal consistency, but it was not audited.

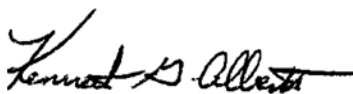
To the best of our knowledge, this report is complete, accurate, and in accordance with generally recognized actuarial methods. Heidi G. Barry and Jamal Adora are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the Academy of Actuaries to render the actuarial opinions herein.

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

Respectfully submitted,



Heidi G. Barry, ASA, FCA, MAAA



Kenneth G. Alberts



Jamal Adora, ASA, MAAA

HGB/KGA/JA:ah

2248



# Table of Contents

	<u>Page</u>
<b>Section A Executive Summary</b>	
Executive Summary .....	1
Discussion .....	2-4
<b>Section B Financial Statements</b>	
Statement of Pension Expense .....	5
Statement of Outflows and Inflows Arising from Current Reporting Period .....	6
Statement of Outflows and Inflows Arising from Current and Prior Reporting Periods .....	7-8
Statement of Fiduciary Net Position .....	9
Statement of Changes in Fiduciary Net Position .....	10
Schedule of Proportionate Employer Share (MoDOT, Highway) .....	11
<b>Section C Required Supplementary Information</b>	
Schedule of Changes in Net Pension Liability and Related Ratios Current Period .....	12
Schedule of Changes in Net Pension Liability and Related Ratios (Multiyear) .....	13
Schedule of Net Pension Liability (Multiyear) .....	14
Schedule of Contributions (Multiyear) .....	15
Notes to Schedule of Contributions .....	16
<b>Section D Notes to Financial Statements</b>	
Single Discount Rate and Sensitivity of Net Pension Liability to the Single Discount Rate Assumption .....	17
Reconciliation of DROP Accounts .....	18
Summary of Population Statistics .....	19
<b>Section E Summary of Benefits</b> .....	20-28
<b>Section F Actuarial Cost Method and Actuarial Assumptions</b>	
Summary of Valuation Method and Assumptions .....	29-30
Actuarial Assumptions, Input to Discount Rates, Mortality Assumptions and Experience Studies .....	31-38
Miscellaneous and Technical Assumptions and Data .....	39-40
Method of Financial Future Benefits for Present Active Members .....	41
<b>Section G Calculation of the Single Discount Rate</b>	
Calculation of the Single Discount Rate .....	42
Projection of Contributions .....	43
Projection of Plan Fiduciary Net Position .....	44-45
Present Values of Projected Benefits .....	46-47
Projection of Plan Net Position and Benefit Payments .....	48
<b>Section H Glossary of Terms</b> .....	49-52

# SECTION A

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## EXECUTIVE SUMMARY

# Executive Summary as of June 30, 2019

Actuarial Valuation Date	June 30, 2019
Measurement Date of the Net Pension Liability	June 30, 2019
Employer's Fiscal Year Ending Date (Employer's Reporting Date)	June 30, 2020
Plan's Fiscal Year Ending Date (Plan's Reporting Date)	June 30, 2019

## Membership

Number of	
- Retirees and Beneficiaries	9,035
- Inactive, Nonretired Members	2,042
- Active Members	7,421
- Total	18,498
Valuation Payroll	\$ 359,296,056
Covered Payroll (Reported Fiscal Year Payroll Paid)	\$ 362,747,630

## Net Pension Liability

Total Pension Liability	\$ 4,037,369,708
Plan Fiduciary Net Position	2,423,261,830
Net Pension Liability	\$ 1,614,107,878
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	60.02%
Net Pension Liability as a Percentage of Covered Payroll	444.97%

## Development of the Single Discount Rate

Single Discount Rate	7.00%
Long-Term Expected Rate of Investment Return	7.00%
Long-Term Municipal Bond Rate*	3.13%
Last year ending June 30 in the 2020 to 2119 projection period for which projected benefit payments are fully funded	2119

<b>Total Pension Expense</b>	<b>\$ 175,678,163</b>
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## Deferred Outflows and Deferred Inflows of Resources by Source to be Recognized in Future Pension Expenses

	Deferred Outflows of Resources	Deferred Inflows of Resources
Difference between expected and actual experience	\$ 155,029	\$ 35,053,632
Changes in assumptions	77,342,885	-
Net difference between projected and actual earnings on pension plan investments	31,434,219	45,933,183
<b>Total</b>	<b>\$ 108,932,133</b>	<b>\$ 80,986,815</b>

\*Source: Fixed-income municipal bonds with 20 years to maturity that include only federally tax-exempt municipal bonds as reported in Fidelity Index's "20-Year Municipal GO AA Index" as of June 28, 2019. In describing this index, Fidelity notes that the municipal curves are constructed using option-adjusted analytics of a diverse population of over 10,000 tax exempt securities.

# Discussion

## Accounting Standard

For pension plans that are administered through trusts or equivalent arrangements, Governmental Accounting Standards Board (GASB) Statement No. 67 establishes standards of financial reporting for separately issued financial reports and specifies the required approach for measuring the pension liability. Similarly, GASB Statement No. 68 establishes standards for state and local government employers (as well as non-employer contributing entities) to account for and disclose the net pension liability, pension expense, and other information associated with providing retirement benefits to their employees (and former employees) on their basic financial statements.

The following discussion provides a summary of the information that is required to be disclosed under these accounting standards. A number of these disclosure items are provided in this report. However, certain information, such as notes regarding accounting policies and investments, is not included in this report and the retirement system and/or plan sponsor will be responsible for preparing and disclosing that information to comply with these accounting standards.

## Financial Statements

GASB Statement No. 68 requires State or local governments to recognize the net pension liability and the pension expense on their financial statements. The net pension liability is the difference between the total pension liability and the plan's fiduciary net position. In traditional actuarial terms, this is analogous to the accrued liability less the market value of assets (not the smoothed actuarial value of assets that is often encountered in actuarial valuations performed to determine the employer's contribution requirement).

The pension expense recognized each fiscal year is equal to the change in the net pension liability from the beginning of the year to the end of the year, adjusted for deferred recognition of the liability and investment experience.

Pension plans that prepare their own, stand-alone financial statements are required to present two financial statements – a statement of fiduciary net position and a statement of changes in fiduciary net position in accordance with GASB Statement No. 67. The *statement of fiduciary net position* presents the assets and liabilities of the pension plan at the end of the pension plan's reporting period. The *statement of changes in fiduciary net position* presents the additions, such as contributions and investment income, and deductions, such as benefit payments and expenses, and net increase or decrease in the fiduciary net position.

## Notes to Financial Statements

GASB Statement No. 68 requires the notes of the employer's financial statements to disclose the total pension expense, the pension plan's liabilities and assets, and deferred outflows and inflows of resources related to pensions.

## Discussion

Both GASB Statements, No. 67 and No. 68 require the notes of the financial statements for the employers and pension plans to include certain additional information. The list of disclosure items should include:

- a description of benefits provided by the plan;
- the type of employees and number of members covered by the pension plan;
- a description of the plan's funding policy, which includes member and employer contribution requirements;
- the pension plan's investment policies;
- the pension plan's fiduciary net position, net pension liability, and the pension plan's fiduciary net position as a percentage of the total pension liability;
- the net pension liability using a discount rate that is 1% higher and 1% lower than used to calculate the total pension liability and net pension liability for financial reporting purposes;
- significant assumptions and methods used to calculate the total pension liability;
- inputs to the discount rates; and
- certain information about mortality assumptions and the dates of experience studies.

Retirement Systems that issue stand-alone financial statements are required to disclose additional information in accordance with GASB Statement No. 67. This information includes:

- the composition of the pension plan's Board and the authority under which benefit terms may be amended;
- a description of how fair value is determined; and
- information regarding certain reserves and investments, which include concentrations of investments greater than or equal to 5%, receivables, and insurance contracts excluded from plan assets.

## Required Supplementary Information

GASB Statement No. 67 requires a 10-year fiscal history of:

- sources of changes in the net pension liability;
- information about the components of the net pension liability and related ratios, including the pension plan's fiduciary net position as a percentage of the total pension liability, and the net pension liability as a percent of covered-employee payroll; and
- comparison of the actual employer contributions to the actuarially determined contributions based on the plan's funding policy.

## Timing of the Valuation

An actuarial valuation to determine the total pension liability is required to be performed at least every two years. The net pension liability and pension expense should be measured as of the pension plan's fiscal year end (measurement date) on a date that is within the employer's prior fiscal year. If the actuarial valuation used to determine the total pension liability is not calculated as of the measurement date, the Total Pension Liability (TPL) is required to be rolled forward from the actuarial valuation date to the measurement date.



## Discussion

The total pension liability shown in this report is based on an actuarial valuation performed as of June 30, 2019 and a measurement date of June 30, 2019.

### Single Discount Rate

Projected benefit payments are required to be discounted to their actuarial present values using a single discount rate that reflects: 1) a long-term expected rate of return on pension plan investments (to the extent that the plan's fiduciary net position is projected to be sufficient to pay benefits); and 2) tax-exempt municipal bond rate based on an index of 20-year general obligation bonds with an average AA credit rating (which is published by the Fidelity Index) as of the measurement date (to the extent that the contributions for use with the long-term expected rate of return are not met).

For the purpose of this valuation, the expected rate of return on pension plan investments is 7.00%; the municipal bond rate is 3.13% (based on the daily rate closest to but not later than the measurement date of the 20-Year Municipal GO AA Index as published by the Fidelity Index); and the resulting single discount rate is 7.00%.

Under the Board's current funding policy, the plan is expected to exceed a 100% funded status if future experience is exactly as assumed due to the Contribution Stabilization Reserve Fund that became part of the funding policy in 2014.

## SECTION B

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### FINANCIAL STATEMENTS

# Statement of Pension Expense Under GASB Statement No. 68

## Fiscal Year Ended June 30, 2019

### A. Expense

1. Service Cost	\$ 43,971,030
2. Interest on the Total Pension Liability	271,174,089
3. Current-Period Benefit Changes	0
4. Member Contributions (made negative for addition here) <sup>#</sup>	(4,449,428)
5. Projected Earnings on Plan Investments (made negative for addition here)	(160,421,281)
6. Pension Plan Administrative Expense	4,372,966
7. Other Changes in Plan Fiduciary Net Position <sup>#</sup>	(3,979,286)
8. Recognition of Outflow (Inflow) of Resources due to Liabilities	5,552,280
9. Recognition of Outflow (Inflow) of Resources due to Assets	19,457,793
<b>10. Total Pension Expense</b>	<b>\$ 175,678,163</b>

*# Employee payments for service purchase of \$1,546,916 and reciprocal transfers of \$2,432,370 were included in line 7. Moving the amount to line 4 would have no effect on results.*

# Statement of Outflows and Inflows Arising from Current Reporting Period Fiscal Year Ended June 30, 2019

## A. Outflows (Inflows) of Resources due to Liabilities

1. Difference between expected and actual experience of the Total Pension Liability (gains) or losses	\$ 203,459
2. Assumption Changes (gains) or losses	\$ -
3. Recognition period for Liabilities: Average of the expected remaining service lives of all employees {in years}	4.2011
4. Outflow (Inflow) of Resources to be recognized in the current pension expense for the difference between expected and actual experience of the Total Pension Liability	\$ 48,430
5. Outflow (Inflow) of Resources to be recognized in the current pension expense for Assumption Changes	\$ -
6. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Liabilities	\$ 48,430
7. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses for the difference between expected and actual experience of the Total Pension Liability	\$ 155,029
8. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses for Assumption Changes	\$ -
9. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Liabilities	\$ 155,029

## B. Outflows (Inflows) of Resources due to Assets

1. Net difference between projected and actual earnings on pension plan investments (gains) or losses	\$ 6,094,463
2. Recognition period for Assets {in years}	5
3. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Assets	\$ 1,218,893
4. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Assets	\$ 4,875,570

# Statement of Outflows and Inflows Arising from Current and Prior Reporting Periods Fiscal Year Ended June 30, 2019

## A. Outflows and Inflows of Resources due to Liabilities and Assets to be Recognized in Current Pension Expense

	Outflows of Resources	Inflows of Resources	Net Outflows of Resources
1. Due to Liabilities	\$ 32,655,042	\$ 27,102,762	\$ 5,552,280
2. Due to Assets	39,273,306	19,815,513	19,457,793
<b>3. Total</b>	<b>\$ 71,928,348</b>	<b>\$ 46,918,275</b>	<b>\$ 25,010,073</b>

## B. Outflows and Inflows of Resources by Source to be Recognized in Current Pension Expense

	Outflows of Resources	Inflows of Resources	Net Outflows of Resources
1. Differences between expected and actual experience	\$ 48,430	\$ 27,102,762	\$ (27,054,332)
2. Assumption Changes	32,606,612	-	32,606,612
3. Net Difference between projected and actual earnings on pension plan investments	39,273,306	19,815,513	19,457,793
<b>4. Total</b>	<b>\$ 71,928,348</b>	<b>\$ 46,918,275</b>	<b>\$ 25,010,073</b>

