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, 2017

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October 11, 2017

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

Dear Board Members:

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

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

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

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

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

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

Respectfully submitted,

Heidi G Barry

Heidi G. Barry, ASA, FCA, MAAA

Kenneth G. Alberts

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KGA/HGB:dj

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Table of Contents

SECTION A

EXECUTIVE SUMMARY

Executive Summary
as of June 30, 2017

Actuarial Valuation Date	June 30, 2017
Measurement Date of the Net Pension Liability	June 30, 2017
Employer's Fiscal Year Ending Date (Employer's Reporting Date)	June 30, 2018
Plan's Fiscal Year Ending Date (Plan's Reporting Date)	June 30, 2017

Membership		
Number of		
- Retirees and Beneficiaries		8,831
- Inactive, Nonretired Members		2,324
- Active Members		7,456
- Total		18,611
Valuation Payroll	$	348,979,212
Covered Payroll (Reported Fiscal Year Payroll Paid)	$	356,515,416
Net Pension Liability		
Total Pension Liability	$	3,802,443,730
Plan Fiduciary Net Position		2,169,775,040
Net Pension Liability	$	1,632,668,690
Plan Fiduciary Net Position as a Percentage of Total Pension Liability		57.06%
Net Pension Liability as a Percentage of Covered Payroll		457.95%
Development of the Single Discount Rate		
Single Discount Rate		7.75%
Long-Term Expected Rate of Investment Return		7.75%
Long-Term Municipal Bond Rate*		3.56%
Last year ending June 30 in the 2018 to 2117 projection period for which projected benefit payments are fully funded		2117
Total Pension Expense	$	136,008,731

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	$ -	$ 55,760,602
Changes in assumptions	-	-
Net difference between projected and actual earnings on pension plan investments	102,667,477	92,183,573
Total	$ 102,667,477	$ 147,944,175

*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 29, 2017. 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.

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.

The total pension liability shown in this report is based on an actuarial valuation performed as of June 30, 2017 and a measurement date of June 30, 2017.

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 7.75%; the municipal bond rate is 3.56% (based on the weekly 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 7.75%.

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.

Post Measurement Date Plan Changes

There were two plan changes after the measurement date that were not included in the valuation:

a) 5-year vesting for Tier 2011 members; and
b) Optional lump sum payments to deferred vested members during a window period.

Neither change is expected to have a material effect on the TPL. For purposes of this statement, material is defined to be greater than 2% in absolute value. Both changes will be reflected in the 2018 valuation.

SECTION B

FINANCIAL STATEMENTS

Statement of Pension Expense Under GASB Statement No. 68
Fiscal Year Ended June 30, 2017

A. Expense

1. Service Cost	$	45,713,403
2. Interest on the Total Pension Liability		283,568,441
3. Current-Period Benefit Changes		0
4. Member Contributions (made negative for addition here)#		(3,238,502)
5. Projected Earnings on Plan Investments (made negative for addition here)		(152,734,956)
6. Pension Plan Administrative Expense		4,515,458
7. Other Changes in Plan Fiduciary Net Position#		(3,397,537)
8. Recognition of Outflow (Inflow) of Resources due to Liabilities		(24,828,487)
9. Recognition of Outflow (Inflow) of Resources due to Assets		(13,589,089)
10. Total Pension Expense	**$**	**136,008,731**

 # Employee payments for service purchase of $1,653,430 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, 2017

A. Outflows (Inflows) of Resources due to Liabilities		
1. Difference between expected and actual experience of the Total Pension Liability (gains) or losses	$	(37,286,966)
2. Assumption Changes (gains) or losses	$	-
3. Recognition period for Liabilities: Average of the expected remaining service lives of all employees {in years}		4.3595
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	$	(8,553,037)
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	$	(8,553,037)
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	$	(28,733,929)
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	$	(28,733,929)
B. Outflows (Inflows) of Resources due to Assets		
1. Net difference between projected and actual earnings on pension plan investments (gains) or losses	$	(67,566,785)
2. Recognition period for Assets {in years}		5
3. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Assets	$	(13,513,357)
4. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Assets	$	(54,053,428)

Statement of Outflows and Inflows Arising from Current and Prior Reporting Periods Fiscal Year Ended June 30, 2017

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	$ -	$ 24,828,487	$ (24,828,487)
2. Due to Assets	38,054,415	51,643,504	(13,589,089)
3. Total	$ 38,054,415	$ 76,471,991	$ (38,417,576)

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	$ -	$ 24,828,487	$ (24,828,487)
2. Assumption Changes	-	-	-
3. Net Difference between projected and actual earnings on pension plan investments	38,054,415	51,643,504	(13,589,089)
4. Total	$ 38,054,415	$ 76,471,991	$ (38,417,576)

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	$ -	$ 55,760,602	$ (55,760,602)
2. Assumption Changes	-	-	-
3. Net Difference between projected and actual earnings on pension plan investments	102,667,477	92,183,573	10,483,904
4. Total	$ 102,667,477	$ 147,944,175	$ (45,276,698)

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
2018	$ (35,863,905)
2019	5,940,848
2020	1,234,534
2021	(16,588,175)
2022	-
Thereafter	-
Total	$ (45,276,698)

Statement of Fiduciary Net Position
as of June 30, 2017

Assets		
Repurchase Agreements-Cash	$	171,775
Receivables		
Investment Sales	$	4,073,357
Accrued Investment Interest and Income		5,686,056
Contributions		8,714,163
Other		52,489
Total Receivables	$	18,526,065
Investments		
Stocks and Rights/Warrants	$	358,551,039
Government Obligations		278,549,207
Corporate Bonds		13,954,059
Short Term Securities		167,590,589
Mortgages and Asset-Backed Securities		283,863,896
Real Estate		241,412,275
Absolute Return		149,640,781
Venture Capital & Partnerships		668,702,307
Total Investments	$	2,162,264,153
Securities Lending Collateral	$	56,823,478
Prepaid Accounts	$	-
Capial Assets		
Land (not depreciated)	$	84,000
Equipment		3,514,781
Building		581,618
Accumulated Depreciation		(2,976,082)
Total Capital Assets	$	1,204,317
Total Assets	$	2,238,989,788
Liabilities		
Investment Purchases Payable	$	8,186,805
OPEB Obligations		715,962
Security Lending Collateral		58,389,459
Accounts Payable - Other		1,922,522
Total Liabilities	$	69,214,748
Net Position Restricted for Pensions	$	2,169,775,040

Statement of Changes in Fiduciary Net Position for Year Ended June 30, 2017

Additions		
Contributions		
Employer	$	206,562,924
Employee		3,238,502
Reciprocal Transfer		1,744,107
Service Purchase		1,653,430
Total Contributions	$	213,198,963
Investment Income		
Total net appreciation and gains	$	187,425,144
Total interest and dividends		63,059,296
Less total investment expenses		(30,460,874)
Net Investment Income	$	220,023,566
Income From Securities Lending Activities		
Securities Lending Income	$	551,362
Less Total Securities Lending Expenses		(273,801)
Net Income from Securities Lending Activities	$	277,561
Other	$	614
Total Additions	$	433,500,704
Deductions		
Benefit Payments, Including Refunds	$	251,284,152
Administrative Expenses		4,515,458
Total Deductions	$	255,799,610
Net Increase in Net Position	$	177,701,094
Net Position Restricted for Pensions		
Beginning of Year	$	1,992,073,946
End of Year	$	2,169,775,040

Schedule of Proportionate Employer Share
for Year Ended June 30, 2017

				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 Contributins and Proportionate Share of Contributions	Total Employer Pension Expense
$ 127,407,570	MoDOT	62.01%	$ 1,012,417,855	$ -	$ 63,664,102	$ -	$ -	$ 63,664,102	$ 34,577,149	$ 57,163,034	$ -	$ 10,859,524	$ 102,599,707	$ 84,339,014	$ (7,593,359)	$ 76,745,655
78,068,086	Highway Patrol	37.99%	620,250,835	-	39,003,375	-	10,859,524	49,862,899	21,183,453	35,020,539	-	-	56,203,992	51,669,717	7,593,359	59,263,076
$ 205,475,656	***Total for All Employers***	**100.0000%**	**$1,632,668,690**	**$ -**	**$ 102,667,477**	**$ -**	**$ 10,859,524**	**$ 113,527,001**	**$ 55,760,602**	**$ 92,183,573**	**$ -**	**$ 10,859,524**	**$ 158,803,699**	**$136,008,731**	**$ -**	**$136,008,731**

 # Excludes $1,087,268 in contributions for Retirement System members. Retirement System members' cost were spread proportionately to the other two employers.

