

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, 2020





September 29, 2020

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 Statement 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.

This report was prepared using our proprietary valuation model and related software which, in our professional judgment, has the capability to provide results that are consistent with the purposes of the valuation. We performed tests to ensure that the model reasonably represents that which is intended to be modeled. We are relying on the GRS actuaries and Internal Software, Training, and Processes Team who developed and maintain the model.

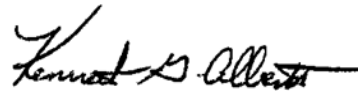
To the best of our knowledge, this report is complete, accurate, and in accordance with generally recognized actuarial methods. Heidi G. Barry and Jamal Adora are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the Academy of Actuaries to render the actuarial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

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SECTION A



EXECUTIVE SUMMARY

Executive Summary as of June 30, 2020

Actuarial Valuation Date	June 30, 2020
Measurement Date of the Net Pension Liability	June 30, 2020
Employer's Fiscal Year Ending Date (Employer's Reporting Date)	June 30, 2021
Plan's Fiscal Year Ending Date (Plan's Reporting Date)	June 30, 2020

Membership

Number of		
- Retirees and Beneficiaries	9,182	
- Inactive, Nonretired Members	2,094	
- Active Members	7,355	
- Total	18,631	
Valuation Payroll	\$ 360,851,545	
Covered Payroll (Reported Fiscal Year Payroll Paid)	\$ 363,980,262	

Net Pension Liability

Total Pension Liability	\$ 4,092,097,897
Plan Fiduciary Net Position	2,361,599,888
Net Pension Liability	\$ 1,730,498,009
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	57.71%
Net Pension Liability as a Percentage of Covered Payroll	475.44%

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*	2.45%
Last year ending June 30 in the 2021 to 2120 projection period for which projected benefit payments are fully funded	2120

Total Pension Expense \$ 202,098,651

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	\$ 2,764,576	\$ 14,740,320
Changes in assumptions	44,736,273	-
Net difference between projected and actual earnings on pension plan investments	146,465,791	26,117,670
Total	\$ 193,966,640	\$ 40,857,990

**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 30, 2020. 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, 2020 and a measurement date of June 30, 2020.

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 2.45% (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

FINANCIAL STATEMENTS

Statement of Pension Expense Under GASB Statement No. 68

Fiscal Year Ended June 30, 2020

A. Expense

1. Service Cost	\$	44,048,083
2. Interest on the Total Pension Liability		274,791,358
3. Current-Period Benefit Changes		0
4. Member Contributions (made negative for addition here) [#]		(4,983,989)
5. Projected Earnings on Plan Investments (made negative for addition here)		(167,843,535)
6. Pension Plan Administrative Expense		4,291,028
7. Other Changes in Plan Fiduciary Net Position [#]		(5,046,936)
8. Recognition of Outflow (Inflow) of Resources due to Liabilities		13,178,335
9. Recognition of Outflow (Inflow) of Resources due to Assets		43,664,307
10. Total Pension Expense	\$	202,098,651

Employee payments for service purchase of \$1,563,362 and reciprocal transfers of \$3,483,574 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, 2020

A. Outflows (Inflows) of Resources due to Liabilities

1. Difference between expected and actual experience of the Total Pension Liability (gains) or losses	\$	3,494,582
2. Assumption Changes (gains) or losses	\$	-
3. Recognition period for Liabilities: Average of the expected remaining service lives of all employees {in years}		4.1771
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	\$	836,605
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	\$	836,605
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	\$	2,657,977
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	\$	2,657,977

B. Outflows (Inflows) of Resources due to Assets

1. Net difference between projected and actual earnings on pension plan investments (gains) or losses	\$	178,511,392
2. Recognition period for Assets {in years}		5
3. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Assets	\$	35,702,278
4. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Assets	\$	142,809,114



Statement of Outflows and Inflows Arising from Current and Prior Reporting Periods Fiscal Year Ended June 30, 2020

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	\$ 33,491,647	\$ 20,313,312	\$ 13,178,335
2. Due to Assets	63,479,820	19,815,513	43,664,307
3. Total	\$ 96,971,467	\$ 40,128,825	\$ 56,842,642

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	\$ 885,035	\$ 20,313,312	\$ (19,428,277)
2. Assumption Changes	32,606,612	-	32,606,612
3. Net Difference between projected and actual earnings on pension plan investments	63,479,820	19,815,513	43,664,307
4. Total	\$ 96,971,467	\$ 40,128,825	\$ 56,842,642

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	\$ 2,764,576	\$ 14,740,320	\$ (11,975,744)
2. Assumption Changes	44,736,273	-	44,736,273
3. Net Difference between projected and actual earnings on pension plan investments	146,465,791	26,117,670	120,348,121
4. Total	\$ 193,966,640	\$ 40,857,990	\$ 153,108,650

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
2021	\$ 39,019,933
2022	40,470,762
2023	37,767,513
2024	35,850,442
2025	-
Thereafter	-
Total	\$ 153,108,650



Statement of Outflows and Inflows Arising from Current and Prior Reporting Periods Fiscal Year Ended June 30, 2020

Year Established	Initial Amount	Initial Recognition Period	Current Year Recognition	Remaining Recognition	Remaining Recognition Period
Deferred Outflow (Inflow) due to Differences Between Expected and Actual Experience on Liabilities					
2016	\$ (39,810,009)	4.3565	\$ (3,257,721)	\$ -	0.0000
2017	(37,286,966)	4.3595	(8,553,037)	(3,074,818)	0.3595
2018	(37,173,164)	4.3720	(8,502,554)	(11,665,502)	1.3720
2019	203,459	4.2011	48,430	106,599	2.2011
2020	3,494,582	4.1771	836,605	2,657,977	3.1771
Total			\$ (19,428,277)	\$ (11,975,744)	
Deferred Outflow (Inflow) due to Assumption Changes					
2016	\$ -	4.3565	\$ -	\$ -	0.0000
2017	-	4.3595	-	-	0.3595
2018	142,556,109	4.3720	32,606,612	44,736,273	1.3720
2019	-	4.2011	-	-	2.2011
2020	-	4.1771	-	-	3.1771
Total			\$ 32,606,612	\$ 44,736,273	
Deferred Outflow (Inflow) due to Differences Between Projected and Actual Earnings on Plan Investments					
2016	\$ 132,793,253	5.0000	\$ 26,558,649	\$ -	0.0000
2017	(67,566,785)	5.0000	(13,513,357)	(13,513,357)	1.0000
2018	(31,510,781)	5.0000	(6,302,156)	(12,604,313)	2.0000
2019	6,094,463	5.0000	1,218,893	3,656,677	3.0000
2020	178,511,392	5.0000	35,702,278	142,809,114	4.0000
Total			\$ 43,664,307	\$ 120,348,121	