## C. Deferred Outflows and Deferred Inflows of Resources by Source to be Recognized in Future Pension Expenses

	Deferred Outflows of Resources	Deferred Inflows of Resources	Net Deferred Outflows of Resources
1. Differences between expected and actual experience	\$ 155,029	\$ 35,053,632	\$ (34,898,603)
2. Assumption Changes	77,342,885	-	77,342,885
3. Net Difference between projected and actual earnings on pension plan investments	31,434,219	45,933,183	(14,498,964)
<b>4. Total</b>	<b>\$ 108,932,133</b>	<b>\$ 80,986,815</b>	<b>\$ 27,945,318</b>

## D. Deferred Outflows and Deferred Inflows of Resources by Year to be Recognized in Future Pension Expenses

Year Ending June 30	Net Deferred Outflows of Resources
2020	\$ 20,303,759
2021	2,481,050
2022	3,931,879
2023	1,228,630
2024	-
Thereafter	-
<b>Total</b>	<b>\$ 27,945,318</b>

# Statement of Outflows and Inflows Arising from Current and Prior Reporting Periods Fiscal Year Ended June 30, 2019

Year Established	Initial Amount	Initial Recognition Period	Current Year Recognition	Remaining Recognition	Remaining Recognition Period
<b>Deferred Outflow (Inflow) due to Differences Between Expected and Actual Experience on Liabilities</b>					
2015	\$ (13,324,219)	4.2929	\$ (909,099)	\$ -	0.0000
2016	(39,810,009)	4.3565	(9,138,072)	(3,257,721)	0.3565
2017	(37,286,966)	4.3595	(8,553,037)	(11,627,855)	1.3595
2018	(37,173,164)	4.3720	(8,502,554)	(20,168,056)	2.3720
2019	203,459	4.2011	48,430	155,029	3.2011
<b>Total</b>			<b>\$ (27,054,332)</b>	<b>\$ (34,898,603)</b>	
<b>Deferred Outflow (Inflow) due to Assumption Changes</b>					
2015	\$ -	4.2929	\$ -	\$ -	0.0000
2016	-	4.3565	-	-	0.3565
2017	-	4.3595	-	-	1.3595
2018	142,556,109	4.3720	32,606,612	77,342,885	2.3720
2019	-	4.2011	-	-	3.2011
<b>Total</b>			<b>\$ 32,606,612</b>	<b>\$ 77,342,885</b>	
<b>Deferred Outflow (Inflow) due to Differences Between Projected and Actual Earnings on Plan Investments</b>					
2015	\$ 57,478,818	5.0000	\$ 11,495,762	\$ -	0.0000
2016	132,793,253	5.0000	26,558,651	26,558,649	1.0000
2017	(67,566,785)	5.0000	(13,513,357)	(27,026,714)	2.0000
2018	(31,510,781)	5.0000	(6,302,156)	(18,906,469)	3.0000
2019	6,094,463	5.0000	1,218,893	4,875,570	4.0000
<b>Total</b>			<b>\$ 19,457,793</b>	<b>\$ (14,498,964)</b>	

# Statement of Fiduciary Net Position as of June 30, 2019

## Assets

Cash	\$ 384,571
Receivables	
Investment Sales	\$ 3,871,328
Accrued Investment Interest and Income	6,426,373
Contributions	8,785,305
Other	6,611
Total Receivables	<u>\$ 19,089,617</u>
Investments	
Equities	\$ 454,989,360
Fixed Income	656,761,582
Limited partnerships	1,066,535,548
Hedge	126,820,799
Short Term Securities	114,242,450
Real Estate	-
Absolute Return	-
Venture Capital & Partnerships	-
Total Investments	<u>\$ 2,419,349,739</u>
Securities Lending Collateral	\$ 104,247,159
Prepaid Accounts	\$ -
Capital Assets	
Land (not depreciated)	\$ 84,000
Equipment	3,430,651
Building	581,619
Accumulated Depreciation	(3,527,226)
Total Capital Assets	<u>\$ 569,044</u>
Deferred Outflows - OPEB Related Items	<u>\$ 32,014</u>
<b>Total Assets</b>	<u><b>\$ 2,543,672,144</b></u>

## Liabilities

Investment Purchases Payable	\$ 6,469,261
OPEB Obligations	1,538,442
Security Lending Collateral	110,924,432
Deferred Inflows - OPEB Related Items	239,104
Accounts Payable - Other	1,239,075
<b>Total Liabilities</b>	<u><b>\$ 120,410,314</b></u>

<b>Net Position Restricted for Pensions</b>	<u><b>\$ 2,423,261,830</b></u>
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# Statement of Changes in Fiduciary Net Position for Year Ended June 30, 2019

## Additions

### Contributions

Employer	\$ 210,166,927
Employee	4,449,428
Reciprocal Transfer	2,432,370
Service Purchase	1,546,916
<b>Total Contributions</b>	<b>\$ 218,595,641</b>

### Investment Income

Total net appreciation and gains	\$ 114,179,051
Total interest and dividends	74,631,867
Less total investment expenses	(34,651,182)
<b>Net Investment Income</b>	<b>\$ 154,159,736</b>

### Income From Securities Lending Activities

Securities Lending Income	\$ 942,500
Less Total Securities Lending Expenses	(775,725)
<b>Net Income from Securities Lending Activities</b>	<b>\$ 166,775</b>

Other	\$ 307
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<b>Total Additions</b>	<b>\$ 372,922,459</b>
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## Deductions

Benefit Payments, Including Refunds	\$ 259,817,811
Administrative Expenses	4,372,966
<b>Total Deductions</b>	<b>\$ 264,190,777</b>

<b>Net Increase in Net Position</b>	<b>\$ 108,731,682</b>
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## Net Position Restricted for Pensions

Beginning of Year	\$ 2,314,530,148
Post Valuation Audit Adjustment	\$ -
<b>End of Year</b>	<b>\$ 2,423,261,830</b>



# Schedule of Proportionate Employer Share for Year Ended June 30, 2019

Deferred Outflows of Resources									Deferred Inflows of Resources				Pension Expense			
Contributions#	Employer	Prop. Share	Net Pension Liability	Differences Between Expected and Actual Experience	Net Difference Between Projected and Actual Investment Earnings on Pension Plan Investments	Changes of Assum.	Changes in Proportion and Differences Between Employer Cont. and Share of Cont.	Total Deferred Outflows of Resources	Differences Between Expected and Actual Experience	Net Difference Between Projected and Actual Investment Earnings on Pension Plan Investments	Changes of Assum.	Changes in Proportion and Differences Between Employer Cont. and Share of Cont.	Total Deferred Inflows of Resources	Prop. Share of Plan Pension Expense	Net Amortization of Deferred Amounts from Changes in Proportion and Differences Between Employer Contributions and Proportionate Share of Contributions	Total Employer Pension Expense
\$ 130,420,220	MoDOT	62.35%	\$ 1,006,396,262	\$ 96,661	\$ 19,599,236	\$ 48,223,289	\$ 3,459,362	\$ 71,378,548	\$ 21,855,940	\$ 28,639,340	\$ -	\$ 896,725	\$ 51,392,005	\$ 109,535,335	\$ (1,559,286)	\$ 107,976,049
78,759,337	Highway Patrol	37.65%	607,711,616	58,368	11,834,983	29,119,596	896,725	41,909,672	13,197,692	17,293,843	-	3,459,362	33,950,897	66,142,828	1,559,286	67,702,114
<u>\$ 209,179,557</u>	<i>Total for All Employers</i>	<u>100.0000%</u>	<u>\$ 1,614,107,878</u>	<u>\$ 155,029</u>	<u>\$ 31,434,219</u>	<u>\$ 77,342,885</u>	<u>\$ 4,356,087</u>	<u>\$ 113,288,220</u>	<u>\$ 35,053,632</u>	<u>\$ 45,933,183</u>	<u>\$ -</u>	<u>\$ 4,356,087</u>	<u>\$ 85,342,902</u>	<u>\$ 175,678,163</u>	<u>\$ -</u>	<u>\$ 175,678,163</u>

# Excludes \$987,370 in contributions for Retirement System members. Retirement System members' costs were spread proportionately to the other two employers.

		Schedule of Deferred (Inflows)/Outflows						
Employer	Employer Allocation Percentage	2020	2021	2022	2023	2024	Thereafter	Total
MoDOT	62.35%	\$ 13,589,567	\$ 2,822,207	\$ 2,839,752	\$ 735,018	\$ -	\$ -	\$ 19,986,544
Highway Patrol	37.65%	6,714,192	(341,157)	1,092,127	493,612	-	-	7,958,774
<b>TOTAL</b>	<b>100.00%</b>	<b>\$ 20,303,759</b>	<b>\$ 2,481,050</b>	<b>\$ 3,931,879</b>	<b>\$ 1,228,630</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 27,945,318</b>

## SECTION C

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### REQUIRED SUPPLEMENTARY INFORMATION

# Schedule of Changes in Net Pension Liability and Related Ratios Current Period Fiscal Year Ended June 30, 2019

## A. Total Pension Liability

1. Service Cost	\$ 43,971,030
2. Interest on the Total Pension Liability	271,174,089
3. Changes of Benefit Terms	-
4. Difference between expected and actual experience of the Total Pension Liability	203,459
5. Changes of Assumptions	-
6. Benefit Payments, including Refunds of Employee Contributions	(256,090,944)
7. Disability Premiums	(1,615,860)
8. Transfers to Other Retirement Systems	(2,111,007)
9. Net change in Total Pension Liability	\$ 55,530,767
10. Total Pension Liability – Beginning	3,981,838,941
11. Total Pension Liability – Ending	<u><u>\$ 4,037,369,708</u></u>

## B. Plan Fiduciary Net Position

1. Contributions – employer	\$ 210,166,927
2. Contributions – employee	5,996,344
3. Net investment income	154,326,818
4. Benefit payments, including refunds of employee contributions	(256,090,944)
5. Disability Premiums	(1,615,860)
6. Pension Plan Administrative Expense	(4,372,966)
7. Net Transfers to Other Retirement Systems	321,363
8. Other	-
9. Net change in Plan Fiduciary Net Position	\$ 108,731,682
10. Plan Fiduciary Net Position – Beginning	2,314,530,148
11. Post Valuation Audit Adjustment	-
12. Plan Fiduciary Net Position – Ending	<u><u>\$ 2,423,261,830</u></u>

## C. Net Pension Liability

\$ 1,614,107,878

## D. Plan Fiduciary Net Position as a percentage of the Total Pension Liability

60.02%

## E. Covered Payroll (Reported Fiscal Year Payroll Paid) #

\$ 362,747,630

## F. Net Pension Liability as a percentage of covered-employee payroll

444.97%

# Valuation Payroll was \$359,296,056.

# Schedules of Required Supplementary Information

## Schedule of Changes in Net Pension Liability and Related Ratios (Multiyear)

(Ultimately 10 Fiscal Years Will Be Displayed)