		Schedule of Deferred (Inflows)/Outflows						
Employer	**Employer Allocation Percentage**	**2018**	**2019**	**2020**	**2021**	**2022**	**Thereafter**	**Total**
MoDOT	62.01%	$ (29,832,568)	$ 820,526	$ 391,600	$ (10,315,163)	$ -	$ -	$ (38,935,605)
Highway Patrol	37.99%	(6,031,337)	5,120,322	842,934	(6,273,012)	-	-	(6,341,093)
TOTAL	100.00%	$ (35,863,905)	$ 5,940,848	$ 1,234,534	$ (16,588,175)	$ -	$ -	$ (45,276,698)

SECTION C

REQUIRED SUPPLEMENTARY INFORMATION

Schedule of Changes in Net Pension Liability and Related Ratios Current Period
Fiscal Year Ended June 30, 2017

A. Total pension liability		
1. Service Cost	$	45,713,403
2. Interest on the Total Pension Liability		283,568,441
3. Changes of Benefit Terms		-
4. Difference between expected and actual experience of the Total Pension Liability		(37,286,966)
5. Changes of Assumptions		-
6. Benefit Payments, including Refunds of Employee Contributions		(246,939,103)
7. Disability Premiums		(1,620,418)
8. Transfers to Other Retirement Systems		(2,724,631)
9. Net change in Total Pension Liability	$	40,710,726
10. Total Pension Liability – beginning		3,761,733,004
11. Total Pension Liability – ending	**$**	**3,802,443,730**
B. Plan fiduciary net position		
1. Contributions – employer	$	206,562,924
2. Contributions – employee		4,891,932
3. Net investment income		220,301,741
4. Benefit payments, including refunds of employee contributions		(246,939,103)
5. Disability Premiums		(1,620,418)
6. Pension Plan Administrative Expense		(4,515,458)
7. Net Transfers to Other Retirement Systems		(980,524)
8. Other		-
9. Net change in plan fiduciary net position	$	177,701,094
10. Plan fiduciary net position – beginning		1,992,073,946
11. Plan fiduciary net position – ending	**$**	**2,169,775,040**
C. Net pension liability	**$**	**1,632,668,690**
D. Plan fiduciary net position as a percentage of the total pension liability		**57.06%**
E. Covered Payroll (Reported Fiscal Year Payroll Paid) #	**$**	**356,515,416**
F. Net pension liability as a percentage of covered-employee payroll		**457.95%**

 # Valuation Payroll was $348,979,212.

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,	2017	2016	2015	2014	2013*
Total Pension Liability					
Service Cost	$ 45,713,403	$ 45,441,305	$ 45,358,095	$ 44,739,603	$ 44,446,279
Interest on the Total Pension Liability	283,568,441	280,432,068	275,284,910	270,525,608	265,339,848
Benefit Changes	-	-	-	-	-
Difference between Expected and Actual Experience	(37,286,966)	(39,810,009)	(13,324,219)	(17,614,321)	(13,690,794)
Assumption Changes	-	-	-	-	204,396,180
Benefit Payments	(246,617,775)	(236,488,629)	(236,905,323)	(227,958,108)	(220,623,394)
Refunds	(321,328)	(198,106)	(107,395)	(18,686)	(29,300)
Disability Premiums	(1,620,418)	(1,567,825)	(1,554,676)	(1,531,578)	(1,512,685)
Transfers to Other Retirement Systems	(2,724,631)	(1,921,451)	(3,147,482)	(1,876,336)	(629,246)
Net Change in Total Pension Liability	40,710,726	45,887,353	65,603,910	66,266,182	277,696,888
Total Pension Liability - Beginning	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)	$ 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	$ 206,562,924	$ 199,609,396	$ 200,638,571	$ 183,353,841	$ 170,836,117
Contributions - Member	4,891,932	3,482,513	3,294,162	2,260,563	1,139,450
Pension Plan Net Investment Income	220,301,741	21,432,095	92,645,571	319,445,780	198,141,088
Benefit Payments	(246,617,775)	(236,488,629)	(236,905,323)	(227,958,108)	(220,619,035)
Refunds	(321,328)	(198,106)	(107,395)	(18,686)	(29,300)
Disability Premiums	(1,620,418)	(1,567,825)	(1,554,676)	(1,531,578)	(1,512,685)
Pension Plan Administrative Expense	(4,515,458)	(4,370,860)	(4,066,944)	(3,736,355)	(2,997,225)
Net Transfers	(980,524)	808,228	(2,033,045)	(91,954)	(629,246)
Other	-	-	-	-	-
Net Change in Plan Fiduciary Net Position	177,701,094	(17,293,188)	51,910,921	271,723,503	144,329,164
Plan Fiduciary Net Position - Beginning	1,992,073,946	2,009,367,134	1,957,456,213	1,685,732,710	1,541,403,546
Plan Fiduciary Net Position - Ending (b)	$ 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)	1,632,668,690	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	57.06 %	52.96 %	54.08 %	53.63 %	47.04 %
Covered-Employee Payroll	$ 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	457.95 %	513.49 %	498.58 %	502.92 %	587.32 %
Notes to Schedule:	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%

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
2008	$ 123,323,265	$123,323,265	$ -	$375,527,604	32.84%
2009	122,613,975	122,613,975	-	379,140,306	32.34%
2010	124,052,534	124,052,534	-	376,258,823	32.97%
2011	149,952,750	149,952,750	-	363,345,651	41.27%
2012	164,884,467	164,884,467	-	344,514,139	47.86%
2013	170,836,117	170,836,117	-	329,863,134	51.79%
2014	183,353,841	183,353,841	-	336,799,855	54.44%
2015	200,638,571	200,638,571	-	342,211,446	58.63%
2016	199,609,396	199,609,396	-	344,154,131	58.00%
2017	206,562,924	206,562,924	-	356,142,972	58.00%

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

Notes to Schedule of Contributions

Valuation Date:	June 30, 2015
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 2017 Contribution Rates:

Actuarial Cost Method	Entry-Age
Amortization Method	Level Percentage of Payroll, Closed #
Remaining Amortization Period	15 years (single equivalent period)
Asset Valuation Method	3-Year smoothed market; 20% corridor
Inflation	3.0% (price inflation)
Salary Increases	3.50% to 11.00% (including 3.50% wage inflation)
Investment Rate of Return	7.75%
Retirement Age	Experience-based table of rates that are specific to the type of eligibility condition. Last updated for the 2013 valuation pursuant to an experience study of the period July 1, 2007 - June 30, 2012.
Mortality	The mortality tables, for post-retirement mortality, used in evaluating allowances to be paid to non-disabled pensioners were the RP-2000 Combined Healthy Mortality Tables projected 16 years and set back 1 year for males and females. Pre-retirement mortality used was 70% for males and 50% for females of the post-retirement tables set back 1 year for males and set back 1 year for females. Disabled pension mortality was based on PBGC Disabled Mortality tables. The healthy mortality tables include a margin for mortality improvement. The margin is in the 16-year projection. The disabled mortality tables do not include a margin for mortality improvement.

Other Information:

Notes	There were no benefit changes during the year.

*A Contribution Stabilization Reserve Fund of approximately $219.6 million was added to the unfunded for purposes of determining the FY 19 contribution rate.*

SECTION D

NOTES TO FINANCIAL STATEMENTS

Single Discount Rate

A single discount rate of 7.75% 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 7.75%. 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 7.75%, 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 6.75%	Current Single Discount Rate Assumption 7.75%	1% Increase 8.75%
Total Pension Liability	$4,245,249,910	$3,802,443,730	$3,432,060,987
Plan Fiduciary Net Position	2,169,775,040	2,169,775,040	2,169,775,040
Net Pension Liability	$2,075,474,870	$1,632,668,690	$1,262,285,947

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

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, 2017 is $219,560,390.

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.

Post Measurement Date Plan Changes

There were two plan changes after the measurement date that were not included in the valuation:

a) 5-year vesting for Tier 2011 members; and
b) Optional lump sum payments to deferred vested members during a window period.

Neither change is expected to have a material effect on the TPL. For purposes of this statement, material is defined to be greater than 2% in absolute value. Both changes will be reflected in the 2018 valuation.

Summary of Population Statistics

Inactive Plan Members or Beneficiaries Currently Receiving Benefits	8,831
Inactive Plan Members Entitled to But Not Yet Receiving Benefits	2,324
Active Plan Members	7,456
Total Plan Members	18,611

SECTION E

SUMMARY OF BENEFITS

Missouri Department of Transportation and Highway Patrol Employees' Retirement System Summary of Benefit Provisions Evaluated as of June 30, 2017

Closed Plan

Participation

Participants include:

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

Year 2000 Plan

Participation

Participants include:

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

2011 Tier

Participation

Participants include:

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

**See Chapter 104.010.1(32) RSMo*

Closed Plan

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 retiring 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).

Year 2000 Plan

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).

2011 Tier

Normal Retirement Eligibility (unreduced benefit)

Non-Uniformed Employees: The earlier of attaining:

1. Age 67 with at least 10 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 10 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). 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).

Closed Plan

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.

Year 2000 Plan

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.

2011 Tier

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 10 years of creditable service.

Amount:

Normal retirement amount reduced by 0.5% for each month that retirement precedes eligibility for normal retirement.

Uniformed Patrol members are not eligible for early retirement.