Statement of Fiduciary Net Position as of June 30, 2020

Assets	
Cash	\$ 617,479
Receivables	
Investment Sales	\$ 5,276,151
Accrued Investment Interest and Income	5,695,747
Contributions	8,040,951
Other	-
Total Receivables	<u>\$ 19,012,849</u>
Investments	
Equities	\$ 308,896,711
Fixed Income	688,908,574
Limited Partnerships	998,139,971
Hedge	109,891,159
Short Term Securities	246,830,423
Real Estate	-
Absolute Return	-
Venture Capital & Partnerships	-
Total Investments	<u>\$ 2,352,666,838</u>
Securities Lending Collateral	\$ 108,567,739
Prepaid Accounts	\$ -
Capital Assets	
Land (not depreciated)	\$ 84,000
Equipment	3,430,652
Building	581,619
Accumulated Depreciation	(3,774,594)
Total Capital Assets	<u>\$ 321,677</u>
Deferred Outflows - OPEB Related Items	<u>\$ 31,054</u>
Total Assets	<u><u>\$ 2,481,217,636</u></u>
Liabilities	
Investment Fees Payable	\$ 626,731
OPEB Obligation	1,552,393
Security Lending Collateral	114,948,267
Deferred Inflows - OPEB Related Items	248,799
Accounts Payable - Other	2,241,558
Total Liabilities	<u>\$ 119,617,748</u>
Net Position Restricted for Pensions	<u><u>\$ 2,361,599,888</u></u>



Statement of Changes in Fiduciary Net Position for Year Ended June 30, 2020

Additions

Contributions	
Employer	\$ 210,871,852
Employee	4,983,989
Reciprocal Transfer	3,483,574
Service Purchase	1,563,362
Total Contributions	<u>\$ 220,902,777</u>
Investment Income	
Total net appreciation and gains	\$ (51,157,620)
Total interest and dividends	61,989,636
Less total investment expenses	(21,698,677)
Net Investment Income	<u>\$ (10,866,661)</u>
Income From Securities Lending Activities	
Securities Lending Income	\$ 733,597
Less Total Securities Lending Expenses	(540,205)
Net Income from Securities Lending Activities	<u>\$ 193,392</u>
Other	\$ 5,412
Total Additions	<u>\$ 210,234,920</u>

Deductions

Benefit Payments, Including Refunds	\$ 267,605,834
Administrative Expenses	4,291,028
Total Deductions	<u>\$ 271,896,862</u>
Net Increase in Net Position	\$ (61,661,942)

Net Position Restricted for Pensions

Beginning of Year	<u>\$ 2,423,261,830</u>
Post Valuation Audit Adjustment	<u>\$ -</u>
End of Year	<u><u>\$ 2,361,599,888</u></u>



Schedule of Proportionate Employer Share for Year Ended June 30, 2020

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
\$ 131,366,043	MoDOT	62.59%	\$ 1,083,118,704	\$ 1,730,348	\$ 91,672,939	\$ 28,000,433	\$ 4,896,390	\$ 126,300,110	\$ 9,225,966	\$ 16,347,050	\$ -	\$ 368,483	\$ 25,941,499	\$ 126,493,546	\$ 1,841,521	\$ 128,335,067
78,518,066	Highway Patrol	37.41%	647,379,305	1,034,228	54,792,852	16,735,840	368,483	72,931,403	5,514,354	9,770,620	-	4,896,390	20,181,364	75,605,105	(1,841,521)	73,763,584
\$ 209,884,109	Total for All Employers	100.0000%	\$ 1,730,498,009	\$ 2,764,576	\$ 146,465,791	\$ 44,736,273	\$ 5,264,873	\$ 199,231,513	\$ 14,740,320	\$ 26,117,670	\$ -	\$ 5,264,873	\$ 46,122,863	\$ 202,098,651	\$ -	\$ 202,098,651

Excludes \$987,743 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	2021	2022	2023	2024	2025	Thereafter	Total
MoDOT	62.59%	\$ 26,609,196	\$ 26,630,223	\$ 24,519,001	\$ 22,600,191	\$ -	\$ -	\$ 100,358,611
Highway Patrol	37.41%	12,410,737	13,840,539	13,248,512	13,250,251	-	-	52,750,039
TOTAL	100.00%	\$ 39,019,933	\$ 40,470,762	\$ 37,767,513	\$ 35,850,442	\$ -	\$ -	\$ 153,108,650



SECTION C

REQUIRED SUPPLEMENTARY INFORMATION

Schedule of Changes in Net Pension Liability and Related Ratios Current Period Fiscal Year Ended June 30, 2020

A. Total Pension Liability

1. Service Cost	\$	44,048,083
2. Interest on the Total Pension Liability		274,791,358
3. Changes of Benefit Terms		-
4. Difference between expected and actual experience of the Total Pension Liability		3,494,582
5. Changes of Assumptions		-
6. Benefit Payments, including Refunds of Employee Contributions		(263,506,918)
7. Disability Premiums		(1,640,971)
8. Transfers to Other Retirement Systems		(2,457,945)
9. Net change in Total Pension Liability	\$	54,728,189
10. Total Pension Liability – Beginning		4,037,369,708
11. Total Pension Liability – Ending	\$	<u><u>4,092,097,897</u></u>

B. Plan Fiduciary Net Position

1. Contributions – employer	\$	210,871,852
2. Contributions – employee		6,547,351
3. Net investment income		(10,667,857)
4. Benefit payments, including refunds of employee contributions		(263,506,918)
5. Disability Premiums		(1,640,971)
6. Pension Plan Administrative Expense		(4,291,028)
7. Net Transfers to Other Retirement Systems		1,025,629
8. Other		-
9. Net change in Plan Fiduciary Net Position	\$	(61,661,942)
10. Plan Fiduciary Net Position – Beginning		2,423,261,830
11. Post Valuation Audit Adjustment		-
12. Plan Fiduciary Net Position – Ending	\$	<u><u>2,361,599,888</u></u>

C. Net Pension Liability

\$ 1,730,498,009

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

57.71%

E. Covered Payroll (Reported Fiscal Year Payroll Paid)

\$ 363,980,262

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

475.44%

Valuation Payroll was \$360,851,545.