Fiscal year ending June 30,	2019	2018	2017	2016	2015	2014	2013*
<b>Total Pension Liability</b>							
Service Cost	\$ 43,971,030	\$ 46,621,377	\$ 45,713,403	\$ 45,441,305	\$ 45,358,095	\$ 44,739,603	\$ 44,446,279
Interest on the Total Pension Liability	271,174,089	286,457,436	283,568,441	280,432,068	275,284,910	270,525,608	265,339,848
Benefit Changes	-	(7,684)	-	-	-	-	-
Difference between Expected and Actual Experience	203,459	(37,173,164)	(37,286,966)	(39,810,009)	(13,324,219)	(17,614,321)	(13,690,794)
Assumption Changes	-	142,556,109	-	-	-	-	204,396,180
Benefit Payments	(255,310,406)	(254,131,209)	(246,617,775)	(236,488,629)	(236,905,323)	(227,958,108)	(220,623,394)
Refunds	(780,538)	(503,007)	(321,328)	(198,106)	(107,395)	(18,686)	(29,300)
Disability Premiums	(1,615,860)	(1,601,605)	(1,620,418)	(1,567,825)	(1,554,676)	(1,531,578)	(1,512,685)
Transfers to Other Retirement Systems	(2,111,007)	(2,823,042)	(2,724,631)	(1,921,451)	(3,147,482)	(1,876,336)	(629,246)
<b>Net Change in Total Pension Liability</b>	<b>55,530,767</b>	<b>179,395,211</b>	<b>40,710,726</b>	<b>45,887,353</b>	<b>65,603,910</b>	<b>66,266,182</b>	<b>277,696,888</b>
<b>Total Pension Liability - Beginning</b>	<b>3,981,838,941</b>	<b>3,802,443,730</b>	<b>3,761,733,004</b>	<b>3,715,845,651</b>	<b>3,650,241,741</b>	<b>3,583,975,559</b>	<b>3,306,278,671</b>
<b>Total Pension Liability - Ending (a)</b>	<b>\$ 4,037,369,708</b>	<b>\$ 3,981,838,941</b>	<b>\$ 3,802,443,730</b>	<b>\$ 3,761,733,004</b>	<b>\$ 3,715,845,651</b>	<b>\$ 3,650,241,741</b>	<b>\$ 3,583,975,559</b>
<b>Plan Fiduciary Net Position</b>							
Contributions - Employer	\$ 210,166,927	\$ 204,955,180	\$ 206,562,924	\$ 199,609,396	\$ 200,638,571	\$ 183,353,841	\$ 170,836,117
Contributions - Member	5,996,344	5,001,418	4,891,932	3,482,513	3,294,162	2,260,563	1,139,450
Pension Plan Net Investment Income	154,326,818	197,619,838	220,301,741	21,432,095	92,645,571	319,445,780	198,141,088
Benefit Payments	(255,310,406)	(254,131,209)	(246,617,775)	(236,488,629)	(236,905,323)	(227,958,108)	(220,619,035)
Refunds	(780,538)	(503,007)	(321,328)	(198,106)	(107,395)	(18,686)	(29,300)
Disability Premiums	(1,615,860)	(1,601,605)	(1,620,418)	(1,567,825)	(1,554,676)	(1,531,578)	(1,512,685)
Pension Plan Administrative Expense	(4,372,966)	(4,693,492)	(4,515,458)	(4,370,860)	(4,066,944)	(3,736,355)	(2,997,225)
Net Transfers	321,363	(955,597)	(980,524)	808,228	(2,033,045)	(91,954)	(629,246)
Other	-	-	-	-	-	-	-
<b>Net Change in Plan Fiduciary Net Position</b>	<b>108,731,682</b>	<b>145,691,526</b>	<b>177,701,094</b>	<b>(17,293,188)</b>	<b>51,910,921</b>	<b>271,723,503</b>	<b>144,329,164</b>
<b>Plan Fiduciary Net Position - Beginning</b>	<b>2,314,530,148</b>	<b>2,169,775,040</b>	<b>1,992,073,946</b>	<b>2,009,367,134</b>	<b>1,957,456,213</b>	<b>1,685,732,710</b>	<b>1,541,403,546</b>
<b>Post Valuation Audit Adjustment</b>	<b>-</b>	<b>(936,418)</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Plan Fiduciary Net Position - Ending (b)</b>	<b>\$ 2,423,261,830</b>	<b>\$ 2,314,530,148</b>	<b>\$ 2,169,775,040</b>	<b>\$ 1,992,073,946</b>	<b>\$ 2,009,367,134</b>	<b>\$ 1,957,456,213</b>	<b>\$ 1,685,732,710</b>
<b>Net Pension Liability - Ending (a) - (b)</b>	<b>1,614,107,878</b>	<b>1,667,308,793</b>	<b>1,632,668,690</b>	<b>1,769,659,058</b>	<b>1,706,478,517</b>	<b>1,692,785,528</b>	<b>1,898,242,849</b>
<b>Plan Fiduciary Net Position as a Percentage of Total Pension Liability</b>	<b>60.02 %</b>	<b>58.13 %</b>	<b>57.06 %</b>	<b>52.96 %</b>	<b>54.08 %</b>	<b>53.63 %</b>	<b>47.04 %</b>
<b>Covered-Employee Payroll</b>	<b>\$ 362,747,630</b>	<b>\$ 353,751,292</b>	<b>\$ 356,515,416</b>	<b>\$ 344,635,441</b>	<b>\$ 342,264,593</b>	<b>\$ 336,590,797</b>	<b>\$ 323,205,767</b>
<b>Net Pension Liability as a Percentage of Covered-Employee Payroll</b>	<b>444.97 %</b>	<b>471.32 %</b>	<b>457.95 %</b>	<b>513.49 %</b>	<b>498.58 %</b>	<b>502.92 %</b>	<b>587.32 %</b>
<b>Notes to Schedule:</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>

\* After post "June 30, 2013 valuation" adjustments.

# Schedules of Required Supplementary Information

## Schedule of the Net Pension Liability (Multiyear)

(Ultimately 10 Fiscal Years Will Be Displayed)

<b>FY Ending June 30,</b>	<b>Total Pension Liability</b>	<b>Plan Net Position</b>	<b>Net Pension Liability</b>	<b>Plan Net Position as a % of Total Pension Liability</b>	<b>Covered Payroll</b>	<b>Net Pension Liability as a % of Covered Payroll</b>
2013	\$ 3,583,975,559	\$ 1,681,869,871	\$ 1,902,105,688	46.93%	\$ 323,205,767	588.51%
2014	3,650,241,741	1,957,456,213	1,692,785,528	53.63%	336,590,797	502.92%
2015	3,715,845,651	2,009,367,134	1,706,478,517	54.08%	342,264,593	498.58%
2016	3,761,733,004	1,992,073,946	1,769,659,058	52.96%	344,635,441	513.49%
2017	3,802,443,730	2,169,775,040	1,632,668,690	57.06%	356,515,416	457.95%
2018	3,981,838,941	2,314,530,148	1,667,308,793	58.13%	353,751,292	471.32%
2019	4,037,369,708	2,423,261,830	1,614,107,878	60.02%	362,747,630	444.97%

## Schedule of Contributions (Multiyear)

Last 10 Fiscal Years

<b>FY Ending June 30,</b>	<b>Actuarially Determined Contribution</b>	<b>Actual Contribution</b>	<b>Contribution Deficiency (Excess)</b>	<b>Covered Payroll *</b>	<b>Actual Contribution as a % of Covered Payroll</b>
2010	\$ 124,052,534	\$ 124,052,534	-	\$ 376,258,823	32.97%
2011	149,952,750	149,952,750	-	363,345,651	41.27%
2012	164,884,467	164,884,467	-	344,514,139	47.86%
2013	170,836,117	170,836,117	-	329,863,134	51.79%
2014	183,353,841	183,353,841	-	336,799,855	54.44%
2015	200,638,571	200,638,571	-	342,211,446	58.63%
2016	199,609,396	199,609,396	-	344,154,131	58.00%
2017	206,562,924	206,562,924	-	356,142,972	58.00%
2018	204,955,180	204,955,180	-	353,371,000	58.00%
2019	210,166,927	210,166,927	-	362,356,771	58.00%

\* Values are estimated from contribution rate and actual contribution amount.

## Notes to Schedule of Contributions

<b>Valuation Date:</b>	June 30, 2017
Notes	Actuarially determined contribution rates are calculated as of June 30, for the fiscal year ending 2 years thereafter.

### Methods and Assumptions Used to Determine FY 2019 Contribution Rates:

Actuarial Cost Method	Entry-Age
Amortization Method	Level Percentage of Payroll, Closed #
Remaining Amortization Period	Permanent Policy: The total contribution will be based on normal cost plus a 18-year amortization of UAAL. The amortization period is a closed 18-year period starting July 1, 2018. Temporary Accelerated Policy: The total contribution is based on normal cost plus a 7-year amortization period for unfunded retiree liabilities and a 22-year amortization period for other unfunded liabilities. Both amortization periods are closed periods starting July 1, 2018. This temporary accelerated policy was adopted by the Retirement Board on September 17, 2009 and will remain in effect until such time as the retiree liability becomes 100% funded or the permanent policy produces a higher contribution rate.
Asset Valuation Method	3-Year smoothed market; 20% corridor
Inflation	3.0% (price inflation)
Salary Increases	3.50% to 11.00% (including 3.50% wage inflation)
Investment Rate of Return	7.75%
Retirement Age	Experience-based table of rates that are specific to the type of eligibility condition. Last updated for the 2013 valuation pursuant to an experience study of the period July 1, 2007 - June 30, 2012.
Mortality	The mortality tables, for post-retirement mortality, used in evaluating allowances to be paid to non-disabled pensioners were the RP-2000 Combined Healthy Mortality Tables projected 16 years and set back 1 year for males and females. Pre-retirement mortality used was 70% for males and 50% for females of the post-retirement tables set back 1 year for males and set back 1 year for females. Disabled pension mortality was based on PBGC Disabled Mortality tables. The healthy mortality tables include a margin for mortality improvement. The margin is in the 16-year projection. The disabled mortality tables do not include a margin for mortality improvement.

### Other Information:

Notes	There were no benefit changes during the year.
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*# A Contribution Stabilization Reserve Fund of approximately \$219.6 million was added to the unfunded for purposes of determining the FY 2019 contribution rate.*

## SECTION D

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### NOTES TO FINANCIAL STATEMENTS



## Single Discount Rate

A single discount rate of 7.00% was used to measure the total pension liability. This single discount rate was based on the expected rate of return on pension plan investments of 7.00%. The projection of cash flows used to determine this single discount rate assumed that plan member contributions will be made at the current contribution rate and that employer contributions will be made at rates equal to the difference between actuarially determined contribution rates and the member rate. Based on these assumptions, the pension plan's fiduciary net position was projected to be available to make all projected future benefit payments of current plan members. Therefore, the long-term expected rate of return on pension plan investments was applied to all periods of projected benefit payments to determine the total pension liability.

Regarding the sensitivity of the net pension liability to changes in the single discount rate, the following presents the plan's net pension liability, calculated using a single discount rate of 7.00%, as well as what the plan's net pension liability would be if it were calculated using a single discount rate that is 1-percentage-point lower or 1-percentage-point higher:

### Sensitivity of Net Pension Liability to the Single Discount Rate Assumption

	1% Decrease 6.00%	Current Single Discount Rate Assumption 7.00%	1% Increase 8.00%
<b>Total Pension Liability</b>	\$4,512,241,049	\$4,037,369,708	\$3,641,047,629
<b>Plan Fiduciary Net Position</b>	2,423,261,830	2,423,261,830	2,423,261,830
<b>Net Pension Liability</b>	\$2,088,979,219	\$1,614,107,878	\$1,217,785,799

The inclusion of discount rates in the schedule above is not an indication of the reasonableness of the discount rate as an assumption.

# Reconciliation of DROP Accounts

## Disclosure Regarding the Contribution Stabilization Reserve Fund

At the September 26, 2014 Board meeting, the Board adopted the use of a Contribution Stabilization Reserve Fund that would result in an MPERS employer contribution rate similar to the Fiscal Year 2015 rates. The Contribution Stabilization Reserve Fund is intended to keep the contribution relatively level over time and may be used if the market experiences a downturn in the future. The Board further adopted (in February 2015) that the employer contribution rate would not fall below 58% unless 1) the fund became fully funded or 2) the Contribution Stabilization Reserve Fund reached \$250 million. The balance of the Contribution Stabilization Reserve Fund as of June 30, 2019 is \$204,781,636.

## Disclosure Regarding the Deferred Retirement Option Program

MPERS currently provides a BackDROP option. This is an election made at the time of actual retirement. In effect, it provides members an option to elect to receive a portion of their benefits as cash. Since the election is not made until the member actually retires, the option is not treated as a DROP provision as defined in GASB Statement No. 67.

## Summary of Population Statistics

Inactive Plan Members or Beneficiaries Currently Receiving Benefits	9,035
Inactive Plan Members Entitled to But Not Yet Receiving Benefits	2,042
Active Plan Members	<u>7,421</u>
Total Plan Members	18,498

## SECTION E

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### SUMMARY OF BENEFITS

# Missouri Department of Transportation and Highway Patrol Employees' Retirement System

## Summary of Benefit Provisions Evaluated as of June 30, 2019

Closed Plan	Year 2000 Plan	2011 Tier
<b>Participation</b> <hr/> 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.	<b>Participation</b> <hr/> Participants include: <ol style="list-style-type: none"> <li>1. All active employees who first became members on or after July 1, 2000 but prior to January 1, 2011.</li> <li>2. Closed Plan active members and vested former members who elect to transfer to the Year 2000 Plan at retirement.</li> <li>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.</li> <li>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.</li> </ol>	<b>Participation</b> <hr/> Participants include: <ol style="list-style-type: none"> <li>1. All employees who first become members on or after January 1, 2011.</li> </ol>

Closed Plan	Year 2000 Plan	2011 Tier
<b>Normal Retirement Eligibility (unreduced benefit)</b>	<b>Normal Retirement Eligibility (unreduced benefit)</b>	<b>Normal Retirement Eligibility (unreduced benefit)</b>
<p><b>Non-Uniformed Employees:</b> The earlier of attaining:</p> <ol style="list-style-type: none"> <li>Age 65 with at least 4 years of creditable service.</li> <li>Age 60 with at least 15 years of creditable service.</li> <li>Age 48 with age plus creditable service equal to 80 or more.</li> <li>Age 65 with at least 5 years of service (deferred).*</li> </ol>	<p><b>Non-Uniformed Employees:</b> The earlier of attaining:</p> <ol style="list-style-type: none"> <li>Age 62 with at least 5 years of creditable service.</li> <li>Age 48 with age plus creditable service equal to 80 or more.</li> </ol>	<p><b>Non-Uniformed Employees:</b> The earlier of attaining:</p> <ol style="list-style-type: none"> <li>Age 67 with at least 5 years of creditable service.</li> <li>Age 55 with age plus creditable service equal to 90 or more.</li> </ol>
<p><b>Uniformed Patrol Employees Only:</b> The earlier of attaining:</p> <ol style="list-style-type: none"> <li>Age 55 with at least 4 years of creditable service.</li> <li>Mandatory retirement at age 60.</li> <li>Age 48 with age plus creditable service equal to 80 or more.</li> </ol>	<p><b>Uniformed Patrol Employees Only:</b> The earlier of attaining:</p> <ol style="list-style-type: none"> <li>Mandatory retirement at age 60.</li> <li>Age 48 with age plus creditable service equal to 80 or more.</li> </ol>	<p><b>Uniformed Patrol Employees Only:</b> The earlier of attaining:</p> <ol style="list-style-type: none"> <li>Age 55 with at least 5 years of creditable service.</li> <li>Mandatory retirement at age 60.</li> </ol>
<b>Final Average Pay Used for Benefit Determination</b>	<b>Final Average Pay Used for Benefit Determination</b>	<b>Final Average Pay Used for Benefit Determination</b>
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.