Closed Plan	Year 2000 Plan	2011 Tier
Vested Deferred Benefits	**Vested Deferred Benefits**	**Vested Deferred Benefits**
Eligibility: All Employees Fully vested in accrued pension with 5 years of creditable service. The benefit will commence at the age the individual is eligible for early or normal retirement, considering years of creditable service.	***Eligibility: All Employees*** Fully vested in accrued pension with 5 years of creditable service. The benefit will commence at the age the individual is eligible for early or normal retirement considering years of creditable service. Normal retirement eligibility begins at age 62.	***Eligibility: All Employees*** Fully vested in accrued pension with 10 years of creditable service. The benefit will commence at the age the individual is eligible for normal retirement considering years of creditable service. Normal retirement eligibility begins at age 67.
Minimum Base Benefit	**Minimum Base Benefit**	**Minimum Base Benefit**
Receive a monthly base benefit of no less than $15 for each full year of creditable service. Must be eligible to receive a normal or early retirement benefit the first of the month immediately following the date you leave state employment. Not required to immediately start drawing a benefit.	Same.	Same.
Death Prior to Retirement	**Death Prior to Retirement**	**Death Prior to Retirement**
The spouse of the member who dies after accruing 5 years of creditable service may elect to receive an annuity as if the employee had retired on the date of death and elected a joint and 100% survivor annuity. If no eligible spouse survives or upon the death of the spouse, 80% of the member's accrued annuity will be paid to eligible children until age 21. If the member has 3 or more, but less than 5 years of creditable service, the surviving spouse may elect to receive an annuity equal to 25% of the accrued benefit. If the death is duty-related, there is no service requirement and the minimum annuity is 50% of the final average pay (FAP) to the surviving spouse or eligible children.	The spouse of the member who dies after accruing 5 years of creditable service may elect to receive an annuity as if the employee had retired on the date of death and elected a joint and 100% survivor annuity. If no eligible spouse survives or upon the death of the spouse, 80% of the member's accrued annuity will be paid to eligible children until age 21. If the death is duty related, there is no service requirement and the minimum annuity is 50% of the final average pay (FAP) to the surviving spouse or eligible children.	The spouse of the member who dies after accruing 10 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.

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

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

Closed Plan	Year 2000 Plan	2011 Tier
Portability: Section 105.691 allows vested members to acquire (purchase/transfer) service credit for any non-federal, full-time public sector employment within Missouri. Service may be purchased/transferred by using the member's own money and/or using the value of the retirement benefit in the prior retirement plan if that plan has an agreement with MPERS. Any non-federal public employment **not covered** by a retirement plan must be purchased.	**Portability:** Same as Closed Plan Section 105.691. In addition, Section 104.1090 provides that in-state vested service with another retirement system may be granted after 10 years of state service if the other retirement plan agrees to transfer assets equal to the accrued liability to MPERS. Service may be purchased/transferred by using the member's own money and/or using the value of the retirement benefit in the prior retirement plan if that plan has an agreement with MPERS. Any non-federal public employment **not covered** by a retirement plan must be purchased.	**Portability:** Same as Closed Plan Section 105.691.
Public Employment Prior Service (Subsidized Purchase)	**Public Employment Prior Service (Subsidized Purchase)**	**Public Employment Prior Service (Subsidized Purchase)**
Section 104.040.6 allows, prior to retirement, members may purchase up to a maximum of 4 years full-time "public employment." Public employment refers to employment with a city, county, municipality, public school, or other political subdivision. Federal and out-of-state employment is not eligible. Members must purchase all months of service they are eligible for up to 4 years.	Not available.	Not available.
Disability	**Disability**	**Disability**
Benefits that may be payable during the period of disability (whether Normal, Work-related, or LTD) are administered through a separate program and were not considered for purposes of the valuation. Normal retirement benefits become payable at the time a disabled member becomes eligible for normal retirement, and are computed based on: i) the service that would have accrued to the member if active employment had continued; and ii) the member's rate of pay at the time of disability.	Benefits that may be payable during the period of disability (whether Normal, Work-related, or LTD) are administered through a separate program and were not considered for purposes of the valuation. Normal retirement benefits become payable at the time a disabled member becomes eligible for normal retirement, and are computed based on: i) the service that would have accrued to the member if active employment had continued; and ii) the member's rate of pay at the time of disability increased by 80% of CPI to the retirement date.	Benefits that may be payable during the period of disability (whether Normal, Work-related, or LTD) are administered through a separate program and were not considered for purposes of the valuation. Normal retirement benefits become payable at the time a disabled member becomes eligible for normal retirement, and are computed based on: i) the service that would have accrued to the member if active employment had continued; and ii) the member's rate of pay at the time of disability increased by 80% of CPI to the retirement date.

Closed Plan	Year 2000 Plan	2011 Tier
Post-Retirement Benefit Adjustments	**Post-Retirement Benefit Adjustments**	**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%.	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%.	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	**Member Contributions**	**Member Contributions**
None.	None.	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, 2017

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, 2013 actuarial valuation, following a five-year actuarial investigation. They were adopted by the Board. The assumptions will be reviewed in detail in the next experience study which will be performed after this valuation.

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

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

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

Economic Assumptions

The investment return rate used in making the valuations was 7.75% per year, compounded annually (net after investment expenses). The ***wage inflation rate*** was assumed to be 3.50%. 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 7.75% investment return rate and 3.50% wage inflation rate translates to an assumed real rate of return over wage growth net of expenses of 4.25%. Based upon other assumptions, the net real rate of return over price inflation is 4.75%.

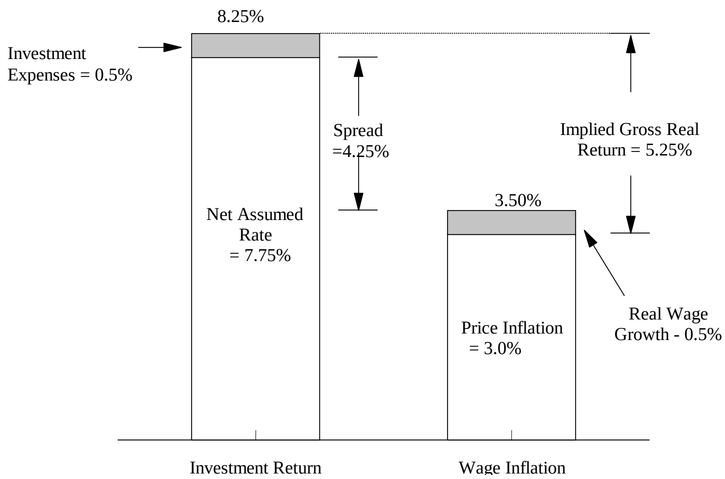
Pay increase assumptions for merit and seniority for individual active members are shown on pages 32 and 33. Part of the total assumed pay increase at each age is for merit and/or seniority, and the other 3.50% recognizes wage inflation. ***The active member payroll*** for all members is assumed to increase 3.50% annually for all years.

The price inflation rate is assumed to be 3.00% annually. This is the inflation rate upon which the post-retirement increases are based. The difference between wage and price inflation of 0.5% is attributable to overall productivity increases and macroeconomic factors.

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

Summary of Valuation Method and Assumptions
June 30, 2017 (Continued)

Economic Assumptions



Reviewing the Investment Return Assumption

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

The investment consultants who have shared their capital market assumptions with us are (in alphabetical order) BNY Mellon, JPMorgan, Marquette, Mercer, NEPC, PCA, RVK, and VOYA. It is important to understand that, in general, no two investment consultants will consider the same asset classes. Moreover, there are differences in investment horizons, price inflation, the treatment of investment expenses, excess manager performance (i.e., alpha), geometric vs. arithmetic averages, and other technical differences.

We have incorporated the assumptions of these eight consultants into our Capital Market Assumption Modeler (CMAM). To the best of our ability, we have adapted the System's investment policy to fit with the eight consultants' assumptions adjusting for these known differences in assumptions and methodology. In the following charts, all returns are net of investment expenses only and have no assumption for excess manager performance (alpha).