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,	2020	2019	2018	2017	2016	2015	2014	2013*
Total Pension Liability								
Service Cost	\$ 44,048,083	\$ 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	274,791,358	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	3,494,582	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	(262,710,812)	(255,310,406)	(254,131,209)	(246,617,775)	(236,488,629)	(236,905,323)	(227,958,108)	(220,623,394)
Refunds	(796,106)	(780,538)	(503,007)	(321,328)	(198,106)	(107,395)	(18,686)	(29,300)
Disability Premiums	(1,640,971)	(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	(2,457,945)	(2,111,007)	(2,823,042)	(2,724,631)	(1,921,451)	(3,147,482)	(1,876,336)	(629,246)
Net Change in Total Pension Liability	54,728,189	55,530,767	179,395,211	40,710,726	45,887,353	65,603,910	66,266,182	277,696,888
Total Pension Liability - Beginning	4,037,369,708	3,981,838,941	3,802,443,730	3,761,733,004	3,715,845,651	3,650,241,741	3,583,975,559	3,306,278,671
Total Pension Liability - Ending (a)	\$4,092,097,897	\$4,037,369,708	\$3,981,838,941	\$3,802,443,730	\$3,761,733,004	\$3,715,845,651	\$3,650,241,741	\$3,583,975,559
Plan Fiduciary Net Position								
Contributions - Employer	\$ 210,871,852	\$ 210,166,927	\$ 204,955,180	\$ 206,562,924	\$ 199,609,396	\$ 200,638,571	\$ 183,353,841	\$ 170,836,117
Contributions - Member	6,547,351	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	(10,667,857)	154,326,818	197,619,838	220,301,741	21,432,095	92,645,571	319,445,780	198,141,088
Benefit Payments	(262,710,812)	(255,310,406)	(254,131,209)	(246,617,775)	(236,488,629)	(236,905,323)	(227,958,108)	(220,619,035)
Refunds	(796,106)	(780,538)	(503,007)	(321,328)	(198,106)	(107,395)	(18,686)	(29,300)
Disability Premiums	(1,640,971)	(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	(4,291,028)	(4,372,966)	(4,693,492)	(4,515,458)	(4,370,860)	(4,066,944)	(3,736,355)	(2,997,225)
Net Transfers	1,025,629	321,363	(955,597)	(980,524)	808,228	(2,033,045)	(91,954)	(629,246)
Other	-	-	-	-	-	-	-	-
Net Change in Plan Fiduciary Net Position	(61,661,942)	108,731,682	145,691,526	177,701,094	(17,293,188)	51,910,921	271,723,503	144,329,164
Plan Fiduciary Net Position - Beginning	2,423,261,830	2,314,530,148	2,169,775,040	1,992,073,946	2,009,367,134	1,957,456,213	1,685,732,710	1,541,403,546
Post Valuation Audit Adjustment	-	-	(936,418)	-	-	-	-	-
Plan Fiduciary Net Position - Ending (b)	\$2,361,599,888	\$2,423,261,830	\$2,314,530,148	\$2,169,775,040	\$1,992,073,946	\$2,009,367,134	\$1,957,456,213	\$1,685,732,710
Net Pension Liability - Ending (a) - (b)	1,730,498,009	1,614,107,878	1,667,308,793	1,632,668,690	1,769,659,058	1,706,478,517	1,692,785,528	1,898,242,849
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	57.71 %	60.02 %	58.13 %	57.06 %	52.96 %	54.08 %	53.63 %	47.04 %
Covered-Employee Payroll	\$ 363,980,262	\$ 362,747,630	\$ 353,751,292	\$ 356,515,416	\$ 344,635,441	\$ 342,264,593	\$ 336,590,797	\$ 323,205,767
Net Pension Liability as a Percentage of Covered-Employee Payroll	475.44 %	444.97 %	471.32 %	457.95 %	513.49 %	498.58 %	502.92 %	587.32 %
Notes to Schedule:	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

* 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)

FY Ending June 30,	Total Pension Liability	Plan Net Position	Net Pension Liability	Plan Net Position as a % of Total Pension Liability	Covered Payroll	Net Pension Liability as a % of Covered Payroll
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%
2020	4,092,097,897	2,361,599,888	1,730,498,009	57.71%	363,980,262	475.44%



Schedule of Contributions (Multiyear)

Last 10 Fiscal Years

FY Ending June 30,	Actuarially Determined Contribution	Actual Contribution	Contribution Deficiency (Excess)	Covered Payroll *	Actual Contribution as a % of Covered Payroll
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%
2020	210,871,852	210,871,852	-	363,572,159	58.00%

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



Notes to Schedule of Contributions

Valuation Date: June 30, 2018
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 2020 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 17-year amortization of UAAL. The amortization period is a closed 17-year period starting July 1, 2019. Temporary Accelerated Policy: The total contribution is based on normal cost plus a 6-year amortization period for unfunded retiree liabilities and a 21-year amortization period for other unfunded liabilities. Both amortization periods are closed periods starting July 1, 2019. 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	2.25% (price inflation)
Salary Increases	3.00% to 12.45% (including 3.00% wage inflation)
Investment Rate of Return	7.00%
Retirement Age	Experience-based table of rates that are specific to the type of eligibility condition. Last updated for the 2018 valuation pursuant to an experience study of the period July 1, 2013 - June 30, 2017.
Mortality	The mortality tables, for post-retirement mortality, used in evaluating allowances to be paid to non-disabled pensioners were the RP-2014 Healthy Annuitant Mortality Tables projected forward 2022 using projection scales MP-2017. Pre-retirement mortality used was RP-2014 Employee Mortality Tables projected to 2022 using projection scales MP-2017 multiplied by a factor of 65%. Post-retirement disabled mortality used was the RP-2014 Disabled Retiree Annuitant Mortality Table projected to 2022 using projection scales MP-2017. All mortality tables include a margin for mortality improvement in the projection to 2022.

Other Information:

Notes There were no benefit changes during the year.

A Contribution Stabilization Reserve Fund of approximately \$157.6 million was added to the unfunded for purposes of determining the FY 2020 contribution rate.



SECTION D

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%
Total Pension Liability	\$4,567,772,632	\$4,092,097,897	\$3,694,606,682
Plan Fiduciary Net Position	2,361,599,888	2,361,599,888	2,361,599,888
Net Pension Liability	\$2,206,172,744	\$1,730,498,009	\$1,333,006,794

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 \$143,863,600.

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	9,182
Inactive Plan Members Entitled to But Not Yet Receiving Benefits	2,094
Active Plan Members	<u>7,355</u>
Total Plan Members	18,631



SECTION E

SUMMARY OF BENEFITS

Missouri Department of Transportation and Highway Patrol Employees' Retirement System Summary of Benefit Provisions Evaluated as of June 30, 2020

Closed Plan	Year 2000 Plan	2011 Tier
<p>Participation</p> <p>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.</p>	<p>Participation</p> <p>Participants include:</p> <ol style="list-style-type: none"> 1. All active employees who first became members on or after July 1, 2000 but prior to January 1, 2011. 2. Closed Plan active members and vested former members who elect to transfer to the Year 2000 Plan at retirement. 3. Closed Plan retirees who elected to transfer to the Year 2000 Plan during the election window from July 1, 2000 through July 1, 2001, and their survivors. 4. Closed Plan members who left state employment prior to becoming vested (not eligible for a future retirement benefit) and return to work in a benefit eligible position on or after July 1, 2000. 	<p>Participation</p> <p>Participants include:</p> <ol style="list-style-type: none"> 1. All employees who first become members on or after January 1, 2011.



Closed Plan**Year 2000 Plan****2011 Tier****Normal Retirement Eligibility
(unreduced benefit)**

Non-Uniformed Employees: The earlier of attaining:

1. Age 65 with at least 4 years of creditable service.
2. Age 60 with at least 15 years of creditable service.
3. Age 48 with age plus creditable service equal to 80 or more.
4. Age 65 with at least 5 years of service (deferred).*

Uniformed Patrol Employees Only: The earlier of attaining:

1. Age 55 with at least 4 years of creditable service.
2. Mandatory retirement at age 60.
3. Age 48 with age plus creditable service equal to 80 or more.

**Final Average Pay Used
for Benefit Determination**

Final Average Pay is the average annual pay of a member for the three consecutive years of service during which pay was highest (overtime pay is included for purposes of determining average pay). Employees terminating after reaching retirement eligibility will receive 1/12 of a year of creditable service for every 168 hours of unused sick leave (usable only for benefit computation, not eligibility).