**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.

**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.

**Normal Retirement Benefit Amount****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.

**Early Retirement (reduced benefit)****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.

**Normal Retirement Benefit Amount****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)****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*****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.

**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.

**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.

**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. Normal retirement eligibility begins at age 62.

**Minimum Base Benefit**

Same.

**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 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.

**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 normal retirement considering years of creditable service. Normal retirement eligibility begins at age 67.

**Minimum Base Benefit**

Same.

**Death Prior to Retirement**

**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**

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.

**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.

**Death After Retirement**

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**

Same.

**Death After Retirement**

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**

Same.

**Closed Plan****Year 2000 Plan****2011 Tier****\$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.

**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.

**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.

**\$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 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**

**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.

**Police Service:** Not available.

**\$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 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**

**Military:** 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.

**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.

**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.

**Portability:** Same as Closed Plan Section 105.691.

**Public Employment Prior Service (Subsidized Purchase)**

Not available.

**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.

**Portability:** Same as Closed Plan Section 105.691.

**Public Employment Prior Service (Subsidized Purchase)**

Not available.

**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.

**Closed Plan****Year 2000 Plan****2011 Tier****Post-Retirement Benefit Adjustments**

For active and inactive employees hired prior to August 28, 1997 and current retirees, 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%.

**Member Contributions**

None.

**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%.

**Member Contributions**

None.

**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**

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 & 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 twelve-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.

## SECTION F

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### **ACTUARIAL COST METHOD AND ACTUARIAL ASSUMPTIONS**

# Summary of Valuation Method and Assumptions

## June 30, 2019

**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, 2018 actuarial valuation, following a five-year actuarial investigation covering the period July 1, 2012 through June 30, 2017. They 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.

### Economic Assumptions

**The investment return rate** used in making the valuations was 7.00% 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 7.00% investment return rate and 3.00% wage inflation rate translates to an assumed real rate of return over wage growth net of expenses of 4.00%. Based upon other assumptions, the net real rate of return over price inflation is 4.75%.

**Pay increase assumptions for merit and seniority** for individual active members are shown on page 31. 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, 2019 (Concluded)

### 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 RP-2014 Healthy Annuitant Mortality Tables projected to 2022 using projection scale MP-2017, shown on page 32.

**Post-Retirement Disabled Mortality Rates.** The rates currently in use for disabled lives are from the RP-2014 Disabled Retiree Annuitant Mortality Tables projected to 2022 using projection scale MP-2017, shown on page 33.

**Pre-Retirement Mortality Rates.** The rates currently in use for active lives are the RP-2014 Employee Mortality Table projected to 2022 using projection scale MP-2017 and multiplied by a factor of 65%, shown on page 34.

**The probabilities of age and service retirement** are shown on page 36. 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 37.

**The probabilities of withdrawal from service** are shown on page 38.

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

**Present assets (cash & investments)** were used at market value.

**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	9.45%	6.80%
2	5.00%	4.50%
3	2.75%	2.80%
4	2.50%	1.50%
5	2.00%	1.00%
6	1.50%	0.80%
7	1.25%	0.00%
8	1.25%	0.00%
9	1.00%	0.00%
10	0.75%	0.00%
11	0.75%	0.00%
12	0.75%	0.00%
13	0.50%	0.00%
14	0.50%	0.00%
15	0.25%	0.00%
16	0.25%	0.00%
17	0.25%	0.00%
18	0.25%	0.00%
19	0.25%	0.00%
20	0.25%	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

## Retired Lives Mortality Rates

Age	% Dying Next Year		Age	% Dying Next Year		Age	% Dying Next Year	
	Male	Female		Male	Female		Male	Female
20	0.0369%	0.0174%	60	0.7938%	0.5667%	100	31.3381%	28.0166%
21	0.0408%	0.0195%	61	0.8547%	0.6147%	101	33.3774%	30.0266%
22	0.0449%	0.0223%	62	0.9205%	0.6657%	102	35.3995%	32.0621%
23	0.0492%	0.0256%	63	0.9918%	0.7196%	103	37.3951%	34.0941%
24	0.0538%	0.0295%	64	1.0684%	0.7773%	104	39.3487%	36.0900%
25	0.0588%	0.0340%	65	1.1511%	0.8398%	105	41.2343%	38.0614%
26	0.0641%	0.0388%	66	1.2408%	0.9085%	106	43.0470%	39.9941%
27	0.0700%	0.0441%	67	1.3387%	0.9850%	107	44.7813%	41.8213%
28	0.0764%	0.0499%	68	1.4472%	1.0710%	108	46.4200%	43.5827%
29	0.0836%	0.0567%	69	1.5680%	1.1678%	109	47.9720%	45.2475%
30	0.0916%	0.0644%	70	1.7034%	1.2770%	110	49.4044%	46.8213%
31	0.1004%	0.0731%	71	1.8549%	1.4005%	111	49.9809%	48.2854%
32	0.1098%	0.0828%	72	2.0259%	1.5392%	112	49.9755%	49.6513%
33	0.1201%	0.0933%	73	2.2187%	1.6965%	113	49.9953%	50.2110%
34	0.1300%	0.1047%	74	2.4366%	1.8727%	114	49.9851%	50.0952%
35	0.1405%	0.1166%	75	2.6823%	2.0723%	115	50.0000%	50.0000%
36	0.1519%	0.1291%	76	2.9606%	2.2975%	116	50.0000%	50.0000%
37	0.1638%	0.1413%	77	3.2770%	2.5540%	117	50.0000%	50.0000%
38	0.1766%	0.1532%	78	3.6348%	2.8455%	118	50.0000%	50.0000%
39	0.1899%	0.1644%	79	4.0410%	3.1769%	119	50.0000%	50.0000%
40	0.2035%	0.1750%	80	4.5024%	3.5553%	120	100.0000%	100.0000%
41	0.2169%	0.1838%	81	5.0252%	3.9869%			
42	0.2307%	0.1918%	82	5.6159%	4.4782%			
43	0.2453%	0.1994%	83	6.2866%	5.0381%			
44	0.2609%	0.2070%	84	7.0474%	5.6722%			
45	0.2779%	0.2146%	85	7.9002%	6.3897%			
46	0.2964%	0.2231%	86	8.8634%	7.1988%			
47	0.3167%	0.2325%	87	9.9417%	8.1051%			
48	0.3394%	0.2424%	88	11.1427%	9.1109%			
49	0.3644%	0.2533%	89	12.4767%	10.2194%			
50	0.3922%	0.2660%	90	13.9500%	11.4522%			
51	0.4231%	0.2806%	91	15.4968%	12.7799%			
52	0.4563%	0.2986%	92	17.0856%	14.1857%			
53	0.4885%	0.3200%	93	18.6789%	15.6544%			
54	0.5223%	0.3449%	94	20.2575%	17.1685%			
55	0.5582%	0.3734%	95	21.8007%	18.7264%			
56	0.5971%	0.4054%	96	23.6045%	20.4458%			
57	0.6398%	0.4409%	97	25.4442%	22.2335%			
58	0.6865%	0.4797%	98	27.3578%	24.1013%			
59	0.7377%	0.5218%	99	29.3232%	26.0345%			

# Post-Retirement Mortality (Disability)

## Disabled Retired Lives Mortality Rates

Age	% Dying Next Year		Age	% Dying Next Year		Age	% Dying Next Year	
	Male	Female		Male	Female		Male	Female
20	0.0438%	0.0203%	60	2.7176%	1.8560%	100	32.6085%	28.7749%
21	0.0612%	0.0284%	61	2.8283%	1.9166%	101	34.2769%	30.5690%
22	0.0856%	0.0397%	62	2.9435%	1.9759%	102	35.9695%	32.4095%
23	0.1168%	0.0547%	63	3.0631%	2.0367%	103	37.6945%	34.2784%
24	0.1553%	0.0728%	64	3.1849%	2.1023%	104	39.4530%	36.1549%
25	0.2005%	0.0940%	65	3.3118%	2.1768%	105	41.2343%	38.0614%
26	0.2533%	0.1174%	66	3.4447%	2.2633%	106	43.0470%	39.9941%
27	0.3130%	0.1436%	67	3.5855%	2.3662%	107	44.7813%	41.8213%
28	0.3801%	0.1725%	68	3.7399%	2.4882%	108	46.4200%	43.5827%
29	0.4543%	0.2051%	69	3.9098%	2.6317%	109	47.9720%	45.2475%
30	0.5358%	0.2419%	70	4.0984%	2.7988%	110	49.4044%	46.8213%
31	0.6235%	0.2828%	71	4.3081%	2.9925%	111	49.9809%	48.2854%
32	0.7158%	0.3281%	72	4.5436%	3.2128%	112	49.9755%	49.6513%
33	0.8114%	0.3776%	73	4.8065%	3.4648%	113	49.9953%	50.2110%
34	0.9026%	0.4306%	74	5.1008%	3.7463%	114	49.9851%	50.0952%
35	0.9943%	0.4864%	75	5.4281%	4.0624%	115	50.0000%	50.0000%
36	1.0858%	0.5436%	76	5.7929%	4.4139%	116	50.0000%	50.0000%
37	1.1751%	0.6006%	77	6.2011%	4.8052%	117	50.0000%	50.0000%
38	1.2617%	0.6557%	78	6.6529%	5.2368%	118	50.0000%	50.0000%
39	1.3443%	0.7078%	79	7.1550%	5.7097%	119	50.0000%	50.0000%
40	1.4204%	0.7560%	80	7.7133%	6.2278%	120	100.0000%	100.0000%
41	1.4852%	0.7965%	81	8.3320%	6.7925%			
42	1.5449%	0.8333%	82	9.0153%	7.4046%			
43	1.6000%	0.8677%	83	9.7759%	8.0682%			
44	1.6518%	0.9006%	84	10.6221%	8.7816%			
45	1.7022%	0.9338%	85	11.5504%	9.5490%			
46	1.7528%	0.9691%	86	12.5809%	10.3728%			
47	1.8036%	1.0081%	87	13.7130%	11.2504%			
48	1.8561%	1.0486%	88	14.9503%	12.1767%			
49	1.9108%	1.0931%	89	16.2983%	13.1470%			
50	1.9679%	1.1445%	90	17.7578%	14.1809%			
51	2.0285%	1.2025%	91	19.1980%	15.3068%			
52	2.0949%	1.2677%	92	20.6246%	16.5148%			
53	2.1519%	1.3387%	93	22.0177%	17.7919%			
54	2.2110%	1.4144%	94	23.3675%	19.1177%			
55	2.2745%	1.4929%	95	24.6544%	20.4885%			
56	2.3451%	1.5721%	96	26.2066%	22.0265%			
57	2.4253%	1.6494%	97	27.7603%	23.6241%			
58	2.5146%	1.7227%	98	29.3541%	25.2910%			
59	2.6124%	1.7921%	99	30.9669%	27.0120%			