Summary of Valuation Method and Assumptions
June 30, 2017 (Continued)

Investment Consultant	Investment Consultant Expected Nominal Return	Investment Consultant Inflation Assumption	Expected Real Return (2)–(3)	Actuary Inflation Assumption	Expected Nominal Return (4)+(5)	Investment Expenses	Expected Nominal Return Net of Expenses (6)-(7)	Standard Deviation of Expected Return (1-Year)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	6.02%	2.20%	3.82%	3.00%	6.82%	0.00%	6.82%	11.28%
2	6.03%	2.00%	4.03%	3.00%	7.03%	0.00%	7.03%	9.77%
3	6.52%	2.26%	4.26%	3.00%	7.26%	0.00%	7.26%	9.63%
4	6.92%	2.50%	4.42%	3.00%	7.42%	0.00%	7.42%	12.09%
5	6.99%	2.50%	4.49%	3.00%	7.49%	0.00%	7.49%	11.43%
6	7.55%	2.25%	5.30%	3.00%	8.30%	0.00%	8.30%	8.81%
7	7.70%	2.21%	5.48%	3.00%	8.48%	0.00%	8.48%	11.65%
8	8.00%	2.25%	5.75%	3.00%	8.75%	0.00%	8.75%	15.11%
Average	**6.96%**	**2.27%**	**4.69%**	**3.00%**	**7.69%**	**0.00%**	**7.69%**	**11.22%**

Investment Consultant	Distribution of 20-Year Average Geometric Net Nominal Return 40th	50th	60th	Probability of Exceeding 7.75%
(1)	(2)	(3)	(4)	(5)
1	5.59%	6.23%	6.86%	27.27%
2	6.04%	6.58%	7.14%	29.67%
3	6.29%	6.83%	7.37%	33.37%
4	6.07%	6.75%	7.43%	35.45%
5	6.25%	6.89%	7.53%	36.73%
6	7.45%	7.94%	8.44%	53.93%
7	7.21%	7.86%	8.52%	51.75%
8	6.88%	7.72%	8.56%	49.61%
Average	**6.47%**	**7.10%**	**7.73%**	**39.72%**

Based on the current asset allocation policy as well as the current price inflation assumption, the investment return assumption is reasonable. Both the price inflation assumption and the investment return assumption will be reviewed in the Plan's next experience study which will be issued after this valuation. It is important to note that as the economy and forward looking expectations have changed since the last experience study, the current assumptions have become aggressive. While we have stated that the assumptions are reasonable for this valuation, that may not continue in the future, if recent trends in forward looking expectations continue.

Summary of Valuation Method and Assumptions
June 30, 2017 (Concluded)

Non-Economic Assumptions

The mortality tables, for post-retirement mortality, used in evaluating allowances to be paid to non-disabled pensioners were the RP-2000 Combined Healthy Mortality Tables projected 16 years and set back 1 year for males and females. Pre-retirement mortality used was 70% for males and 50% for females of the post-retirement tables set back 1 year for males and set back 1 year for females. Disabled pension mortality was based on PBGC Disabled Mortality tables. Related values are shown on page 34. The healthy mortality tables include a margin for mortality improvement. The margin is in the 16-year projection. The disabled mortality tables do not include a margin for mortality improvement.

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 withdrawal from service are shown on pages 38 and 39. ***The probabilities of disability*** are shown on page 37.

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

Present assets (cash & investments) were used without a market value adjustment. Assets may be used in the valuation prior to the final audit.

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.

Age Based Salary Scale

All Plan Participants

Age	Salary Increase Assumptions for an Individual Member					
	Non-Uniformed			Uniformed		
	Merit & Seniority	Base (Economic)	Increase Next Year	Merit & Seniority	Base (Economic)	Increase Next Year
20	4.40%	3.50%	7.90%	6.00%	3.50%	9.50%
21	4.11%	3.50%	7.61%	6.00%	3.50%	9.50%
22	3.84%	3.50%	7.34%	6.00%	3.50%	9.50%
23	3.60%	3.50%	7.10%	5.48%	3.50%	8.98%
24	3.38%	3.50%	6.88%	4.89%	3.50%	8.39%
25	3.18%	3.50%	6.68%	4.25%	3.50%	7.75%
26	3.08%	3.50%	6.58%	3.54%	3.50%	7.04%
27	2.90%	3.50%	6.40%	3.38%	3.50%	6.88%
28	2.82%	3.50%	6.32%	3.08%	3.50%	6.58%
29	2.66%	3.50%	6.16%	2.78%	3.50%	6.28%
30	2.59%	3.50%	6.09%	2.48%	3.50%	5.98%
31	2.44%	3.50%	5.94%	2.18%	3.50%	5.68%
32	2.39%	3.50%	5.89%	1.88%	3.50%	5.38%
33	2.25%	3.50%	5.75%	1.76%	3.50%	5.26%
34	2.20%	3.50%	5.70%	1.65%	3.50%	5.15%
35	2.09%	3.50%	5.59%	1.54%	3.50%	5.04%
36	1.97%	3.50%	5.47%	1.43%	3.50%	4.93%
37	1.87%	3.50%	5.37%	1.31%	3.50%	4.81%
38	1.76%	3.50%	5.26%	1.24%	3.50%	4.74%
39	1.60%	3.50%	5.10%	1.16%	3.50%	4.66%
40	1.44%	3.50%	4.94%	1.09%	3.50%	4.59%
41	1.23%	3.50%	4.73%	1.01%	3.50%	4.51%
42	1.09%	3.50%	4.59%	0.94%	3.50%	4.44%
43	0.95%	3.50%	4.45%	0.86%	3.50%	4.36%
44	0.81%	3.50%	4.31%	0.79%	3.50%	4.29%
45	0.68%	3.50%	4.18%	0.71%	3.50%	4.21%
46	0.56%	3.50%	4.06%	0.64%	3.50%	4.14%
47	0.43%	3.50%	3.93%	0.56%	3.50%	4.06%
48	0.31%	3.50%	3.81%	0.53%	3.50%	4.03%
49	0.18%	3.50%	3.68%	0.49%	3.50%	3.99%
50	0.12%	3.50%	3.62%	0.45%	3.50%	3.95%
51	0.06%	3.50%	3.56%	0.41%	3.50%	3.91%
52	0.06%	3.50%	3.56%	0.38%	3.50%	3.88%
53	0.00%	3.50%	3.50%	0.35%	3.50%	3.85%
54	0.00%	3.50%	3.50%	0.32%	3.50%	3.82%
55	0.00%	3.50%	3.50%	0.29%	3.50%	3.79%
56	0.00%	3.50%	3.50%	0.26%	3.50%	3.76%
57	0.00%	3.50%	3.50%	0.23%	3.50%	3.73%
58	0.00%	3.50%	3.50%	0.23%	3.50%	3.73%
59	0.00%	3.50%	3.50%	0.23%	3.50%	3.73%
60	0.00%	3.50%	3.50%	0.23%	3.50%	3.73%
Ref.	11			403		

Service Based Salary Scale

Non-Uniformed Plan Participants

% Merit Increases in Salaries Next Year*	
Service Index	Rate
1	8.0%
2	7.0%
3	4.5%
4	4.0%
Ref	519

Uniformed Plan Participants

% Merit Increases in Salaries Next Year*	
Service Index	Rate
1	10.0%
2	10.0%
Ref	518

* *For Non-Uniformed members with 4 or less years of service and Uniformed members with 2 or less years of service, the service based table overwrites the age based table on page 32.*

Post-Retirement Mortality

Age	Regular		Disabled		Age	Regular		Disabled	
	Male	Female	Male	Female		Male	Female	Male	Female
21	0.00025	0.00015	0.04589	0.02630	61	0.00521	0.00467	0.05928	0.03390
22	0.00027	0.00015	0.04589	0.02630	62	0.00603	0.00537	0.06109	0.03470
23	0.00028	0.00015	0.04589	0.02630	63	0.00688	0.00614	0.06242	0.03550
24	0.00029	0.00015	0.04589	0.02630	64	0.00799	0.00706	0.06346	0.03620
25	0.00031	0.00016	0.04589	0.02630	65	0.00900	0.00796	0.06441	0.03700
26	0.00032	0.00017	0.04380	0.02570	66	0.01017	0.00896	0.06527	0.03780
27	0.00034	0.00018	0.04142	0.02530	67	0.01169	0.01011	0.06622	0.03860
28	0.00035	0.00018	0.03905	0.02470	68	0.01304	0.01123	0.06736	0.03940
29	0.00036	0.00019	0.03686	0.02420	69	0.01426	0.01241	0.06869	0.04020
30	0.00038	0.00020	0.03439	0.02370	70	0.01580	0.01372	0.07021	0.04110
31	0.00041	0.00023	0.03221	0.02320	71	0.01744	0.01545	0.07192	0.04210
32	0.00046	0.00027	0.03040	0.02270	72	0.01929	0.01687	0.07372	0.04330
33	0.00052	0.00031	0.02869	0.02220	73	0.02142	0.01877	0.07562	0.04470
34	0.00058	0.00034	0.02736	0.02180	74	0.02386	0.02053	0.07771	0.04650
35	0.00065	0.00037	0.02641	0.02140	75	0.02662	0.02275	0.07999	0.04920
36	0.00071	0.00040	0.02584	0.02120	76	0.03019	0.02472	0.08256	0.05290
37	0.00078	0.00042	0.02575	0.02100	77	0.03365	0.02723	0.08626	0.05780
38	0.00083	0.00045	0.02594	0.02080	78	0.03805	0.03048	0.09139	0.06310
39	0.00088	0.00048	0.02622	0.02080	79	0.04297	0.03360	0.09909	0.06860
40	0.00091	0.00051	0.02679	0.02090	80	0.04853	0.03709	0.10716	0.07460
41	0.00095	0.00055	0.02736	0.02100	81	0.05481	0.04100	0.11600	0.08130
42	0.00099	0.00061	0.02822	0.02130	82	0.06234	0.04538	0.12559	0.08850
43	0.00104	0.00067	0.02898	0.02160	83	0.07078	0.05031	0.13604	0.09620
44	0.00109	0.00074	0.02983	0.02190	84	0.07890	0.05586	0.14735	0.10430
45	0.00115	0.00081	0.03059	0.02240	85	0.08917	0.06213	0.15970	0.11280
46	0.00122	0.00087	0.03135	0.02290	86	0.09898	0.07034	0.17338	0.12210
47	0.00129	0.00093	0.03230	0.02350	87	0.10974	0.07972	0.18810	0.13220
48	0.00136	0.00099	0.03354	0.02420	88	0.12355	0.09035	0.20425	0.14320
49	0.00144	0.00107	0.03487	0.02490	89	0.13898	0.10064	0.22135	0.15510
50	0.00152	0.00116	0.03639	0.02570	90	0.15359	0.11356	0.23988	0.16820
51	0.00160	0.00127	0.03810	0.02640	91	0.17202	0.12550	0.26021	0.18250
52	0.00180	0.00143	0.03990	0.02720	92	0.18736	0.13782	0.28234	0.19800
53	0.00193	0.00161	0.04171	0.02810	93	0.20644	0.15022	0.30647	0.21500
54	0.00211	0.00182	0.04370	0.02880	94	0.22270	0.16506	0.33203	0.23300
55	0.00231	0.00206	0.04579	0.02950	95	0.23893	0.17704	0.35996	0.25250
56	0.00267	0.00239	0.04807	0.03010	96	0.25906	0.18838	0.39036	0.27390
57	0.00314	0.00281	0.05045	0.03070	97	0.27496	0.19891	0.42351	0.29720
58	0.00357	0.00321	0.05273	0.03150	98	0.29040	0.21182	0.45961	0.32260
59	0.00407	0.00362	0.05520	0.03230	99	0.31029	0.22039	0.49809	0.34950
60	0.00459	0.00410	0.05729	0.03310	100	0.32496	0.22771	0.53998	0.37890
Ref	#508sb1x1	#509sb1x1	#250sb0x0.95	#251sb0x1		#508sb1x1	#509sb1x1	#250sb0x0.95	#251sb0x1