*See Chapter 104.010.1(32) RSMo.

**Normal Retirement Eligibility
(unreduced benefit)**

Non-Uniformed Employees: The earlier of attaining:

1. Age 62 with at least 5 years of creditable service.
2. Age 48 with age plus creditable service equal to 80 or more.

Uniformed Patrol Employees Only: The earlier of attaining:

1. Mandatory retirement at age 60.
2. Age 48 with age plus creditable service equal to 80 or more.

**Final Average Pay Used
for Benefit Determination**

Final Average Pay is the average annual pay of a member for the three consecutive years of service during which pay was highest (overtime pay is included for purposes of determining average pay). 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).

**Normal Retirement Eligibility
(unreduced benefit)**

Non-Uniformed Employees: The earlier of attaining:

1. Age 67 with at least 5 years of creditable service.
2. Age 55 with age plus creditable service equal to 90 or more.

Uniformed Patrol Employees Only: The earlier of attaining:

1. Age 55 with at least 5 years of creditable service.
2. Mandatory retirement at age 60.

**Final Average Pay Used
for Benefit Determination**

Final Average Pay is the average annual pay of a member for the three consecutive years of service during which pay was highest (overtime pay is included for purposes of determining average pay). Employees terminating after reaching retirement eligibility will receive 1/12 of a year of creditable service for every 168 hours of unused sick leave (usable only for benefit computation, not eligibility).



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

ACTUARIAL COST METHOD AND ACTUARIAL ASSUMPTIONS

Summary of Valuation Method and Assumptions

June 30, 2020

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, 2020 (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		Normal
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

Administrative Expenses:	1.12% of payroll, based upon actual results from previous year.
Disability Expenses:	0.53% of payroll included in contribution. Retirement system pays premium directly to an outside insurance company or TPA.
Marriage Assumption:	90% of participants are assumed to be married for purposes of death-in-service benefits. Applies to disabled members entitled to future retirement benefits also. Male spouses are assumed to be 3 years older than females if beneficiary information is not available. For purposes of valuing the 50% death after retirement benefit, 100% of closed active members are assumed to be married.
Pay Increase Timing:	Beginning of (Fiscal) year. This is equivalent to assuming that reported pays represent amounts paid to members during the year ended on the valuation date.
Decrement Timing:	Decrements of all types are assumed to occur mid-year.
Eligibility Testing:	Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.
Benefit Service:	Exact fractional service is used to determine the amount of benefit payable.
Decrement Relativity:	Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.
Normal Form of Benefit:	The assumed normal form of benefit is a 50% joint & survivor benefit for married members in the Closed Plan and a straight life benefit for all other members.
Optional Benefit Factors:	Optional Benefit Factors are in accordance with tables adopted by the Board. We believe these factors are reasonably close to actuarial equivalence based on valuation assumptions. The reduction for the Y2K and 2011 Tier benefits was calculated in accordance with 104.1027 RSMo.
Deferred Joint and Survivor:	It was assumed that all deferred members eligible for the Closed plan would choose Closed plan benefits at retirement.
Other:	Turnover decrements do not operate during retirement eligibility.
Miscellaneous Adjustments:	The calculated normal and early retirement benefits 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)

Miscellaneous Adjustments:	Liabilities for future deferred members were increased by 2% to account for potential survivor benefits payable if the member dies during the deferred period. We have otherwise not modeled this benefit for future deferred members.
Reserve Fund:	The contribution stabilization reserve fund affects the total amount of UAAL financed and is assumed to grow at the investment return rate.
Death Prior to Retirement:	100% of deaths in service are assumed to be non-duty.
Gainful Employment Offset:	30% of the \$90 per month special benefit is assumed to be offset by gainful employment.
Minimum Benefit Eligibility:	Death prior to retirement benefits are assumed to be eligible for the minimum base benefit along with normal and early retirement benefits.
Active Plan Choice:	It was assumed that active members eligible for the Closed plan would choose the Closed plan benefits at retirement.
Member Contribution Interest:	Member contributions are assumed to be credited with 3.0% interest.

Data

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

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.

Deferred Member Data: Two Terminated Vested members were indicated to have a refund request in progress. As a result, we removed them from the Terminated Vested data file. Additionally, one member was in the Terminated Vested file last year and in the Active file this year. In this year's Active data file, they were indicated to have been termed with an effective date prior to May 30, 2020. As such, we have valued this member as a Terminated Vested member by using the Terminated Vested data from last year's valuation.

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



Method of Financing Future Benefits for Present Active Members

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

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

- (i) The annual normal cost for each individual active member, payable from the date of employment to the date of retirement, is sufficient to accumulate the value of the member's benefit at the time of retirement; and
- (ii) Each annual normal cost is a constant percentage of the member's year by year projected covered pay.

The **Value of Future Benefits** was calculated using the benefits assumed to be payable in the future to current active, terminated vested and retired members. It was assumed that current active and retired Uniformed Patrol members hired prior to July 1, 2000 would elect to retain the benefits under the current plan. Computed costs were increased in accordance with the adjustments described on page E-14.

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

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

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

Actuarial Accrued Liabilities, less pension assets as of June 30, 2020, 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 15-year amortization of unfunded actuarial accrued liabilities. The amortization period is a closed 15-year period starting July 1, 2021.

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, 2021.

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

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 2.45%; 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 tables shown on pages 43 through 45 show 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, 2020 valuation report and includes the effects of the \$143,863,600 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, 2070

Year	Valuation Payroll for Current Employees	Contributions from Current Employees	Service Cost and Expense Contributions	UAL Contributions	Total Contributions
0	\$ 360,851,545				
1	358,099,765	\$ 5,151,788	\$ 39,184,552	\$ 181,238,202	\$ 225,574,543
2	338,494,835	4,963,615	36,870,713	188,049,448	229,883,776
3	320,706,252	4,851,633	34,626,178	193,690,931	233,168,742
4	303,761,567	4,764,937	32,430,507	199,501,659	236,697,103
5	286,967,554	4,686,194	30,221,528	205,486,709	240,394,431
6	270,455,676	4,611,641	28,033,371	211,651,310	244,296,322
7	254,703,798	4,535,752	25,958,119	124,723,267	155,217,138
8	239,543,957	4,458,690	23,988,944	128,464,964	156,912,598
9	224,944,884	4,383,061	22,120,754	132,318,913	158,822,728
10	210,961,788	4,309,197	20,358,648	136,288,481	160,956,325
11	197,806,251	4,239,262	18,731,165	140,377,135	163,347,563
12	185,258,200	4,170,467	17,199,433	144,588,450	165,958,349
13	173,189,593	4,100,428	15,743,918	148,926,104	168,770,450
14	161,674,157	4,030,660	14,368,828	153,393,886	171,793,374
15	150,783,379	3,959,493	13,083,578	157,995,703	175,038,774
16	140,836,048	3,890,046	11,919,721	162,735,574	178,545,341
17	131,602,707	3,822,530	10,844,479	167,617,641	182,284,649
18	122,890,223	3,753,291	9,833,106	172,646,170	186,232,568
19	114,820,895	3,680,245	8,898,877	73,208,742	85,787,864
20	107,647,244	3,602,317	8,080,904	(8,080,904)	3,602,317
21	101,282,026	3,517,527	7,371,308	-	10,888,836
22	95,373,485	3,419,000	6,737,724	-	10,156,724
23	89,600,481	3,295,557	6,154,748	-	9,450,306
24	83,693,289	3,142,378	5,597,342	-	8,739,720
25	77,475,406	2,956,818	5,048,989	-	8,005,806
26	70,918,989	2,742,359	4,505,831	-	7,248,191
27	64,064,942	2,502,528	3,973,816	-	6,476,344
28	56,755,262	2,234,251	3,436,750	-	5,671,001
29	49,274,220	1,950,011	2,916,123	-	4,866,133
30	41,806,302	1,658,724	2,428,012	-	4,086,736
31	34,339,496	1,364,807	1,958,114	-	3,322,921
32	27,150,068	1,080,385	1,515,064	-	2,595,449
33	20,507,612	816,774	1,114,735	-	1,931,509
34	14,837,020	591,294	782,297	-	1,373,591
35	10,384,178	414,045	529,045	-	943,090
36	7,011,664	279,695	341,375	-	621,070
37	4,596,875	183,441	209,353	-	392,794
38	2,958,439	118,106	123,036	-	241,142
39	1,879,116	75,046	70,516	-	145,562
40	1,223,949	48,902	43,118	-	92,020
41	831,329	33,230	28,876	-	62,106
42	553,661	22,138	18,994	-	41,132
43	358,258	14,328	11,967	-	26,295
44	223,878	8,955	7,448	-	16,402
45	133,175	5,327	4,449	-	9,776
46	73,119	2,925	2,304	-	5,229
47	37,955	1,518	1,077	-	2,595
48	19,481	779	561	-	1,340
49	9,399	376	289	-	665
50	3,371	135	65	-	200