# Pre-Retirement Mortality

## Death-in-Service Mortality Rates

Age	% Dying Next Year		Age	% Dying Next Year		Age	% Dying Next Year	
	Male	Female		Male	Female		Male	Female
20	0.0239%	0.0106%	60	0.3113%	0.1733%	100	20.3698%	18.2108%
21	0.0268%	0.0108%	61	0.3515%	0.1870%	101	21.6953%	19.5173%
22	0.0295%	0.0109%	62	0.3965%	0.2013%	102	23.0097%	20.8404%
23	0.0313%	0.0112%	63	0.4467%	0.2166%	103	24.3068%	22.1612%
24	0.0324%	0.0116%	64	0.5019%	0.2329%	104	25.5767%	23.4585%
25	0.0309%	0.0119%	65	0.5624%	0.2506%	105	26.8023%	24.7399%
26	0.0302%	0.0122%	66	0.6210%	0.2753%	106	27.9806%	25.9962%
27	0.0300%	0.0127%	67	0.6844%	0.3028%	107	29.1078%	27.1838%
28	0.0303%	0.0133%	68	0.7539%	0.3335%	108	30.1730%	28.3288%
29	0.0311%	0.0140%	69	0.8303%	0.3680%	109	31.1818%	29.4109%
30	0.0322%	0.0150%	70	0.9147%	0.4070%	110	32.1129%	30.4338%
31	0.0337%	0.0161%	71	1.0083%	0.4510%	111	32.4876%	31.3855%
32	0.0352%	0.0174%	72	1.1130%	0.5006%	112	32.4841%	32.2733%
33	0.0368%	0.0187%	73	1.2299%	0.5572%	113	32.4969%	32.6372%
34	0.0382%	0.0200%	74	1.3608%	0.6207%	114	32.4903%	32.5619%
35	0.0393%	0.0214%	75	1.5071%	0.6928%	115	32.5000%	32.5000%
36	0.0402%	0.0227%	76	1.6706%	0.7741%	116	32.5000%	32.5000%
37	0.0412%	0.0242%	77	1.8540%	0.8664%	117	32.5000%	32.5000%
38	0.0423%	0.0258%	78	2.0582%	0.9704%	118	32.5000%	32.5000%
39	0.0437%	0.0276%	79	2.2859%	1.0874%	119	32.5000%	32.5000%
40	0.0456%	0.0296%	80	2.5398%	1.2190%	120	100.0000%	100.0000%
41	0.0478%	0.0317%	81	2.8770%	1.4450%			
42	0.0506%	0.0340%	82	3.2941%	1.7633%			
43	0.0543%	0.0367%	83	3.7903%	2.1715%			
44	0.0588%	0.0398%	84	4.3640%	2.6658%			
45	0.0640%	0.0434%	85	5.0073%	3.2435%			
46	0.0705%	0.0474%	86	5.7229%	3.9007%			
47	0.0777%	0.0521%	87	6.5034%	4.6310%			
48	0.0860%	0.0571%	88	7.3429%	5.4253%			
49	0.0954%	0.0626%	89	8.2360%	6.2734%			
50	0.1058%	0.0688%	90	9.1736%	7.1761%			
51	0.1174%	0.0757%	91	10.1429%	8.1223%			
52	0.1305%	0.0835%	92	11.1417%	9.1047%			
53	0.1442%	0.0922%	93	12.1542%	10.1144%			
54	0.1594%	0.1017%	94	13.1696%	11.1381%			
55	0.1764%	0.1121%	95	14.1705%	12.1722%			
56	0.1960%	0.1233%	96	15.3429%	13.2898%			
57	0.2187%	0.1351%	97	16.5387%	14.4518%			
58	0.2452%	0.1474%	98	17.7826%	15.6658%			
59	0.2759%	0.1602%	99	19.0601%	16.9224%			

## Joint Life Retirement Values (7.00% Interest)

Sample Attained Ages	Single Life Retirement Values					
	Present Value of \$1 Monthly for Life		Percent Dying Next Year		Future Life Expectancy (years)	
	Men	Women	Men	Women	Men	Women
50	\$149.37	\$153.84	0.3922%	0.2660%	32.36	34.85
55	142.00	147.02	0.5582%	0.3734%	28.05	30.34
60	132.97	138.52	0.7938%	0.5667%	23.89	25.97
65	122.06	128.13	1.1511%	0.8398%	19.90	21.76
70	109.01	115.45	1.7034%	1.2770%	16.11	17.74
75	93.80	100.44	2.6823%	2.0723%	12.58	13.97
80	76.99	83.55	4.5024%	3.5553%	9.41	10.56

The present values shown above are for illustrative purposes only and include a 50% survivor benefit but do not include the value of future post-retirement increases. Males are assumed to be 3 years older than their spouses.

## Rates of Retirement

Age	% of Active Participants Retiring								
	Closed and Year 2000 Plans					2011 Tier			
	Non-Uniformed Members				Uniformed	Non-Uniformed			Uniformed
	Male		Female			Normal		Early	
	Normal	Early	Normal	Early		Normal	Age & Service		Rule of 90
50	40%		25%		45%				
51	30%		20%		15%				
52	26%		20%		15%				
53	26%		20%		16%				
54	24%		24%		16%				
55	27%	3%	32%	3%	25%		30%		30%
56	25%	3%	35%	3%	30%		30%		30%
57	26%	4%	29%	4%	20%		30%		30%
58	22%	2%	25%	4%	30%		30%		30%
59	25%	4%	30%	5%	40%		30%		30%
60	19%	5%	22%	5%	100%		30%		100%
61	18%	5%	22%	5%	100%		30%		100%
62	40%	40%	36%	30%	100%		30%	10%	100%
63	35%	35%	22%	30%	100%		30%	10%	100%
64	25%	30%	20%	25%	100%		30%	10%	100%
65	35%		35%		100%		30%	10%	100%
66	40%		45%		100%		30%	10%	100%
67	45%		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%	0.10%	0.10%
31	0.10%	0.10%	0.10%	0.10%
32	0.10%	0.10%	0.11%	0.11%
33	0.10%	0.10%	0.11%	0.11%
34	0.10%	0.10%	0.12%	0.12%
35	0.10%	0.10%	0.13%	0.13%
36	0.10%	0.10%	0.13%	0.13%
37	0.10%	0.10%	0.14%	0.14%
38	0.10%	0.10%	0.14%	0.14%
39	0.10%	0.10%	0.15%	0.15%
40	0.10%	0.10%	0.17%	0.17%
41	0.10%	0.10%	0.19%	0.19%
42	0.10%	0.10%	0.21%	0.21%
43	0.10%	0.10%	0.23%	0.23%
44	0.10%	0.10%	0.24%	0.24%
45	0.10%	0.10%	0.27%	0.27%
46	0.10%	0.10%	0.30%	0.30%
47	0.10%	0.10%	0.32%	0.32%
48	0.10%	0.10%	0.36%	0.36%
49	0.10%	0.10%	0.41%	0.41%
50	0.10%	0.10%	0.46%	0.46%
51	0.10%	0.10%	0.52%	0.52%
52	0.10%	0.10%	0.59%	0.59%
53	0.10%	0.10%	0.68%	0.68%
54	0.10%	0.10%	0.77%	0.77%
55	0.10%	0.10%	0.86%	0.86%
56	0.10%	0.10%	0.97%	0.97%
57	0.10%	0.10%	1.09%	1.09%
58	0.10%	0.10%	1.22%	1.22%
59	0.10%	0.10%	1.35%	1.35%
60	0.10%	0.10%	1.49%	1.49%
61	0.10%	0.10%	1.64%	1.64%
62	0.10%	0.10%	1.80%	1.80%
63	0.10%	0.10%	1.97%	1.97%
64	0.10%	0.10%	2.15%	2.15%
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	12.00%	12.00%	30.00%	20.00%
	1-2	6.00%	6.00%	16.00%	14.00%
	2-3	2.50%	2.50%	9.00%	11.00%
	3-4	2.50%	2.50%	7.00%	9.00%
	4-5	2.50%	2.50%	5.50%	6.00%
25	5 & Up	1.89%	1.89%	5.60%	6.00%
26		1.89%	1.89%	5.60%	6.00%
27		1.89%	1.89%	5.60%	6.00%
28		1.89%	1.89%	5.60%	6.00%
29		1.89%	1.89%	5.60%	6.00%
30		1.89%	1.89%	5.60%	6.00%
31		1.89%	1.89%	5.53%	6.00%
32		1.83%	1.83%	5.46%	6.00%
33		1.65%	1.65%	5.39%	6.00%
34		1.49%	1.49%	5.32%	6.00%
35		1.34%	1.34%	5.25%	6.00%
36		1.19%	1.19%	5.18%	6.00%
37		1.06%	1.06%	5.11%	6.00%
38		0.95%	0.95%	5.04%	6.00%
39		0.86%	0.86%	4.97%	5.78%
40		0.79%	0.79%	4.90%	5.54%
41		0.74%	0.74%	4.48%	5.29%
42		0.69%	0.69%	4.06%	5.05%
43		0.64%	0.64%	3.64%	4.81%
44		0.60%	0.60%	3.22%	4.56%
45		0.55%	0.55%	2.80%	4.32%
46		0.50%	0.50%	2.66%	4.12%
47		0.46%	0.46%	2.52%	3.92%
48		0.41%	0.41%	2.38%	3.72%
49		0.36%	0.36%	2.24%	3.36%
50		0.32%	0.32%	2.10%	3.00%
51		0.27%	0.27%	1.96%	3.00%
52		0.23%	0.23%	1.82%	3.00%
53		0.21%	0.21%	1.68%	3.00%
54		0.19%	0.19%	1.54%	3.00%
55		0.16%	0.16%	1.40%	3.00%
56		0.17%	0.17%	1.40%	3.00%
57		0.13%	0.13%	1.40%	3.00%
58		0.13%	0.13%	1.40%	3.00%
59		0.13%	0.13%	1.40%	3.00%
60		0.12%	0.12%	1.40%	3.00%



## Miscellaneous and Technical Assumptions

<b>Administrative Expenses:</b>	1.15% of payroll, based upon actual results from previous year.
<b>Disability Expenses:</b>	0.53% of payroll included in contribution. Retirement system pays premium directly to an outside insurance company or TPA.
<b>Marriage Assumption:</b>	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.
<b>Pay Increase Timing:</b>	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.
<b>Decrement Timing:</b>	Decrements of all types are assumed to occur mid-year.
<b>Eligibility Testing:</b>	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.
<b>Benefit Service:</b>	Exact fractional service is used to determine the amount of benefit payable.
<b>Decrement Relativity:</b>	Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.
<b>Normal Form of Benefit:</b>	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.
<b>Optional Benefit Factors:</b>	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.
<b>Deferred Joint and Survivor:</b>	It was assumed that all deferred members eligible for the Closed plan would choose Closed plan benefits at retirement.
<b>Other:</b>	Turnover decrements do not operate during retirement eligibility.
<b>Miscellaneous Adjustments:</b>	The calculated normal and early retirement benefits for the Closed and Year 2000 plans were increased by 3.75% for Uniformed and 2.6% 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 for the 2011 Tier plan were increased by 1.5% for Uniformed and 1.0% for Non-Uniformed to account for the inclusion of unused sick leave in the calculation of Average Pay. Post disability benefit liabilities were increased by 50% 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 (Concluded)

### Contribution Stabilization

<b>Reserve Fund:</b>	The contribution stabilization reserve fund affects the total amount of UAAL financed and is assumed to grow at the investment return rate.
<b>Death Prior to Retirement:</b>	100% of deaths-in-service are assumed to be non-duty.
<b>Gainful Employment Offset:</b>	30% of the \$90 per month special benefit is assumed to be offset by gainful employment.
<b>Minimum Benefit Eligibility:</b>	Deferred benefits and death prior to retirement benefits are assumed to be eligible for the minimum base benefit along with normal and early retirement benefits.
<b>Active Plan Choice:</b>	It was assumed that active members eligible for the Closed plan would choose the Closed plan benefits at retirement.
<b>Member Contribution Interest:</b>	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.

**Salary Adjustments:** Salary from data as provided in prior valuations was used for two 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.

**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 of the valuation report), 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 39.

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, 2019, resulted in **Unfunded Actuarial Accrued Liabilities (UAAL)**. The UAAL plus the CSR was amortized using the following funding policy.

**Permanent Policy:** The total contribution will be based on normal cost plus a 16-year amortization of unfunded actuarial accrued liabilities. The amortization period is a closed 16-year period starting July 1, 2020.

**Temporary Accelerated Policy:** The total contribution is based on normal cost plus a 5-year amortization period for unfunded retiree liabilities and a 20-year amortization period for other unfunded liabilities. Both amortization periods are closed periods starting July 1, 2020.

This temporary accelerated policy was adopted by the Retirement Board on September 17, 2009 and will remain in effect until such time as the retiree liability becomes 100% funded or the permanent policy produces a higher contribution rate.

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

## **SECTION G**

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### **CALCULATION OF THE SINGLE DISCOUNT RATE**

## Calculation of the Single Discount Rate

GASB Statement No. 67 includes a specific requirement for the discount rate that is used for the purpose of the measurement of the Total Pension Liability. This rate considers the ability of the fund to meet benefit obligations in the future. To make this determination, employer contributions, employee contributions, benefit payments, expenses and investment returns are projected into the future. The Plan Net Position (assets) in future years can then be determined and compared to its obligation to make benefit payments in those years. As long as assets are projected to be on hand in a future year, the assumed valuation discount rate is used. In years where assets are not projected to be sufficient to meet benefit payments, the use of a “risk-free” rate is required, as described in the following paragraph.