Pre-Retirement mortality is 70% of the regular post-retirement mortality values for males and 50% of the regular post-retirement mortality values for females.

Joint Life Retirement Values
(7.75% Interest)

Sample Attained Ages	Present Value of $1 Monthly for Life		Percent Dying Next Year		Future Life Expectancy (years)	
	Men	Women	Men	Women	Men	Women
50	$147.46	$147.37	0.1516%	0.1159%	33.34	35.39
55	142.23	142.00	0.2313%	0.2064%	28.61	30.63
60	135.19	134.87	0.4593%	0.4099%	24.03	26.02
65	126.18	125.80	0.9002%	0.7955%	19.69	21.67
70	115.18	114.73	1.5803%	1.3715%	15.71	17.66
75	101.84	101.56	2.6618%	2.2752%	12.07	14.01
80	86.45	86.42	4.8531%	3.7094%	8.86	10.73
Ref:	#508sb1x1	#509sb1x1				

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

	Closed and Year 2000 Plans					2011 Tier			
	Non-Uniformed				Uniformed	Non-Uniformed			Uniformed
	Male		Female			Normal			
Age	Normal	Early	Normal	Early	Normal	Age & Service	Rule of 90	Early	Normal
50	0.3000		0.2500		0.3500				
51	0.2500		0.2000		0.1500				
52	0.2600		0.2000		0.1500				
53	0.2600		0.2000		0.1500				
54	0.2400		0.2400		0.1500				
55	0.2700	0.0300	0.3200	0.0300	0.2000		0.3000		0.3000
56	0.3000	0.0300	0.3500	0.0300	0.1500		0.3000		0.3000
57	0.2600	0.0400	0.2900	0.0300	0.3000		0.3000		0.3000
58	0.2200	0.0200	0.2500	0.0300	0.3500		0.3000		0.3000
59	0.2500	0.0400	0.3000	0.0300	0.5000		0.3000		0.3000
60	0.1900	0.0800	0.2200	0.0600	1.0000		0.3000		1.0000
61	0.1800	0.0400	0.2200	0.0500	1.0000		0.3000		1.0000
62	0.4500	0.3000	0.3600	0.3000	1.0000		0.3000	0.1000	1.0000
63	0.3700	0.4000	0.2200	0.3000	1.0000		0.3000	0.1000	1.0000
64	0.2500	0.4000	0.2000	0.2500	1.0000		0.3000	0.1000	1.0000
65	0.3500		0.3500		1.0000		0.3000	0.1000	1.0000
66	0.4000		0.4500		1.0000		0.3000	0.1000	1.0000
67	0.2500		0.4000		1.0000	0.5000	0.3000		1.0000
68	0.3000		0.4000		1.0000	0.5000	0.3000		1.0000
69	0.3000		0.4000		1.0000	0.5000	0.3000		1.0000
70	0.4000		0.5000		1.0000	1.0000	1.0000		1.0000
71	0.5000		0.5000		1.0000	1.0000	1.0000		1.0000
72	0.5000		1.0000		1.0000	1.0000	1.0000		1.0000
73	0.5000								
74	1.0000								
Ref	2265	2267	2266	2268	2264	1873	1875	1262	1875

Rates of Disability

All Plan Participants

Age	Non-Uniformed		Uniformed		Age	Non-Uniformed		Uniformed	
	Male	Female	Male	Female		Male	Female	Male	Female
21	0.0000	0.0006	0.0000	0.0000	51	0.0037	0.0059	0.0022	0.0022
22	0.0004	0.0006	0.0000	0.0000	52	0.0041	0.0063	0.0024	0.0024
23	0.0004	0.0007	0.0000	0.0000	53	0.0046	0.0067	0.0028	0.0028
24	0.0004	0.0007	0.0000	0.0000	54	0.0054	0.0071	0.0031	0.0031
25	0.0004	0.0007	0.0001	0.0001	55	0.0062	0.0074	0.0035	0.0035
26	0.0004	0.0007	0.0001	0.0001	56	0.0072	0.0078	0.0039	0.0039
27	0.0004	0.0008	0.0002	0.0002	57	0.0082	0.0082	0.0043	0.0043
28	0.0007	0.0008	0.0002	0.0002	58	0.0093	0.0086	0.0048	0.0048
29	0.0009	0.0008	0.0002	0.0002	59	0.0102	0.0090	0.0052	0.0052
30	0.0009	0.0008	0.0002	0.0002	60	0.0112	0.0090	0.0058	0.0058
31	0.0011	0.0009	0.0002	0.0002	61	0.0120	0.0090	0.0063	0.0063
32	0.0011	0.0010	0.0002	0.0002	62	0.0126	0.0090	0.0070	0.0070
33	0.0011	0.0011	0.0002	0.0002	63	0.0128	0.0090	0.0077	0.0077
34	0.0011	0.0012	0.0002	0.0002	64	0.0128	0.0090	0.0077	0.0077
35	0.0013	0.0013	0.0002	0.0002	65	0.0000	0.0090	0.0000	0.0000
36	0.0013	0.0014	0.0002	0.0002	66	0.0000	0.0090	0.0000	0.0000
37	0.0013	0.0015	0.0003	0.0003	67	0.0000	0.0090	0.0000	0.0000
38	0.0015	0.0015	0.0003	0.0003	68	0.0000	0.0090	0.0000	0.0000
39	0.0017	0.0016	0.0004	0.0004	69	0.0000	0.0090	0.0000	0.0000
40	0.0017	0.0017	0.0005	0.0005	70	0.0000	0.0090	0.0000	0.0000
41	0.0018	0.0021	0.0006	0.0006	71	0.0000	0.0090	0.0000	0.0000
42	0.0020	0.0025	0.0006	0.0006	72	0.0000	0.0090	0.0000	0.0000
43	0.0021	0.0029	0.0007	0.0007	73	0.0000	0.0090	0.0000	0.0000
44	0.0022	0.0032	0.0008	0.0008	74	0.0000	0.0090	0.0000	0.0000
45	0.0023	0.0036	0.0009	0.0009	75	0.0000	0.0090	0.0000	0.0000
46	0.0026	0.0040	0.0011	0.0011	76	0.0000	0.0090	0.0000	0.0000
47	0.0028	0.0044	0.0012	0.0012	77	0.0000	0.0090	0.0000	0.0000
48	0.0030	0.0048	0.0014	0.0014	78	0.0000	0.0090	0.0000	0.0000
49	0.0031	0.0052	0.0016	0.0016	79	0.0000	0.0090	0.0000	0.0000
50	0.0033	0.0055	0.0019	0.0019	80	0.0000	0.0090	0.0000	0.0000
Ref	#186x0.8	#517x0.6	#19x0.75	#19x0.75		#186x0.8	#517x0.6	#19x0.75	#19x0.75

Rates of Separation from Active Employment
Less Than 5 Years of Service

All Plan Participants

	Non-Uniformed		Uniformed	
Service	Male	Female	Male	Female
0-1	0.3000	0.2000	0.1000	0.1000
1-2	0.1600	0.1400	0.0700	0.0700
2-3	0.0900	0.1100	0.0325	0.0325
3-4	0.0700	0.0900	0.0300	0.0300
4-5	0.0550	0.0500	0.0275	0.0275
Ref	852	853	851	851

This assumption was first used in the June 30, 2013 valuation.