Single Discount Rate Development

Projection of Plan Fiduciary Net Position Ending June 30, 2120

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	\$ 2,361,599,888	\$ 225,574,543	\$ 264,749,169	\$ 4,010,717	\$ 163,826,069	\$ 2,482,240,614
2	2,482,240,614	229,883,776	271,284,168	3,791,142	172,201,891	2,609,250,970
3	2,609,250,970	233,168,742	278,267,376	3,591,910	180,972,222	2,741,532,648
4	2,741,532,648	236,697,103	285,107,869	3,402,130	190,124,505	2,879,844,258
5	2,879,844,258	240,394,431	293,320,950	3,214,037	199,657,411	3,023,361,113
6	3,023,361,113	244,296,322	301,620,891	3,029,104	209,558,626	3,172,566,066
7	3,172,566,066	155,217,138	309,384,668	2,852,683	216,676,866	3,232,222,721
8	3,232,222,721	156,912,598	316,157,735	2,682,892	220,683,964	3,290,978,656
9	3,290,978,656	158,822,728	322,879,072	2,519,383	224,636,961	3,349,039,890
10	3,349,039,890	160,956,325	328,816,088	2,362,772	228,575,768	3,407,393,124
11	3,407,393,124	163,347,563	334,132,454	2,215,430	232,564,916	3,466,957,719
12	3,466,957,719	165,958,349	339,489,391	2,074,892	236,644,784	3,527,996,568
13	3,527,996,568	168,770,450	344,097,760	1,939,723	240,860,348	3,591,589,884
14	3,591,589,884	171,793,374	348,619,553	1,810,751	245,264,745	3,658,217,698
15	3,658,217,698	175,038,774	351,475,967	1,688,774	249,946,273	3,730,038,004
16	3,730,038,004	178,545,341	353,682,514	1,577,364	255,022,259	3,808,345,727
17	3,808,345,727	182,284,649	354,797,170	1,473,950	260,597,667	3,894,956,923
18	3,894,956,923	186,232,568	355,079,971	1,376,371	266,789,918	3,991,523,067
19	3,991,523,067	85,787,864	354,461,205	1,285,994	270,117,842	3,991,681,575
20	3,991,681,575	3,602,317	352,063,246	1,205,649	267,386,367	3,909,401,364
21	3,909,401,364	10,888,836	349,000,517	1,134,359	261,985,303	3,832,140,627
22	3,832,140,627	10,156,724	344,424,980	1,068,183	256,711,573	3,753,515,762
23	3,753,515,762	9,450,306	339,457,484	1,003,525	251,356,673	3,673,861,731
24	3,673,861,731	8,739,720	334,393,762	937,365	245,932,950	3,593,203,274
25	3,593,203,274	8,005,806	329,623,887	867,725	240,428,124	3,511,145,592
26	3,511,145,592	7,248,191	325,107,222	794,293	234,815,954	3,427,308,223
27	3,427,308,223	6,476,344	320,485,024	717,527	229,082,463	3,341,664,478
28	3,341,664,478	5,671,001	316,263,821	635,659	223,207,751	3,253,643,750
29	3,253,643,750	4,866,133	311,453,669	551,871	217,186,997	3,163,691,340
30	3,163,691,340	4,086,736	306,817,417	468,231	211,025,913	3,071,518,341
31	3,071,518,341	3,322,921	301,919,150	384,602	204,718,938	2,977,256,448
32	2,977,256,448	2,595,449	296,660,592	304,081	198,279,282	2,881,166,506
33	2,881,166,506	1,931,509	290,751,050	229,685	191,736,037	2,783,853,317
34	2,783,853,317	1,373,591	283,695,440	166,175	185,149,872	2,686,515,166
35	2,686,515,166	943,090	275,231,293	116,303	178,614,339	2,590,724,999
36	2,590,724,999	621,070	265,845,636	78,531	172,222,190	2,497,644,092
37	2,497,644,092	392,794	255,629,847	51,485	166,051,107	2,408,406,661
38	2,408,406,661	241,142	244,662,784	33,135	160,177,256	2,324,129,140
39	2,324,129,140	145,562	233,383,496	21,046	154,663,055	2,245,533,216
40	2,245,533,216	92,020	222,150,512	13,708	149,546,255	2,173,007,271
41	2,173,007,271	62,106	211,050,626	9,311	144,850,486	2,106,859,926
42	2,106,859,926	41,132	200,151,231	6,201	140,594,585	2,047,338,211
43	2,047,338,211	26,295	189,445,367	4,012	136,795,997	1,994,711,124
44	1,994,711,124	16,402	178,752,838	2,507	133,479,721	1,949,451,903
45	1,949,451,903	9,776	168,042,461	1,492	130,679,906	1,912,097,632
46	1,912,097,632	5,229	157,444,844	819	128,429,617	1,883,086,815
47	1,883,086,815	2,595	147,065,745	425	126,755,907	1,862,779,147
48	1,862,779,147	1,340	136,912,071	218	125,683,702	1,851,551,901
49	1,851,551,901	665	127,042,093	105	125,237,383	1,849,747,751
50	1,849,747,751	200	117,531,730	38	125,438,311	1,857,654,494