The Single Discount Rate (SDR) is equivalent to applying these two rates to the benefits that are projected to be paid during the different time periods. The SDR reflects (1) the long-term expected rate of return on pension plan investments (during the period in which the fiduciary net position is projected to be sufficient to pay benefits) and (2) tax-exempt municipal bond rate based on an index of 20-year general obligation bonds with an average AA credit rating (which is published by the Fidelity Index) as of the measurement date (to the extent that the contributions for use with the long-term expected rate of return are not met).

For the purpose of this valuation, the expected rate of return on pension plan investments is 7.00%; the municipal bond rate is 3.13%; and the resulting single discount rate is 7.00%.

The tables in this section provide background for the development of the single discount rate.

The **Projection of Contributions** table shows the development of expected contributions in future years. Normal Cost contributions for future hires are not included (nor are their liabilities).

The **Projection of Plan Fiduciary Net Position** table shows the development of expected asset levels in future years.

The **Present Values of Projected Benefit Payments** table shows the development of the Single Discount Rate (SDR). It breaks down the benefit payments into present values for funded and unfunded portions and shows the equivalent total at the SDR.

The table on pages 43 through 45 shows the projected contributions on behalf of the current members. This contribution is based on the current funding policy. The amortization of UAL is similar to the amortization schedule shown in the June 30, 2019 valuation report and includes the effects of the \$204,781,636 Contribution Stabilization Reserve Fund. However, the schedule was adjusted for the use of market value of assets instead of actuarial value of assets and to allow the Contribution Stabilization Reserve Fund to grow until reaching \$250 million. Once the maximum Contribution Stabilization Reserve Fund was reached, contributions were reduced, but not below \$0.

The tables shown on pages 46 and 47 show that the present value of projected unfunded benefit payments using the municipal bond rate is \$0. Therefore, we used the market rate of assumed investment return for all periods in the valuation.

**The Projected Total Contributions shown are based on a closed group projection and are therefore not applicable for funding purposes of the open group.**

# Single Discount Rate Development

## Projection of Contributions Ending June 30, 2069

Year	Valuation Payroll for Current Employees	Contributions from Current Employees	Service Cost and Expense Contributions	UAL Contributions	Total Contributions
0	\$ 359,296,056				
1	356,719,995	\$ 4,564,191	\$ 40,255,997	\$ 167,373,814	\$ 212,194,002
2	337,843,660	4,387,120	38,050,860	174,396,109	216,834,089
3	320,740,173	4,285,789	35,903,372	179,627,993	219,817,154
4	304,044,521	4,210,700	33,722,435	185,016,833	222,949,968
5	287,691,500	4,144,723	31,551,242	190,567,337	226,263,303
6	271,309,060	4,077,440	29,364,029	196,284,358	229,725,827
7	255,165,678	4,012,299	27,199,181	122,144,494	153,355,973
8	239,673,881	3,945,943	25,126,904	125,808,829	154,881,677
9	224,746,570	3,878,975	23,155,097	129,583,093	156,617,165
10	210,423,833	3,814,671	21,289,335	133,470,586	158,574,591
11	196,743,648	3,752,250	19,536,754	137,474,704	160,763,708
12	183,876,340	3,693,049	17,917,451	141,598,945	163,209,445
13	171,644,558	3,635,293	16,402,188	145,846,913	165,884,394
14	159,952,769	3,576,232	14,967,299	150,222,321	168,765,852
15	148,802,436	3,517,251	13,618,373	154,728,990	171,864,615
16	138,282,162	3,458,793	12,359,768	159,370,860	175,189,421
17	128,675,578	3,401,323	11,218,738	164,151,986	178,772,048
18	119,737,834	3,343,100	10,163,937	169,076,546	182,583,583
19	111,302,734	3,281,918	9,170,617	33,466,976	45,919,512
20	103,453,836	3,216,465	8,250,944	(8,250,944)	3,216,465
21	96,470,037	3,146,460	7,442,887	(7,442,887)	3,146,460
22	90,267,058	3,069,001	6,739,037	-	9,808,038
23	84,489,145	2,976,878	6,107,342	-	9,084,220
24	78,842,867	2,859,941	5,524,475	-	8,384,415
25	73,087,912	2,714,085	4,969,413	-	7,683,497
26	66,899,784	2,530,758	4,414,238	-	6,944,995
27	60,281,939	2,314,693	3,860,153	-	6,174,846
28	53,454,125	2,076,984	3,326,132	-	5,403,116
29	46,352,768	1,817,795	2,801,380	-	4,619,175
30	39,277,179	1,549,987	2,308,077	-	3,858,064
31	32,295,751	1,278,357	1,847,675	-	3,126,033
32	25,476,519	1,010,308	1,418,369	-	2,428,677
33	19,248,329	764,293	1,041,210	-	1,805,503
34	13,941,081	554,078	728,864	-	1,282,941
35	9,757,360	388,074	489,947	-	878,021
36	6,640,240	264,256	317,680	-	581,935
37	4,367,576	173,905	194,773	-	368,678
38	2,846,700	113,415	116,777	-	230,192
39	1,864,696	74,343	70,361	-	144,704
40	1,226,274	48,924	42,651	-	91,575
41	834,146	33,304	28,534	-	61,838
42	560,789	22,405	18,938	-	41,343
43	369,590	14,773	12,176	-	26,949
44	234,731	9,386	7,684	-	17,070
45	141,059	5,641	4,547	-	10,188
46	77,859	3,114	2,433	-	5,547
47	39,431	1,577	1,151	-	2,728
48	19,867	795	580	-	1,375
49	9,761	390	292	-	682
50	4,261	170	88	-	258

# Single Discount Rate Development

## Projection of Plan Fiduciary Net Position Ending June 30, 2119

Year	Projected Beginning Plan Net Position	Projected Total Contributions	Projected Benefit Payments	Projected Administrative Expenses	Projected Investment Earnings at 7.00%	Projected Ending Plan Net Position
	(a)	(b)	(c)	(d)	(e)	(f)=(a)+(b)-(c)-(d)+(e)
1	\$ 2,423,261,830	\$ 212,194,002	\$ 256,749,758	\$ 4,102,280	\$ 167,954,100	\$ 2,542,557,894
2	2,542,557,894	216,834,089	263,477,132	3,885,202	176,240,475	2,668,270,123
3	2,668,270,123	219,817,154	270,128,118	3,688,512	184,920,892	2,799,191,540
4	2,799,191,540	222,949,968	277,596,631	3,496,512	193,942,815	2,934,991,179
5	2,934,991,179	226,263,303	284,681,075	3,308,452	203,325,504	3,076,590,458
6	3,076,590,458	229,725,827	293,169,341	3,120,054	213,071,010	3,223,097,900
7	3,223,097,900	153,355,973	301,501,170	2,934,405	220,418,500	3,292,436,798
8	3,292,436,798	154,881,677	309,560,939	2,756,250	225,053,528	3,360,054,814
9	3,360,054,814	156,617,165	316,533,021	2,584,586	229,612,515	3,427,166,887
10	3,427,166,887	158,574,591	323,414,169	2,419,874	234,146,612	3,494,054,047
11	3,494,054,047	160,763,708	329,587,548	2,262,552	238,697,035	3,561,664,690
12	3,561,664,690	163,209,445	335,087,490	2,114,578	243,329,783	3,631,001,849
13	3,631,001,849	165,884,394	340,306,540	1,973,912	248,100,686	3,702,706,478
14	3,702,706,478	168,765,852	344,792,859	1,839,457	253,069,416	3,777,909,430
15	3,777,909,430	171,864,615	349,230,086	1,711,228	258,291,981	3,857,124,712
16	3,857,124,712	175,189,421	351,887,815	1,590,245	263,864,167	3,942,700,239
17	3,942,700,239	178,772,048	353,955,101	1,479,769	269,910,395	4,035,947,811
18	4,035,947,811	182,583,583	354,930,704	1,376,985	276,538,840	4,138,762,546
19	4,138,762,546	45,919,512	355,183,362	1,279,981	279,028,173	4,107,246,887
20	4,107,246,887	3,216,465	354,531,432	1,189,719	275,378,286	4,030,120,487
21	4,030,120,487	3,146,460	352,213,801	1,109,405	270,059,537	3,950,003,279
22	3,950,003,279	9,808,038	349,166,129	1,038,071	264,787,864	3,874,394,981
23	3,874,394,981	9,084,220	344,622,768	971,625	259,628,992	3,797,513,800
24	3,797,513,800	8,384,415	339,694,805	906,693	254,395,026	3,719,691,744
25	3,719,691,744	7,683,497	334,528,138	840,511	249,103,417	3,641,110,009
26	3,641,110,009	6,944,995	329,723,991	769,348	243,745,035	3,561,306,701
27	3,561,306,701	6,174,846	325,229,887	693,242	238,289,556	3,479,847,974
28	3,479,847,974	5,403,116	320,626,065	614,722	232,722,002	3,396,732,305
29	3,396,732,305	4,619,175	316,089,273	533,057	227,035,843	3,311,764,993
30	3,311,764,993	3,858,064	310,888,494	451,688	221,243,691	3,225,526,566
31	3,225,526,566	3,126,033	305,743,362	371,401	215,361,610	3,137,899,446
32	3,137,899,446	2,428,677	300,255,030	292,980	209,395,258	3,049,175,372
33	3,049,175,372	1,805,503	294,050,115	221,356	203,379,094	2,960,088,498
34	2,960,088,498	1,282,941	286,873,474	160,322	197,374,067	2,871,711,711
35	2,871,711,711	878,021	278,519,607	112,210	191,462,855	2,785,420,770
36	2,785,420,770	581,935	268,952,849	76,363	185,742,708	2,702,716,202
37	2,702,716,202	368,678	258,656,051	50,227	180,301,243	2,624,679,845
38	2,624,679,845	230,192	247,711,919	32,737	175,211,101	2,552,376,481
39	2,552,376,481	144,704	236,350,482	21,444	170,538,237	2,486,687,497
40	2,486,687,497	91,575	225,043,315	14,102	166,327,490	2,428,049,145
41	2,428,049,145	61,838	213,885,761	9,593	162,605,847	2,376,821,475
42	2,376,821,475	41,343	202,904,892	6,449	159,397,144	2,333,348,621
43	2,333,348,621	26,949	192,038,178	4,250	156,727,527	2,298,060,668
44	2,298,060,668	17,070	181,170,082	2,699	154,631,033	2,271,535,990
45	2,271,535,990	10,188	170,276,395	1,622	153,148,936	2,254,417,098
46	2,254,417,098	5,547	159,427,379	895	152,323,773	2,247,318,143
47	2,247,318,143	2,728	148,755,145	453	152,193,975	2,250,759,249
48	2,250,759,249	1,375	138,334,050	228	152,793,383	2,265,219,728
49	2,265,219,728	682	128,197,788	112	154,154,366	2,291,176,876
50	2,291,176,876	258	118,397,176	49	156,308,573	2,329,088,484