Rates of Separation from Active Employment
More Than 5 Years of Service

All Plan Participants

	Non-Uniformed		Uniformed	
Age	Male	Female	Male	Female
25	0.0575	0.0510	0.0270	0.0270
26	0.0575	0.0510	0.0270	0.0270
27	0.0575	0.0510	0.0270	0.0270
28	0.0554	0.0510	0.0270	0.0270
29	0.0533	0.0510	0.0270	0.0270
30	0.0512	0.0510	0.0270	0.0270
31	0.0492	0.0510	0.0270	0.0270
32	0.0472	0.0510	0.0261	0.0261
33	0.0452	0.0493	0.0236	0.0236
34	0.0432	0.0476	0.0213	0.0213
35	0.0412	0.0459	0.0191	0.0191
36	0.0393	0.0442	0.0170	0.0170
37	0.0375	0.0425	0.0152	0.0152
38	0.0356	0.0408	0.0136	0.0136
39	0.0338	0.0391	0.0122	0.0122
40	0.0321	0.0374	0.0113	0.0113
41	0.0304	0.0357	0.0105	0.0105
42	0.0287	0.0340	0.0098	0.0098
43	0.0271	0.0323	0.0092	0.0092
44	0.0256	0.0306	0.0085	0.0085
45	0.0241	0.0289	0.0079	0.0079
46	0.0226	0.0272	0.0072	0.0072
47	0.0213	0.0255	0.0065	0.0065
48	0.0200	0.0238	0.0058	0.0058
49	0.0188	0.0221	0.0052	0.0052
50	0.0176	0.0204	0.0046	0.0046
51	0.0165	0.0187	0.0038	0.0038
52	0.0155	0.0170	0.0033	0.0033
53	0.0146	0.0153	0.0029	0.0029
54	0.0137	0.0136	0.0028	0.0028
55	0.0129	0.0119	0.0023	0.0023
56	0.0123	0.0102	0.0025	0.0025
57	0.0116	0.0085	0.0019	0.0019
58	0.0111	0.0068	0.0019	0.0019
59	0.0107	0.0051	0.0018	0.0018
60	0.0104	0.0034	0.0017	0.0017
61	0.0102	0.0017		
62	0.0101	0.0000		
63	0.0101	0.0000		
64	0.0102	0.0000		
65	0.0104	0.0000		
66	0.0107	0.0000		
67	0.0111	0.0000		
68	0.0111	0.0000		
69	0.0111	0.0000		
Ref	#63x0.7	#684x0.85	#1272x1	#1272x1

Miscellaneous and Technical Assumptions

Administrative Expenses:	1.21% 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.
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.
Deferred Joint and Survivor:	For the purpose of valuing the Joint and Survivor option it was assumed that all deferred members would choose closed plan benefits.
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 3.0% 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 23% to account for future survivor benefits. Liabilities for future deferred members were increased by 2% to account for potential survivor benefits payable if the member dies during the deferred period. The rationale for this load is based on the associated liabilities for the current deferred members.
Contribution Stabilization Reserve Fund:	The contribution stabilization reserve fund affects the total amount of UAAL financed and is assumed to grow at the investment return rate.

Miscellaneous and Technical Assumptions (Concluded)

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.
Death after Retirement:	For purposes of valuing the 50% death after retirement benefit, 100% of closed active members are assumed to be married.
Beneficiaries:	Male spouses are assumed to be 3 years older than females if beneficiary information is not available.
Minimum Benefit Eligibility:	Deferred benefits and death prior to retirement benefits are assumed to be eligible for the minimum base benefit along with normal and early retirement benefits.
Active Plan Choice:	It was assumed that active members eligible for the Closed plan would choose the Closed plan benefits at retirement.
Joint and Survivor Factors:	For purposes of Death Prior to Retirement, the actuarial reduction for Closed members was calculated using the current valuation assumptions. The reduction for the Y2K and 2011 Tier benefits was calculated in accordance with 104.1027 RSMo.

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. Last year's salary as provided in the current valuation data was used if current year's salary was less than 100.

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 2.4% (80% of the current 3.0% CPI assumption) projected annual increases.

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

Method of Financing Future Benefits for Present Active Members

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

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

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

The ***Value of Future Benefits*** was calculated using the benefits assumed to be payable in the future to current active, terminated vested and retired members. It was assumed that current active and retired Uniformed Patrol members hired prior to July 1, 2000 would elect to retain the benefits under the current plan. Computed costs were increased in accordance with the loads described on page 40.

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, 2017, 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 an 18-year amortization of unfunded actuarial accrued liabilities. The amortization period is a closed 18-year period starting July 1, 2018.

Temporary Accelerated Policy: The total contribution is based on normal cost plus a 7-year amortization period for unfunded retiree liabilities and a 22-year amortization period for other unfunded liabilities. Both amortization periods are closed periods starting July 1, 2018.

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

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 7.75%; the municipal bond rate is 3.56%; and the resulting single discount rate is 7.75%.

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

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

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

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

The table on page 44 shows the projected contributions on behalf of the current members. This contribution is based on the current funding policy. The amortization of UAL is similar to the amortization schedule shown in the June 30, 2017 valuation report and includes the effects of the $219,560,390 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 47 and 48 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, 2067

Year	Valuation Payroll for Current Employees	Contributions from Current Employees	Service Cost and Expense Contributions	UAL Contributions	Total Contributions
0	$ 348,979,212				
1	352,324,745	$ 3,317,665	$ 44,638,187	$ 162,459,463	$ 210,415,315
2	340,883,751	3,248,915	43,147,623	168,145,544	214,542,082
3	330,868,198	3,242,469	41,737,360	174,030,638	219,010,467
4	320,881,379	3,259,917	40,276,533	180,121,710	223,658,159
5	310,462,741	3,293,192	38,699,032	186,425,970	228,418,194
6	299,262,052	3,327,462	36,982,044	192,950,879	233,260,385
7	287,363,659	3,354,818	35,150,280	199,704,159	238,209,257
8	274,732,024	3,376,075	33,208,748	206,693,805	243,278,628
9	261,557,565	3,386,348	31,198,052	125,405,927	159,990,326
10	248,361,444	3,385,797	29,184,813	129,795,134	162,365,744
11	235,448,629	3,388,134	27,225,390	134,337,964	164,951,488
12	222,931,947	3,397,589	25,339,549	139,039,793	167,776,930
13	210,667,743	3,407,623	23,519,444	143,906,185	170,833,252
14	198,829,146	3,419,315	21,789,353	148,942,902	174,151,570
15	187,283,846	3,430,588	20,125,551	154,155,904	177,712,043
16	175,962,209	3,437,684	18,513,508	159,551,360	181,502,551
17	164,923,913	3,440,383	16,969,356	165,135,658	185,545,397
18	154,313,916	3,438,660	15,504,285	170,915,406	189,858,351
19	144,295,589	3,432,756	14,133,065	176,897,445	194,463,266
20	134,647,628	3,421,500	12,822,062	(12,822,062)	3,421,500
21	125,359,451	3,404,238	11,568,715	(11,568,715)	3,404,238
22	116,617,282	3,381,027	10,393,147	(10,393,147)	3,381,027
23	108,764,835	3,348,514	9,349,222	(9,349,222)	3,348,514
24	101,837,815	3,301,062	8,454,294	-	11,755,356
25	95,419,126	3,230,615	7,663,670	-	10,894,285
26	89,031,936	3,124,933	6,928,575	-	10,053,508
27	82,255,390	2,973,252	6,212,337	-	9,185,589
28	74,660,058	2,764,780	5,474,820	-	8,239,600
29	66,196,477	2,501,219	4,712,019	-	7,213,238
30	57,135,617	2,193,392	3,954,037	-	6,147,429
31	47,624,829	1,850,319	3,209,295	-	5,059,614
32	38,254,314	1,497,294	2,517,636	-	4,014,930
33	29,426,977	1,155,464	1,898,119	-	3,053,583
34	21,449,002	843,537	1,358,168	-	2,201,705
35	14,996,260	590,294	930,286	-	1,520,580
36	10,284,286	405,119	622,875	-	1,027,994
37	6,956,928	274,233	409,659	-	683,892
38	4,708,487	185,790	270,093	-	455,884
39	3,169,773	125,235	177,336	-	302,570
40	2,122,729	84,000	115,579	-	199,579
41	1,457,913	57,815	79,122	-	136,937
42	980,586	38,961	52,978	-	91,939
43	645,113	25,677	34,638	-	60,315
44	410,490	16,364	21,991	-	38,355
45	247,944	9,895	13,259	-	23,154
46	140,784	5,623	7,405	-	13,028
47	69,222	2,767	3,645	-	6,412
48	28,221	1,128	1,486	-	2,614
49	9,987	399	516	-	915
50	2,515	101	126	-	226