Single Discount Rate Development

Projection of Plan Fiduciary Net Position Ending June 30, 2120 (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	\$ 1,857,654,494	\$ 41	\$ 108,431,577	\$ 9	\$ 126,304,897	\$ 1,875,527,847
52	1,875,527,847	2	99,756,971	-	127,854,507	1,903,625,385
53	1,903,625,385	-	91,514,138	-	130,104,955	1,942,216,202
54	1,942,216,202	-	83,702,320	-	133,075,101	1,991,588,983
55	1,991,588,983	-	76,314,558	-	136,785,394	2,052,059,820
56	2,052,059,820	-	69,339,278	-	141,258,359	2,123,978,900
57	2,123,978,900	-	62,762,256	-	146,518,997	2,207,735,641
58	2,207,735,641	-	56,568,613	-	152,595,080	2,303,762,108
59	2,303,762,108	-	50,744,220	-	159,517,338	2,412,535,226
60	2,412,535,226	-	45,276,803	-	167,319,580	2,534,578,002
61	2,534,578,002	-	40,156,573	-	176,038,751	2,670,460,180
62	2,670,460,180	-	35,376,146	-	185,714,989	2,820,799,022
63	2,820,799,022	-	30,930,532	-	196,391,672	2,986,260,163
64	2,986,260,163	-	26,817,169	-	208,115,485	3,167,558,479
65	3,167,558,479	-	23,035,273	-	220,936,495	3,365,459,701
66	3,365,459,701	-	19,585,079	-	234,908,295	3,580,782,917
67	3,580,782,917	-	16,466,801	-	250,088,214	3,814,404,329
68	3,814,404,329	-	13,679,074	-	266,537,633	4,067,262,889
69	4,067,262,889	-	11,217,344	-	284,322,435	4,340,367,980
70	4,340,367,980	-	9,072,814	-	303,513,581	4,634,808,746
71	4,634,808,746	-	7,231,991	-	324,187,774	4,951,764,529
72	4,951,764,529	-	5,676,559	-	346,428,198	5,292,516,168
73	5,292,516,168	-	4,383,921	-	370,325,290	5,658,457,536
74	5,658,457,536	-	3,328,349	-	395,977,506	6,051,106,692
75	6,051,106,692	-	2,482,146	-	423,492,063	6,472,116,608
76	6,472,116,608	-	1,816,821	-	452,985,649	6,923,285,437
77	6,923,285,437	-	1,304,287	-	484,585,103	7,406,566,253
78	7,406,566,253	-	917,837	-	518,428,057	7,924,076,473
79	7,924,076,473	-	632,898	-	554,663,576	8,478,107,151
80	8,478,107,151	-	427,597	-	593,452,788	9,071,132,342
81	9,071,132,342	-	283,118	-	634,969,522	9,705,818,746
82	9,705,818,746	-	183,825	-	679,400,987	10,385,035,908
83	10,385,035,908	-	117,177	-	726,948,482	11,111,867,213
84	11,111,867,213	-	73,456	-	777,828,177	11,889,621,934
85	11,889,621,934	-	45,397	-	832,271,973	12,721,848,510
86	12,721,848,510	-	27,749	-	890,528,441	13,612,349,202
87	13,612,349,202	-	16,843	-	952,863,865	14,565,196,224
88	14,565,196,224	-	10,197	-	1,019,563,385	15,584,749,411
89	15,584,749,411	-	6,186	-	1,090,932,246	16,675,675,471
90	16,675,675,471	-	3,775	-	1,167,297,153	17,842,968,849
91	17,842,968,849	-	2,321	-	1,249,007,740	19,091,974,268
92	19,091,974,268	-	1,437	-	1,336,438,149	20,428,410,980
93	20,428,410,980	-	893	-	1,429,988,738	21,858,398,824
94	21,858,398,824	-	555	-	1,530,087,899	23,388,486,168
95	23,388,486,168	-	342	-	1,637,194,020	25,025,679,846
96	25,025,679,846	-	208	-	1,751,797,582	26,777,477,220
97	26,777,477,220	-	125	-	1,874,423,401	28,651,900,496
98	28,651,900,496	-	73	-	2,005,633,032	30,657,533,455
99	30,657,533,455	-	42	-	2,146,027,340	32,803,560,753
100	32,803,560,753	-	24	-	2,296,249,252	35,099,809,981



Single Discount Rate Development

Present Values of Projected Benefits Ending June 30, 2120

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 ^{(a)-.5}	(g)=(e)*vf ^{(a)-.5}	(h)=(c)/(1+sdr) ^{(a)-.5}
1	\$ 2,361,599,888	\$ 264,749,169	\$ 264,749,169	\$ -	\$ 255,942,682	\$ -	\$ 255,942,682
2	2,482,240,614	271,284,168	271,284,168	-	245,103,088	-	245,103,088
3	2,609,250,970	278,267,376	278,267,376	-	234,964,823	-	234,964,823
4	2,741,532,648	285,107,869	285,107,869	-	224,991,433	-	224,991,433
5	2,879,844,258	293,320,950	293,320,950	-	216,329,668	-	216,329,668
6	3,023,361,113	301,620,891	301,620,891	-	207,898,158	-	207,898,158
7	3,172,566,066	309,384,668	309,384,668	-	199,298,593	-	199,298,593
8	3,232,222,721	316,157,735	316,157,735	-	190,337,990	-	190,337,990
9	3,290,978,656	322,879,072	322,879,072	-	181,667,728	-	181,667,728
10	3,349,039,890	328,816,088	328,816,088	-	172,904,848	-	172,904,848
11	3,407,393,124	334,132,454	334,132,454	-	164,205,990	-	164,205,990
12	3,466,957,719	339,489,391	339,489,391	-	155,923,927	-	155,923,927
13	3,527,996,568	344,097,760	344,097,760	-	147,701,404	-	147,701,404
14	3,591,589,884	348,619,553	348,619,553	-	139,852,664	-	139,852,664
15	3,658,217,698	351,475,967	351,475,967	-	131,774,342	-	131,774,342
16	3,730,038,004	353,682,514	353,682,514	-	123,926,743	-	123,926,743
17	3,808,345,727	354,797,170	354,797,170	-	116,184,399	-	116,184,399
18	3,894,956,923	355,079,971	355,079,971	-	108,670,100	-	108,670,100
19	3,991,523,067	354,461,205	354,461,205	-	101,383,860	-	101,383,860
20	3,991,681,575	352,063,246	352,063,246	-	94,110,271	-	94,110,271
21	3,909,401,364	349,000,517	349,000,517	-	87,188,384	-	87,188,384
22	3,832,140,627	344,424,980	344,424,980	-	80,416,177	-	80,416,177
23	3,753,515,762	339,457,484	339,457,484	-	74,071,372	-	74,071,372
24	3,673,861,731	334,393,762	334,393,762	-	68,192,936	-	68,192,936
25	3,593,203,274	329,623,887	329,623,887	-	62,822,631	-	62,822,631
26	3,511,145,592	325,107,222	325,107,222	-	57,908,229	-	57,908,229
27	3,427,308,223	320,485,024	320,485,024	-	53,350,394	-	53,350,394
28	3,341,664,478	316,263,821	316,263,821	-	49,203,458	-	49,203,458
29	3,253,643,750	311,453,669	311,453,669	-	45,285,148	-	45,285,148
30	3,163,691,340	306,817,417	306,817,417	-	41,692,560	-	41,692,560
31	3,071,518,341	301,919,150	301,919,150	-	38,342,943	-	38,342,943
32	2,977,256,448	296,660,592	296,660,592	-	35,210,392	-	35,210,392
33	2,881,166,506	290,751,050	290,751,050	-	32,251,396	-	32,251,396
34	2,783,853,317	283,695,440	283,695,440	-	29,410,053	-	29,410,053
35	2,686,515,166	275,231,293	275,231,293	-	26,665,976	-	26,665,976
36	2,590,724,999	265,845,636	265,845,636	-	24,071,626	-	24,071,626
37	2,497,644,092	255,629,847	255,629,847	-	21,632,349	-	21,632,349
38	2,408,406,661	244,662,784	244,662,784	-	19,349,790	-	19,349,790
39	2,324,129,140	233,383,496	233,383,496	-	17,250,222	-	17,250,222
40	2,245,533,216	222,150,512	222,150,512	-	15,345,749	-	15,345,749
41	2,173,007,271	211,050,626	211,050,626	-	13,625,224	-	13,625,224
42	2,106,859,926	200,151,231	200,151,231	-	12,076,233	-	12,076,233
43	2,047,338,211	189,445,367	189,445,367	-	10,682,513	-	10,682,513
44	1,994,711,124	178,752,838	178,752,838	-	9,420,167	-	9,420,167
45	1,949,451,903	168,042,461	168,042,461	-	8,276,390	-	8,276,390
46	1,912,097,632	157,444,844	157,444,844	-	7,247,138	-	7,247,138
47	1,883,086,815	147,065,745	147,065,745	-	6,326,534	-	6,326,534
48	1,862,779,147	136,912,071	136,912,071	-	5,504,429	-	5,504,429
49	1,851,551,901	127,042,093	127,042,093	-	4,773,472	-	4,773,472
50	1,849,747,751	117,531,730	117,531,730	-	4,127,225	-	4,127,225