# Single Discount Rate Development

## Projection of Plan Fiduciary Net Position Ending June 30, 2119

### (Concluded)

Year	Projected Beginning Plan Net Position	Projected Total Contributions	Projected Benefit Payments	Projected Administrative Expenses	Projected Investment Earnings at 7.00%	Projected Ending Plan Net Position
51	\$ 2,329,088,484	\$ 66	\$ 109,009,689	\$ 14	\$ 159,285,386	\$ 2,379,364,232
52	2,379,364,232	4	100,058,106	1	163,112,693	2,442,418,822
53	2,442,418,822	-	91,554,975	-	167,819,090	2,518,682,937
54	2,518,682,937	-	83,505,833	-	173,434,533	2,608,611,637
55	2,608,611,637	-	75,908,815	-	179,990,941	2,712,693,763
56	2,712,693,763	-	68,756,380	-	187,522,791	2,831,460,174
57	2,831,460,174	-	62,036,580	-	196,067,655	2,965,491,249
58	2,965,491,249	-	55,735,002	-	205,666,655	3,115,422,902
59	3,115,422,902	-	49,836,670	-	216,364,821	3,281,951,053
60	3,281,951,053	-	44,327,385	-	228,211,355	3,465,835,024
61	3,465,835,024	-	39,194,715	-	241,259,838	3,667,900,147
62	3,667,900,147	-	34,428,388	-	255,568,397	3,889,040,155
63	3,889,040,155	-	30,020,020	-	271,199,881	4,130,220,016
64	4,130,220,016	-	25,962,879	-	288,222,069	4,392,479,207
65	4,392,479,207	-	22,251,735	-	306,707,906	4,676,935,377
66	4,676,935,377	-	18,882,133	-	326,735,779	4,984,789,023
67	4,984,789,023	-	15,849,572	-	348,389,879	5,317,329,330
68	5,317,329,330	-	13,148,566	-	371,760,637	5,675,941,401
69	5,675,941,401	-	10,771,322	-	396,945,278	6,062,115,357
70	6,062,115,357	-	8,706,433	-	424,048,504	6,477,457,428
71	6,477,457,428	-	6,938,237	-	453,183,289	6,923,702,480
72	6,923,702,480	-	5,446,942	-	484,471,755	7,402,727,292
73	7,402,727,292	-	4,209,195	-	518,046,080	7,916,564,178
74	7,916,564,178	-	3,199,151	-	554,049,416	8,467,414,442
75	8,467,414,442	-	2,389,625	-	592,636,789	9,057,661,606
76	9,057,661,606	-	1,752,995	-	633,975,995	9,689,884,606
77	9,689,884,606	-	1,262,191	-	678,248,493	10,366,870,908
78	10,366,870,908	-	891,598	-	725,650,285	11,091,629,595
79	11,091,629,595	-	617,751	-	776,392,816	11,867,404,661
80	11,867,404,661	-	419,851	-	830,703,880	12,697,688,690
81	12,697,688,690	-	280,034	-	888,828,573	13,586,237,228
82	13,586,237,228	-	183,466	-	951,030,293	14,537,084,055
83	14,537,084,055	-	118,241	-	1,017,591,815	15,554,557,629
84	15,554,557,629	-	75,123	-	1,088,816,449	16,643,298,955
85	16,643,298,955	-	47,188	-	1,165,029,303	17,808,281,070
86	17,808,281,070	-	29,411	-	1,246,578,663	19,054,830,322
87	19,054,830,322	-	18,269	-	1,333,837,494	20,388,649,547
88	20,388,649,547	-	11,362	-	1,427,205,077	21,815,843,263
89	21,815,843,263	-	7,105	-	1,527,108,784	23,342,944,942
90	23,342,944,942	-	4,481	-	1,634,005,992	24,976,946,452
91	24,976,946,452	-	2,854	-	1,748,386,153	26,725,329,752
92	26,725,329,752	-	1,832	-	1,870,773,020	28,596,100,940
93	28,596,100,940	-	1,181	-	2,001,727,025	30,597,826,784
94	30,597,826,784	-	760	-	2,141,847,849	32,739,673,872
95	32,739,673,872	-	486	-	2,291,777,154	35,031,450,540
96	35,031,450,540	-	307	-	2,452,201,527	37,483,651,760
97	37,483,651,760	-	191	-	2,623,855,617	40,107,507,185
98	40,107,507,185	-	117	-	2,807,525,499	42,915,032,568
99	42,915,032,568	-	70	-	3,004,052,277	45,919,084,775
100	45,919,084,775	-	41	-	3,214,335,933	49,133,420,667



# Single Discount Rate Development

## Present Values of Projected Benefits Ending June 30, 2119

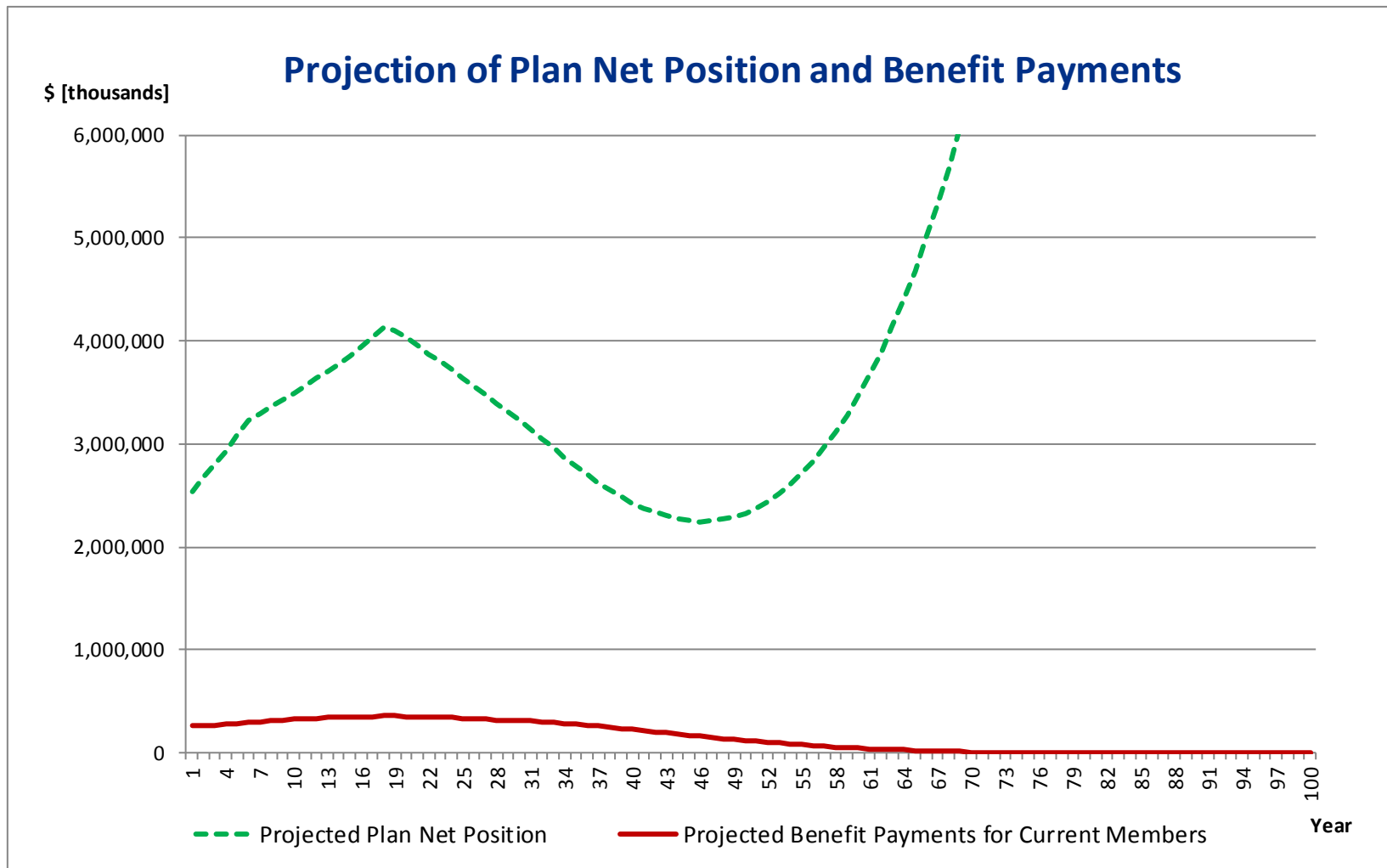
Year	Projected Beginning Plan Net Position	Projected Benefit Payments	Funded Portion of Benefit Payments	Unfunded Portion of Benefit Payments	Present Value of Funded Benefit Payments using Expected Return Rate (v)	Present Value of Unfunded Benefit Payments using Municipal Bond Rate (vf)	Present Value of Benefit Payments using Single Discount Rate (sdr)
(a)	(b)	(c)	(d)	(e)	(f)=(d)*v <sup>a</sup> ((a)-.5)	(g)=(e)*vf <sup>a</sup> ((a)-.5)	(h)=(c)/((1+sdr) <sup>a</sup> ((a)-.5)
1	\$ 2,423,261,830	\$ 256,749,758	\$ 256,749,758	\$ -	\$ 248,209,360	\$ -	\$ 248,209,360
2	2,542,557,894	263,477,132	263,477,132	-	238,049,493	-	238,049,493
3	2,668,270,123	270,128,118	270,128,118	-	228,092,155	-	228,092,155
4	2,799,191,540	277,596,631	277,596,631	-	219,063,978	-	219,063,978
5	2,934,991,179	284,681,075	284,681,075	-	209,957,599	-	209,957,599
6	3,076,590,458	293,169,341	293,169,341	-	202,072,760	-	202,072,760
7	3,223,097,900	301,501,170	301,501,170	-	194,220,222	-	194,220,222
8	3,292,436,798	309,560,939	309,560,939	-	186,366,488	-	186,366,488
9	3,360,054,814	316,533,021	316,533,021	-	178,097,127	-	178,097,127
10	3,427,166,887	323,414,169	323,414,169	-	170,064,300	-	170,064,300
11	3,494,054,047	329,587,548	329,587,548	-	161,972,442	-	161,972,442
12	3,561,664,690	335,087,490	335,087,490	-	153,902,180	-	153,902,180
13	3,631,001,849	340,306,540	340,306,540	-	146,074,051	-	146,074,051
14	3,702,706,478	344,792,859	344,792,859	-	138,317,543	-	138,317,543
15	3,777,909,430	349,230,086	349,230,086	-	130,932,324	-	130,932,324
16	3,857,124,712	351,887,815	351,887,815	-	123,297,899	-	123,297,899
17	3,942,700,239	353,955,101	353,955,101	-	115,908,649	-	115,908,649
18	4,035,947,811	354,930,704	354,930,704	-	108,624,417	-	108,624,417
19	4,138,762,546	355,183,362	355,183,362	-	101,590,413	-	101,590,413
20	4,107,246,887	354,531,432	354,531,432	-	94,770,043	-	94,770,043
21	4,030,120,487	352,213,801	352,213,801	-	87,991,136	-	87,991,136
22	3,950,003,279	349,166,129	349,166,129	-	81,523,138	-	81,523,138
23	3,874,394,981	344,622,768	344,622,768	-	75,198,464	-	75,198,464
24	3,797,513,800	339,694,805	339,694,805	-	69,273,978	-	69,273,978
25	3,719,691,744	334,528,138	334,528,138	-	63,757,327	-	63,757,327
26	3,641,110,009	329,723,991	329,723,991	-	58,730,570	-	58,730,570
27	3,561,306,701	325,229,887	325,229,887	-	54,140,260	-	54,140,260
28	3,479,847,974	320,626,065	320,626,065	-	49,882,124	-	49,882,124
29	3,396,732,305	316,089,273	316,089,273	-	45,959,161	-	45,959,161
30	3,311,764,993	310,888,494	310,888,494	-	42,245,768	-	42,245,768
31	3,225,526,566	305,743,362	305,743,362	-	38,828,608	-	38,828,608
32	3,137,899,446	300,255,030	300,255,030	-	35,637,013	-	35,637,013
33	3,049,175,372	294,050,115	294,050,115	-	32,617,343	-	32,617,343
34	2,960,088,498	286,873,474	286,873,474	-	29,739,512	-	29,739,512
35	2,871,711,711	278,519,607	278,519,607	-	26,984,566	-	26,984,566
36	2,785,420,770	268,952,849	268,952,849	-	24,352,976	-	24,352,976
37	2,702,716,202	258,656,051	258,656,051	-	21,888,437	-	21,888,437
38	2,624,679,845	247,711,919	247,711,919	-	19,590,938	-	19,590,938
39	2,552,376,481	236,350,482	236,350,482	-	17,469,523	-	17,469,523
40	2,486,687,497	225,043,315	225,043,315	-	15,545,579	-	15,545,579
41	2,428,049,145	213,885,761	213,885,761	-	13,808,258	-	13,808,258
42	2,376,821,475	202,904,892	202,904,892	-	12,242,377	-	12,242,377
43	2,333,348,621	192,038,178	192,038,178	-	10,828,718	-	10,828,718
44	2,298,060,668	181,170,082	181,170,082	-	9,547,555	-	9,547,555
45	2,271,535,990	170,276,395	170,276,395	-	8,386,415	-	8,386,415
46	2,254,417,098	159,427,379	159,427,379	-	7,338,394	-	7,338,394
47	2,247,318,143	148,755,145	148,755,145	-	6,399,210	-	6,399,210
48	2,250,759,249	138,334,050	138,334,050	-	5,561,599	-	5,561,599
49	2,265,219,728	128,197,788	128,197,788	-	4,816,896	-	4,816,896
50	2,291,176,876	118,397,176	118,397,176	-	4,157,616	-	4,157,616