Single Discount Rate Development
Projection of Plan Fiduciary Net Position Ending June 30, 2117

Year	Projected Beginning Plan Net Position	Projected Total Contributions	Projected Benefit Payments	Projected Administrative Expenses	Projected Investment Earnings at 7.75%	Projected Ending Plan Net Position
	(a)	(b)	(c)	(d)	(e)	(f)=(a)+(b)-(c)-(d)+(e)
1	$ 2,169,775,040	$ 210,415,315	$ 244,676,615	$ 4,263,129	$ 166,692,598	$ 2,297,943,210
2	2,297,943,210	214,542,082	251,355,143	4,124,693	176,533,860	2,433,539,316
3	2,433,539,316	219,010,467	258,706,923	4,003,505	186,937,520	2,576,776,875
4	2,576,776,875	223,658,159	266,306,926	3,882,665	197,930,758	2,728,176,201
5	2,728,176,201	228,418,194	274,311,614	3,756,599	209,545,616	2,888,071,798
6	2,888,071,798	233,260,385	283,331,321	3,621,071	221,783,820	3,056,163,611
7	3,056,163,611	238,209,257	292,352,135	3,477,100	234,661,566	3,233,205,199
8	3,233,205,199	243,278,628	301,972,486	3,324,257	248,215,042	3,419,402,126
9	3,419,402,126	159,990,326	312,322,486	3,164,847	259,090,584	3,522,995,702
10	3,522,995,702	162,365,744	322,383,115	3,005,173	266,832,913	3,626,806,071
11	3,626,806,071	164,951,488	331,579,169	2,848,928	274,632,788	3,731,962,249
12	3,731,962,249	167,776,930	341,011,639	2,697,477	282,536,906	3,838,566,969
13	3,838,566,969	170,833,252	349,793,248	2,549,080	290,586,699	3,947,644,592
14	3,947,644,592	174,151,570	358,142,331	2,405,833	298,854,357	4,060,102,356
15	4,060,102,356	177,712,043	366,382,274	2,266,135	307,397,200	4,176,563,190
16	4,176,563,190	181,502,551	373,893,366	2,129,143	316,286,642	4,298,329,874
17	4,298,329,874	185,545,397	381,123,984	1,995,579	325,607,417	4,426,363,125
18	4,426,363,125	189,858,351	386,840,051	1,867,198	335,481,520	4,562,995,748
19	4,562,995,748	194,463,266	392,343,861	1,745,977	346,040,976	4,709,410,152
20	4,709,410,152	3,421,500	396,342,446	1,629,236	349,975,737	4,664,835,707
21	4,664,835,707	3,404,238	399,935,615	1,516,849	346,388,198	4,613,175,679
22	4,613,175,679	3,381,027	402,389,580	1,411,069	342,294,368	4,555,050,425
23	4,555,050,425	3,348,514	402,718,047	1,316,054	337,779,547	4,492,144,385
24	4,492,144,385	11,755,356	401,717,258	1,232,238	333,265,260	4,434,215,506
25	4,434,215,506	10,894,285	398,877,404	1,154,571	328,853,973	4,373,931,789
26	4,373,931,789	10,053,508	395,434,642	1,077,286	324,283,869	4,311,757,238
27	4,311,757,238	9,185,589	391,793,491	995,290	319,573,917	4,247,727,963
28	4,247,727,963	8,239,600	388,848,991	903,387	314,691,140	4,180,906,326
29	4,180,906,326	7,213,238	385,950,096	800,977	309,587,565	4,110,956,055
30	4,110,956,055	6,147,429	383,229,548	691,341	304,233,513	4,037,416,108
31	4,037,416,108	5,059,614	380,384,997	576,260	298,605,346	3,960,119,811
32	3,960,119,811	4,014,930	376,838,487	462,877	292,714,332	3,879,547,708
33	3,879,547,708	3,053,583	373,010,252	356,066	286,583,074	3,795,818,047
34	3,795,818,047	2,201,705	368,074,460	259,533	280,252,995	3,709,938,754
35	3,709,938,754	1,520,580	361,359,803	181,455	273,829,756	3,623,747,833
36	3,623,747,833	1,027,994	352,604,739	124,440	267,466,325	3,539,512,973
37	3,539,512,973	683,892	342,411,147	84,179	261,314,201	3,459,015,740
38	3,459,015,740	455,884	331,140,019	56,973	255,496,636	3,383,771,267
39	3,383,771,267	302,570	319,179,861	38,354	250,114,876	3,314,970,498
40	3,314,970,498	199,579	307,049,495	25,685	245,240,663	3,253,335,560
41	3,253,335,560	136,937	294,839,824	17,641	240,926,176	3,199,541,207
42	3,199,541,207	91,939	282,566,547	11,865	237,222,338	3,154,277,072
43	3,154,277,072	60,315	270,234,560	7,806	234,182,267	3,118,277,287
44	3,118,277,287	38,355	257,707,524	4,967	231,867,922	3,092,471,073
45	3,092,471,073	23,154	244,883,111	3,000	230,355,111	3,077,963,227
46	3,077,963,227	13,028	231,773,215	1,703	229,728,947	3,075,930,284
47	3,075,930,284	6,412	218,505,878	838	230,075,691	3,087,505,671
48	3,087,505,671	2,614	205,182,092	341	231,479,322	3,113,805,174
49	3,113,805,174	915	191,962,699	121	234,020,171	3,155,863,441
50	3,155,863,441	226	178,940,544	30	237,774,857	3,214,697,949

Single Discount Rate Development
Projection of Plan Fiduciary Net Position Ending June 30, 2117
(Concluded)