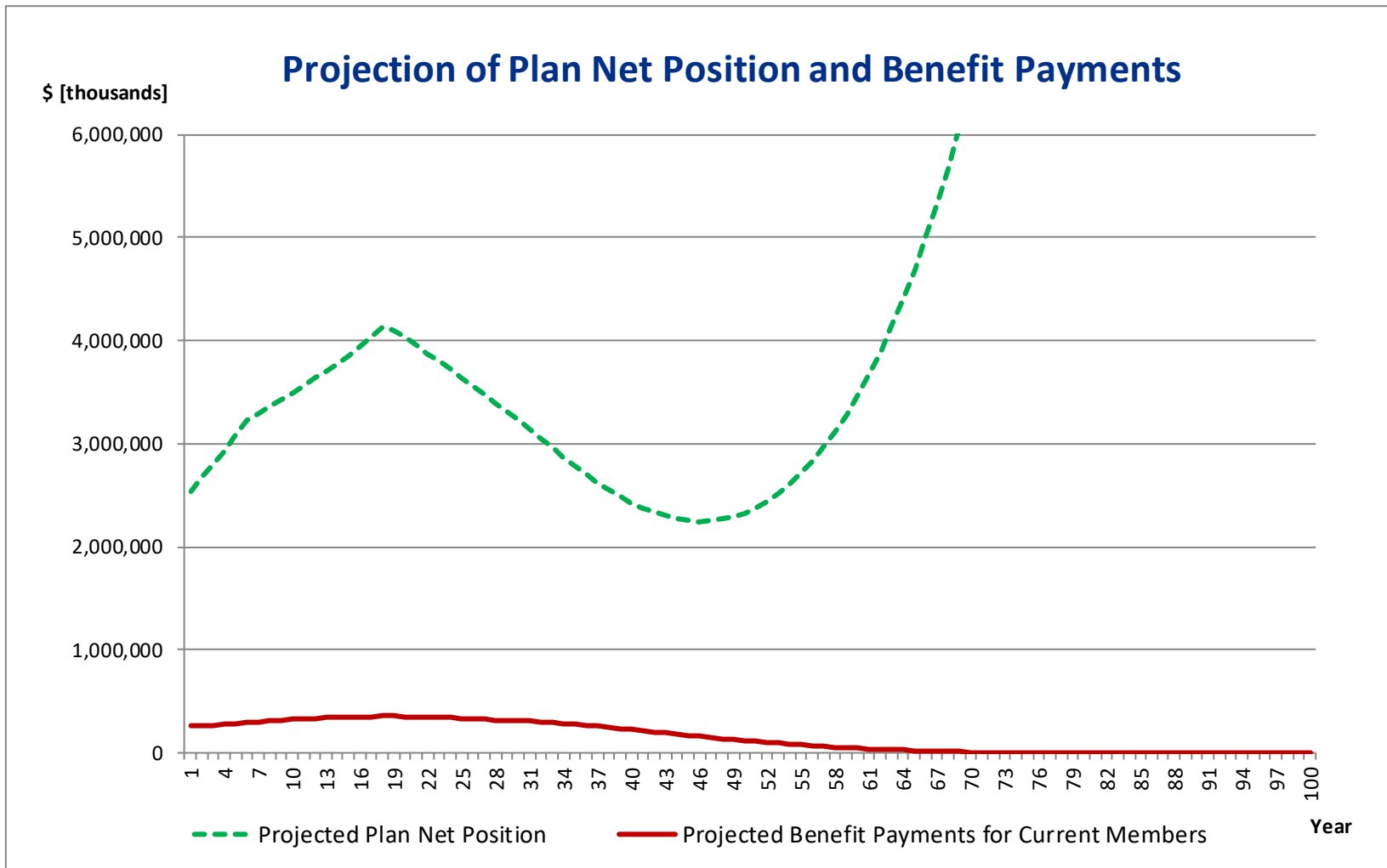


Single Discount Rate Development

Present Values of Projected Benefits Ending June 30, 2120 (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 ^a ((a)-.5)	(g)=(e)*vf ^a ((a)-.5)	(h)=(c)/(1+sdr) ^a (a-.5)
51	\$ 1,857,654,494	\$ 108,431,577	\$ 108,431,577	\$ -	\$ 3,558,566	\$ -	\$ 3,558,566
52	1,875,527,847	99,756,971	99,756,971	-	3,059,699	-	3,059,699
53	1,903,625,385	91,514,138	91,514,138	-	2,623,251	-	2,623,251
54	1,942,216,202	83,702,320	83,702,320	-	2,242,360	-	2,242,360
55	1,991,588,983	76,314,558	76,314,558	-	1,910,696	-	1,910,696
56	2,052,059,820	69,339,278	69,339,278	-	1,622,481	-	1,622,481
57	2,123,978,900	62,762,256	62,762,256	-	1,372,509	-	1,372,509
58	2,207,735,641	56,568,613	56,568,613	-	1,156,134	-	1,156,134
59	2,303,762,108	50,744,220	50,744,220	-	969,250	-	969,250
60	2,412,535,226	45,276,803	45,276,803	-	808,241	-	808,241
61	2,534,578,002	40,156,573	40,156,573	-	669,943	-	669,943
62	2,670,460,180	35,376,146	35,376,146	-	551,580	-	551,580
63	2,820,799,022	30,930,532	30,930,532	-	450,714	-	450,714
64	2,986,260,163	26,817,169	26,817,169	-	365,210	-	365,210
65	3,167,558,479	23,035,273	23,035,273	-	293,184	-	293,184
66	3,365,459,701	19,585,079	19,585,079	-	232,964	-	232,964
67	3,580,782,917	16,466,801	16,466,801	-	183,058	-	183,058
68	3,814,404,329	13,679,074	13,679,074	-	142,119	-	142,119
69	4,067,262,889	11,217,344	11,217,344	-	108,918	-	108,918
70	4,340,367,980	9,072,814	9,072,814	-	82,332	-	82,332
71	4,634,808,746	7,231,991	7,231,991	-	61,334	-	61,334
72	4,951,764,529	5,676,559	5,676,559	-	44,993	-	44,993
73	5,292,516,168	4,383,921	4,383,921	-	32,474	-	32,474
74	5,658,457,536	3,328,349	3,328,349	-	23,042	-	23,042
75	6,051,106,692	2,482,146	2,482,146	-	16,060	-	16,060
76	6,472,116,608	1,816,821	1,816,821	-	10,986	-	10,986
77	6,923,285,437	1,304,287	1,304,287	-	7,371	-	7,371
78	7,406,566,253	917,837	917,837	-	4,848	-	4,848
79	7,924,076,473	632,898	632,898	-	3,124	-	3,124
80	8,478,107,151	427,597	427,597	-	1,973	-	1,973
81	9,071,132,342	283,118	283,118	-	1,221	-	1,221
82	9,705,818,746	183,825	183,825	-	741	-	741
83	10,385,035,908	117,177	117,177	-	441	-	441
84	11,111,867,213	73,456	73,456	-	259	-	259
85	11,889,621,934	45,397	45,397	-	149	-	149
86	12,721,848,510	27,749	27,749	-	85	-	85
87	13,612,349,202	16,843	16,843	-	48	-	48
88	14,565,196,224	10,197	10,197	-	27	-	27
89	15,584,749,411	6,186	6,186	-	16	-	16
90	16,675,675,471	3,775	3,775	-	9	-	9
91	17,842,968,849	2,321	2,321	-	5	-	5
92	19,091,974,268	1,437	1,437	-	3	-	3
93	20,428,410,980	893	893	-	2	-	2
94	21,858,398,824	555	555	-	1	-	1
95	23,388,486,168	342	342	-	1	-	1
96	25,025,679,846	208	208	-	0	-	0
97	26,777,477,220	125	125	-	0	-	0
98	28,651,900,496	73	73	-	0	-	0
99	30,657,533,455	42	42	-	0	-	0
100	32,803,560,753	24	24	-	0	-	0
Totals					\$ 4,397,506,243	\$ -	\$ 4,397,506,243





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

GLOSSARY OF TERMS

Glossary of Terms

<i>Accrued Service</i>	Service credited under the system which was rendered before the date of the actuarial valuation.
<i>Actuarial Accrued Liability (AAL)</i>	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.
<i>Actuarial Assumptions</i>	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.
<i>Actuarial Equivalent</i>	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.
<i>Actuarial Cost Method</i>	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.
<i>Actuarial Gain/(Loss)</i>	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.
<i>Actuarial Present Value (APV)</i>	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.
<i>Actuarial Valuation</i>	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.
<i>Actuarial Valuation Date</i>	The date as of which an actuarial valuation is performed.
<i>Actuarially Determined Contribution (ADC) or Annual Required Contribution (ARC)</i>	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

<i>Amortization Method</i>	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).
<i>Amortization Payment</i>	The amortization payment is the periodic payment required to pay off an interest-discounted amount with payments of interest and principal.
<i>Cost-of-Living Adjustments</i>	Postemployment benefit changes intended to adjust benefit payments for the effects of inflation.