# Single Discount Rate Development

## Present Values of Projected Benefits Ending June 30, 2119

### (Concluded)

Year	Projected Beginning Plan Net Position	Projected Benefit Payments	Funded Portion of Benefit Payments	Unfunded Portion of Benefit Payments	Present Value of Funded Benefit Payments using Expected Return Rate (v)	Present Value of Unfunded Benefit Payments using Municipal Bond Rate (vf)	Present Value of Benefit Payments using Single Discount Rate (sdr)
(a)	(b)	(c)	(d)	(e)	(f)=(d)*v <sup>a</sup> ((a)-.5)	(g)=(e)*vf <sup>a</sup> ((a)-.5)	(h)=(c)/(1+sdr) <sup>a</sup> ((a)-.5)
51	\$ 2,329,088,484	\$ 109,009,689	\$ 109,009,689	\$ -	\$ 3,577,539	\$ -	\$ 3,577,539
52	2,379,364,232	100,058,106	100,058,106	-	3,068,935	-	3,068,935
53	2,442,418,822	91,554,975	91,554,975	-	2,624,422	-	2,624,422
54	2,518,682,937	83,505,833	83,505,833	-	2,237,096	-	2,237,096
55	2,608,611,637	75,908,815	75,908,815	-	1,900,537	-	1,900,537
56	2,712,693,763	68,756,380	68,756,380	-	1,608,842	-	1,608,842
57	2,831,460,174	62,036,580	62,036,580	-	1,356,639	-	1,356,639
58	2,965,491,249	55,735,002	55,735,002	-	1,139,097	-	1,139,097
59	3,115,422,902	49,836,670	49,836,670	-	951,915	-	951,915
60	3,281,951,053	44,327,385	44,327,385	-	791,293	-	791,293
61	3,465,835,024	39,194,715	39,194,715	-	653,896	-	653,896
62	3,667,900,147	34,428,388	34,428,388	-	536,802	-	536,802
63	3,889,040,155	30,020,020	30,020,020	-	437,446	-	437,446
64	4,130,220,016	25,962,879	25,962,879	-	353,576	-	353,576
65	4,392,479,207	22,251,735	22,251,735	-	283,211	-	283,211
66	4,676,935,377	18,882,133	18,882,133	-	224,602	-	224,602
67	4,984,789,023	15,849,572	15,849,572	-	176,196	-	176,196
68	5,317,329,330	13,148,566	13,148,566	-	136,607	-	136,607
69	5,675,941,401	10,771,322	10,771,322	-	104,588	-	104,588
70	6,062,115,357	8,706,433	8,706,433	-	79,007	-	79,007
71	6,477,457,428	6,938,237	6,938,237	-	58,843	-	58,843
72	6,923,702,480	5,446,942	5,446,942	-	43,173	-	43,173
73	7,402,727,292	4,209,195	4,209,195	-	31,180	-	31,180
74	7,916,564,178	3,199,151	3,199,151	-	22,148	-	22,148
75	8,467,414,442	2,389,625	2,389,625	-	15,461	-	15,461
76	9,057,661,606	1,752,995	1,752,995	-	10,600	-	10,600
77	9,689,884,606	1,262,191	1,262,191	-	7,133	-	7,133
78	10,366,870,908	891,598	891,598	-	4,709	-	4,709
79	11,091,629,595	617,751	617,751	-	3,049	-	3,049
80	11,867,404,661	419,851	419,851	-	1,937	-	1,937
81	12,697,688,690	280,034	280,034	-	1,207	-	1,207
82	13,586,237,228	183,466	183,466	-	739	-	739
83	14,537,084,055	118,241	118,241	-	445	-	445
84	15,554,557,629	75,123	75,123	-	264	-	264
85	16,643,298,955	47,188	47,188	-	155	-	155
86	17,808,281,070	29,411	29,411	-	90	-	90
87	19,054,830,322	18,269	18,269	-	52	-	52
88	20,388,649,547	11,362	11,362	-	31	-	31
89	21,815,843,263	7,105	7,105	-	18	-	18
90	23,342,944,942	4,481	4,481	-	11	-	11
91	24,976,946,452	2,854	2,854	-	6	-	6
92	26,725,329,752	1,832	1,832	-	4	-	4
93	28,596,100,940	1,181	1,181	-	2	-	2
94	30,597,826,784	760	760	-	1	-	1
95	32,739,673,872	486	486	-	1	-	1
96	35,031,450,540	307	307	-	0	-	0
97	37,483,651,760	191	191	-	0	-	0
98	40,107,507,185	117	117	-	0	-	0
99	42,915,032,568	70	70	-	0	-	0
100	45,919,084,775	41	41	-	0	-	0
<b>Totals</b>					<b>\$ 4,346,470,410</b>	<b>\$ -</b>	<b>\$ 4,346,470,410</b>



Note the Net Plan Position is currently projected to grow since the Board has adopted a funding policy goal of more than 100% funded; therefore, even in the absence of contributions from the current active member population, the negative unfunded will continue to accrue interest.

## SECTION H

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### GLOSSARY OF TERMS

## Glossary of Terms

<b><i>Accrued Service</i></b>	Service credited under the system which was rendered before the date of the actuarial valuation.
<b><i>Actuarial Accrued Liability (AAL)</i></b>	The AAL is the difference between the actuarial present value of all benefits and the actuarial value of future normal costs. The definition comes from the fundamental equation of funding which states that the present value of all benefits is the sum of the Actuarial Accrued Liability and the present value of future normal costs. The AAL may also be referred to as accrued liability or actuarial liability.
<b><i>Actuarial Assumptions</i></b>	These assumptions are estimates of future experience with respect to rates of mortality, disability, turnover, retirement, rate or rates of investment income and compensation increases. Actuarial assumptions are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (compensation increases, payroll growth, inflation and investment return) consist of an underlying real rate of return plus an assumption for a long-term average rate of inflation.
<b><i>Actuarial Equivalent</i></b>	A single amount or series of amounts of equal actuarial value to another single amount or series of amounts, computed on the basis of appropriate actuarial assumptions.
<b><i>Actuarial Cost Method</i></b>	A mathematical budgeting procedure for allocating the dollar amount of the actuarial present value of the pension trust benefits between future normal cost and actuarial accrued liability. The actuarial cost method may also be referred to as the actuarial funding method.
<b><i>Actuarial Gain/(Loss)</i></b>	The difference in liabilities between actual experience and expected experience during the period between two actuarial valuations is the gain/(loss) on the accrued liabilities.
<b><i>Actuarial Present Value (APV)</i></b>	The amount of funds currently required to provide a payment or series of payments in the future. The present value is determined by discounting future payments at predetermined rates of interest and probabilities of payment.
<b><i>Actuarial Valuation</i></b>	The actuarial valuation report determines, as of the actuarial valuation date, the service cost, total pension liability, and related actuarial present value of projected benefit payments for pensions.
<b><i>Actuarial Valuation Date</i></b>	The date as of which an actuarial valuation is performed.
<b><i>Actuarially Determined Contribution (ADC) or Annual Required Contribution (ARC)</i></b>	A calculated contribution into a defined benefit pension plan for the reporting period, most often determined based on the funding policy of the plan. Typically the Actuarially Determined Contribution has a normal cost payment and an amortization payment.

## Glossary of Terms

<b><i>Amortization Method</i></b>	The method used to determine the periodic amortization payment may be a level dollar amount, or a level percent of pay amount. The period will typically be expressed in years, and the method will either be “open” (meaning, reset each year) or “closed” (the number of years remaining will decline each year).
<b><i>Amortization Payment</i></b>	The amortization payment is the periodic payment required to pay off an interest-discounted amount with payments of interest and principal.
<b><i>Cost-of-Living Adjustments</i></b>	Postemployment benefit changes intended to adjust benefit payments for the effects of inflation.
<b><i>Cost-Sharing Multiple-Employer Defined Benefit Pension Plan (cost-sharing pension plan)</i></b>	A multiple-employer defined benefit pension plan in which the pension obligations to the employees of more than one employer are pooled and pension plan assets can be used to pay the benefits of the employees of any employer that provides pensions through the pension plan.
<b><i>Covered-Employee Payroll</i></b>	The payroll of covered employees, which is typically only the pensionable pay and does not include pay above any pay cap.
<b><i>Deferred Inflows and Outflows</i></b>	The deferred inflows and outflows of pension resources are amounts used under GASB Statement No. 68 in developing the annual pension expense. Deferred inflows and outflows arise with differences between expected and actual experiences; changes of assumptions. The portion of these amounts not included in pension expense should be included in the deferred inflows or outflows of resources.
<b><i>Deferred Retirement Option Program (DROP)</i></b>	A program that permits a plan member to elect a calculation of benefit payments based on service credits and salary, as applicable, as of the DROP entry date. The plan member continues to provide service to the employer and is paid for the service by the employer after the DROP entry date; however, the pensions that would have been paid to the plan member are credited to an individual member account within the defined benefit pension plan until the end of the DROP period. Other variations for DROP exist and will be more fully detailed in the plan provision section of the valuation report.
<b><i>Discount Rate</i></b>	<p>For GASB purposes, the discount rate is the single rate of return that results in the present value of all projected benefit payments to be equal to the sum of the funded and unfunded projected benefit payments, specifically:</p> <ol style="list-style-type: none"><li>1. The benefit payments to be made while the pension plans’ fiduciary net position is projected to be greater than the benefit payments that are projected to be made in the period; and</li><li>2. The present value of the benefit payments not in (1) above, discounted using the municipal bond rate.</li></ol>

## Glossary of Terms

<b><i>Entry Age Actuarial Cost Method (EAN)</i></b>	The EAN is a funding method for allocating the costs of the plan between the normal cost and the accrued liability. The actuarial present value of the projected benefits of each individual included in an actuarial valuation is allocated on a level basis (either level dollar or level percent of pay) over the earnings or service of the individual between entry age and assumed exit age(s). The portion of the actuarial present value allocated to a valuation year is the normal cost. The portion of this actuarial present value not provided for at a valuation date by the actuarial present value of future normal costs is the actuarial accrued liability. The sum of the accrued liability plus the present value of all future normal costs is the present value of all benefits.
<b><i>Fiduciary Net Position</i></b>	The fiduciary net position is the value of the assets of the trust.
<b><i>GASB</i></b>	The Governmental Accounting Standards Board is an organization that exists in order to promulgate accounting standards for governmental entities.
<b><i>Long-Term Expected Rate of Return</i></b>	The long-term rate of return is the expected return to be earned over the entire trust portfolio based on the asset allocation of the portfolio.
<b><i>Money-Weighted Rate of Return</i></b>	The money-weighted rate of return is a method of calculating the returns that adjusts for the changing amounts actually invested. For purposes of GASB Statement No. 67, money-weighted rate of return is calculated as the internal rate of return on pension plan investments, net of pension plan investment expense.
<b><i>Multiple-Employer Defined Benefit Pension Plan</i></b>	A multiple-employer plan is a defined benefit pension plan that is used to provide pensions to the employees of more than one employer.
<b><i>Municipal Bond Rate</i></b>	The Municipal Bond Rate is the discount rate to be used for those benefit payments that occur after the assets of the trust have been depleted.
<b><i>Net Pension Liability (NPL)</i></b>	The NPL is the liability of employers and non-employer contribution entities to plan members for benefits provided through a defined benefit pension plan.
<b><i>Non-Employer Contribution Entities</i></b>	Non-employer contribution entities are entities that make contributions to a pension plan that is used to provide pensions to the employees of other entities. For purposes of the GASB Accounting Statement, plan members are not considered non-employer contribution entities.
<b><i>Normal Cost</i></b>	The actuarial present value of the pension trust benefits allocated to the current year by the actuarial cost method.

## Glossary of Terms

<b><i>Other Postemployment Benefits (OPEB)</i></b>	All postemployment benefits other than retirement income (such as death benefits, life insurance, disability, and long-term care) that are provided separately from a pension plan, as well as postemployment healthcare benefits regardless of the manner in which they are provided. Other post-employment benefits do not include termination benefits.
<b><i>Real Rate of Return</i></b>	The real rate of return is the rate of return on an investment after adjustment to eliminate inflation.
<b><i>Service Cost</i></b>	The service cost is the portion of the actuarial present value of projected benefit payments that is attributed to a valuation year.
<b><i>Total Pension Expense</i></b>	<p>The total pension expense is the sum of the following items that are recognized at the end of the employer's fiscal year:</p> <ol style="list-style-type: none"><li>1. Service Cost</li><li>2. Interest on the Total Pension Liability</li><li>3. Current-Period Benefit Changes</li><li>4. Employee Contributions (made negative for addition here)</li><li>5. Projected Earnings on Plan Investments (made negative for addition here)</li><li>6. Pension Plan Administrative Expense</li><li>7. Other Changes in Plan Fiduciary Net Position</li><li>8. Recognition of Outflow (Inflow) of Resources due to Liabilities</li><li>9. Recognition of Outflow (Inflow) of Resources due to Assets</li></ol>
<b><i>Total Pension Liability (TPL)</i></b>	The TPL is the portion of the actuarial present value of projected benefit payments that is attributed to past periods of member service.
<b><i>Unfunded Actuarial Accrued Liability (UAAL)</i></b>	The UAAL is the difference between actuarial accrued liability and valuation assets.
<b><i>Valuation Assets</i></b>	The valuation assets are the assets used in determining the unfunded liability of the plan. For purposes of the GASB Statement No. 67, the valuation asset is equal to the market value of assets.