<i>Cost-Sharing Multiple-Employer Defined Benefit Pension Plan (cost-sharing pension plan)</i>	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.
<i>Covered-Employee Payroll</i>	The payroll of covered employees, which is typically only the pensionable pay and does not include pay above any pay cap.
<i>Deferred Inflows and Outflows</i>	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.
<i>Deferred Retirement Option Program (DROP)</i>	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.
<i>Discount Rate</i>	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: <ol style="list-style-type: none">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; and2. The present value of the benefit payments not in (1) above, discounted using the municipal bond rate.

Glossary of Terms

Entry Age Actuarial Cost Method (EAN)

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.

Fiduciary Net Position

The fiduciary net position is the value of the assets of the trust.

GASB

The Governmental Accounting Standards Board is an organization that exists in order to promulgate accounting standards for governmental entities.

Long-Term Expected Rate of Return

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.

Money-Weighted Rate of Return

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.

Multiple-Employer Defined Benefit Pension Plan

A multiple-employer plan is a defined benefit pension plan that is used to provide pensions to the employees of more than one employer.

Municipal Bond Rate

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.

Net Pension Liability (NPL)

The NPL is the liability of employers and non-employer contribution entities to plan members for benefits provided through a defined benefit pension plan.

Non-Employer Contribution Entities

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.

Normal Cost

The actuarial present value of the pension trust benefits allocated to the current year by the actuarial cost method.



Glossary of Terms

<i>Other Postemployment Benefits (OPEB)</i>	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.
<i>Real Rate of Return</i>	The real rate of return is the rate of return on an investment after adjustment to eliminate inflation.
<i>Service Cost</i>	The service cost is the portion of the actuarial present value of projected benefit payments that is attributed to a valuation year.
<i>Total Pension Expense</i>	The total pension expense is the sum of the following items that are recognized at the end of the employer’s fiscal year: <ol style="list-style-type: none">1. Service Cost2. Interest on the Total Pension Liability3. Current-Period Benefit Changes4. Employee Contributions (made negative for addition here)5. Projected Earnings on Plan Investments (made negative for addition here)6. Pension Plan Administrative Expense7. Other Changes in Plan Fiduciary Net Position8. Recognition of Outflow (Inflow) of Resources due to Liabilities9. Recognition of Outflow (Inflow) of Resources due to Assets
<i>Total Pension Liability (TPL)</i>	The TPL is the portion of the actuarial present value of projected benefit payments that is attributed to past periods of member service.
<i>Unfunded Actuarial Accrued Liability (UAAL)</i>	The UAAL is the difference between actuarial accrued liability and valuation assets.
<i>Valuation Assets</i>	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.



September 29, 2020

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

Dear Board Members:

Please find enclosed five copies of the GASB Statement Nos. 67 and 68 Accounting and Financial Reporting for Pensions report of the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS).

We will be happy to meet with the Board to discuss the results of this report.

Respectfully submitted,

A handwritten signature in black ink that reads "Heidi G. Barry". The signature is written in a cursive, flowing style.

Heidi G. Barry, ASA, FCA, MAAA

A handwritten signature in black ink that reads "Kenneth G. Alberts". The signature is written in a cursive, flowing style.

Kenneth G. Alberts

A handwritten signature in black ink that reads "Jamal Adora". The signature is written in a cursive, flowing style.

Jamal Adora, ASA, MAAA

HGB/KGA/JA:rmn
Enclosures