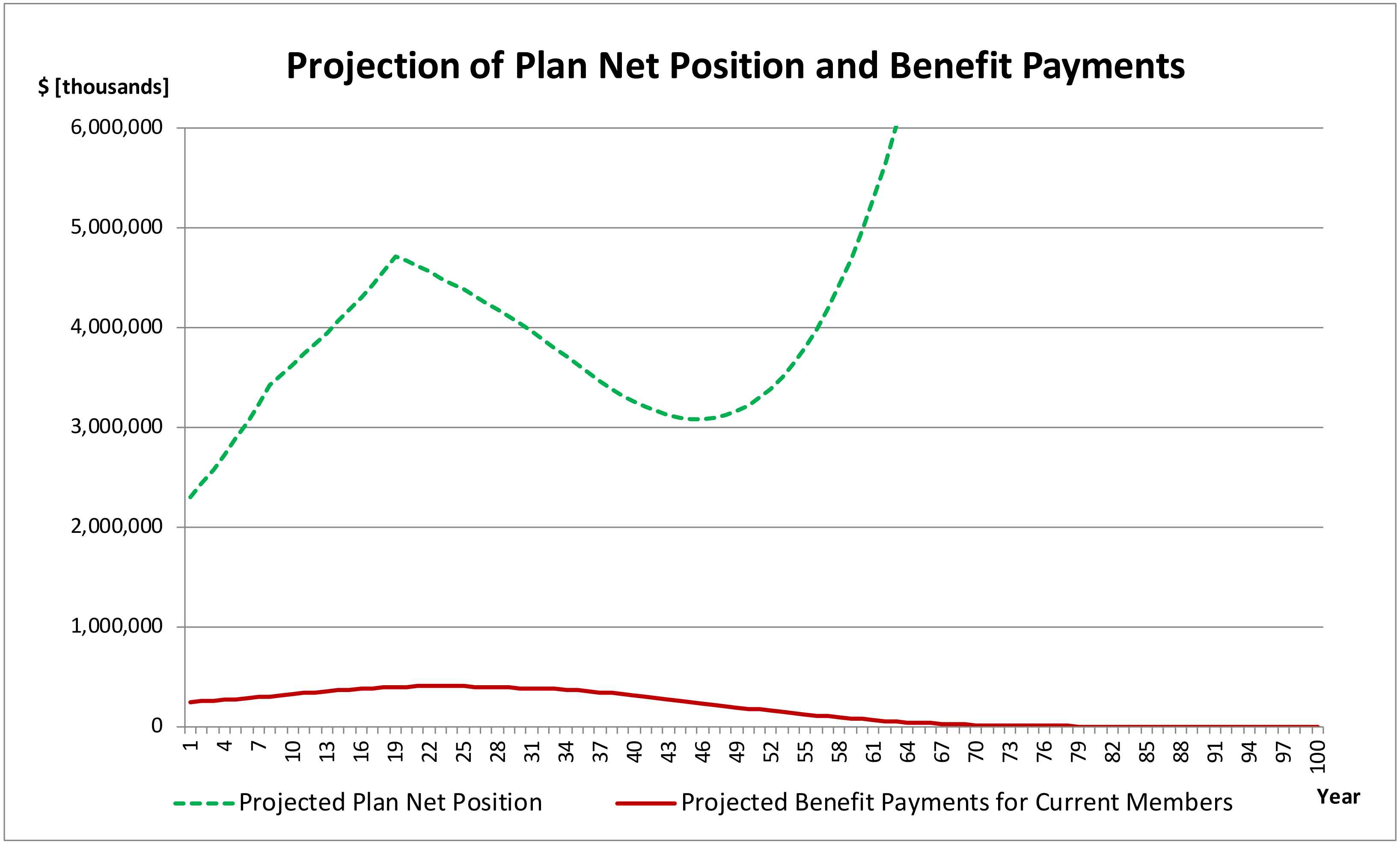
Year	Projected Beginning Plan Net Position	Projected Total Contributions	Projected Benefit Payments	Projected Administrative Expenses	Projected Investment Earnings at 7.75%	Projected Ending Plan Net Position
51	$ 3,214,697,949	$ 46	$ 166,191,669	$ 6	$ 242,819,326	$ 3,291,325,646
52	3,291,325,646	-	153,771,424	-	249,230,276	3,386,784,497
53	3,386,784,497	-	141,726,524	-	257,086,368	3,502,144,341
54	3,502,144,341	-	130,096,510	-	266,469,010	3,638,516,841
55	3,638,516,841	-	118,913,728	-	277,463,126	3,797,066,239
56	3,797,066,239	-	108,203,324	-	290,157,988	3,979,020,903
57	3,979,020,903	-	97,983,672	-	304,648,097	4,185,685,328
58	4,185,685,328	-	88,268,054	-	321,034,046	4,418,451,320
59	4,418,451,320	-	79,066,186	-	339,423,329	4,678,808,464
60	4,678,808,464	-	70,386,202	-	359,931,082	4,968,353,344
61	4,968,353,344	-	62,235,875	-	382,680,742	5,288,798,211
62	5,288,798,211	-	54,622,570	-	407,804,730	5,641,980,371
63	5,641,980,371	-	47,553,048	-	435,445,180	6,029,872,504
64	6,029,872,504	-	41,033,731	-	465,754,730	6,454,593,503
65	6,454,593,503	-	35,068,935	-	498,897,431	6,918,421,999
66	6,918,421,999	-	29,660,719	-	535,049,798	7,423,811,077
67	7,423,811,077	-	24,807,767	-	574,401,994	7,973,405,305
68	7,973,405,305	-	20,503,474	-	617,159,226	8,570,061,057
69	8,570,061,057	-	16,735,831	-	663,543,319	9,216,868,545
70	9,216,868,545	-	13,485,437	-	713,794,502	9,917,177,610
71	9,917,177,610	-	10,723,625	-	768,173,478	10,674,627,463
72	10,674,627,463	-	8,414,011	-	826,963,669	11,493,177,121
73	11,493,177,121	-	6,513,889	-	890,473,523	12,377,136,755
74	12,377,136,755	-	4,976,484	-	959,038,858	13,331,199,129
75	13,331,199,129	-	3,753,188	-	1,033,025,210	14,360,471,151
76	14,360,471,151	-	2,795,330	-	1,112,830,216	15,470,506,038
77	15,470,506,038	-	2,057,182	-	1,198,885,989	16,667,334,845
78	16,667,334,845	-	1,497,028	-	1,291,661,523	17,957,499,340
79	17,957,499,340	-	1,077,969	-	1,391,665,207	19,348,086,578
80	19,348,086,578	-	768,679	-	1,499,447,479	20,846,765,378
81	20,846,765,378	-	543,300	-	1,615,603,657	22,461,825,735
82	22,461,825,735	-	380,978	-	1,740,777,007	24,202,221,764
83	24,202,221,764	-	265,314	-	1,875,662,098	26,077,618,548
84	26,077,618,548	-	183,698	-	2,021,008,452	28,098,443,301
85	28,098,443,301	-	126,593	-	2,177,624,542	30,275,941,250
86	30,275,941,250	-	86,909	-	2,346,382,142	32,622,236,483
87	32,622,236,483	-	59,495	-	2,528,221,065	35,150,398,053
88	35,150,398,053	-	40,614	-	2,724,154,305	37,874,511,743
89	37,874,511,743	-	27,633	-	2,935,273,609	40,809,757,719
90	40,809,757,719	-	18,758	-	3,162,755,510	43,972,494,471
91	43,972,494,471	-	12,696	-	3,407,867,839	47,380,349,614
92	47,380,349,614	-	8,550	-	3,671,976,770	51,052,317,834
93	51,052,317,834	-	5,716	-	3,956,554,415	55,008,866,533
94	55,008,866,533	-	3,770	-	4,263,187,013	59,272,049,777
95	59,272,049,777	-	2,458	-	4,593,583,764	63,865,631,083
96	63,865,631,083	-	1,586	-	4,949,586,349	68,815,215,846
97	68,815,215,846	-	998	-	5,333,179,190	74,148,394,039
98	74,148,394,039	-	620	-	5,746,500,514	79,894,893,933
99	79,894,893,933	-	384	-	6,191,854,265	86,086,747,815
100	86,086,747,815	-	245	-	6,671,722,946	92,758,470,516

Single Discount Rate Development
Present Values of Projected Benefits Ending June 30, 2117

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	$ 2,169,775,040	$ 244,676,615	$ 244,676,615	$ -	$ 235,713,157	$ -	$ 235,713,157
2	2,297,943,210	251,355,143	251,355,143	-	224,730,417	-	224,730,417
3	2,433,539,316	258,706,923	258,706,923	-	214,666,785	-	214,666,785
4	2,576,776,875	266,306,926	266,306,926	-	205,079,376	-	205,079,376
5	2,728,176,201	274,311,614	274,311,614	-	196,049,816	-	196,049,816
6	2,888,071,798	283,331,321	283,331,321	-	187,931,488	-	187,931,488
7	3,056,163,611	292,352,135	292,352,135	-	179,967,448	-	179,967,448
8	3,233,205,199	301,972,486	301,972,486	-	172,519,338	-	172,519,338
9	3,419,402,126	312,322,486	312,322,486	-	165,598,494	-	165,598,494
10	3,522,995,702	322,383,115	322,383,115	-	158,638,333	-	158,638,333
11	3,626,806,071	331,579,169	331,579,169	-	151,427,869	-	151,427,869
12	3,731,962,249	341,011,639	341,011,639	-	144,534,157	-	144,534,157
13	3,838,566,969	349,793,248	349,793,248	-	137,592,714	-	137,592,714
14	3,947,644,592	358,142,331	358,142,331	-	130,744,188	-	130,744,188
15	4,060,102,356	366,382,274	366,382,274	-	124,132,045	-	124,132,045
16	4,176,563,190	373,893,366	373,893,366	-	117,565,511	-	117,565,512
17	4,298,329,874	381,123,984	381,123,984	-	111,219,562	-	111,219,562
18	4,426,363,125	386,840,051	386,840,051	-	104,768,096	-	104,768,096
19	4,562,995,748	392,343,861	392,343,861	-	98,615,959	-	98,615,959
20	4,709,410,152	396,342,446	396,342,446	-	92,455,691	-	92,455,691
21	4,664,835,707	399,935,615	399,935,615	-	86,583,645	-	86,583,645
22	4,613,175,679	402,389,580	402,389,580	-	80,849,108	-	80,849,108
23	4,555,050,425	402,718,047	402,718,047	-	75,095,224	-	75,095,224
24	4,492,144,385	401,717,258	401,717,258	-	69,520,748	-	69,520,748
25	4,434,215,506	398,877,404	398,877,404	-	64,064,303	-	64,064,303
26	4,373,931,789	395,434,642	395,434,642	-	58,943,253	-	58,943,253
27	4,311,757,238	391,793,491	391,793,491	-	54,200,005	-	54,200,005
28	4,247,727,963	388,848,991	388,848,991	-	49,923,590	-	49,923,590
29	4,180,906,326	385,950,096	385,950,096	-	45,987,384	-	45,987,384
30	4,110,956,055	383,229,548	383,229,548	-	42,378,859	-	42,378,859
31	4,037,416,108	380,384,997	380,384,997	-	39,038,792	-	39,038,792
32	3,960,119,811	376,838,487	376,838,487	-	35,893,100	-	35,893,100
33	3,879,547,708	373,010,252	373,010,252	-	32,973,056	-	32,973,056
34	3,795,818,047	368,074,460	368,074,460	-	30,196,516	-	30,196,516
35	3,709,938,754	361,359,803	361,359,803	-	27,513,366	-	27,513,366
36	3,623,747,833	352,604,739	352,604,739	-	24,915,795	-	24,915,795
37	3,539,512,973	342,411,147	342,411,147	-	22,455,215	-	22,455,215
38	3,459,015,740	331,140,019	331,140,019	-	20,154,114	-	20,154,114
39	3,383,771,267	319,179,861	319,179,861	-	18,028,942	-	18,028,942
40	3,314,970,498	307,049,495	307,049,495	-	16,096,293	-	16,096,293
41	3,253,335,560	294,839,824	294,839,824	-	14,344,531	-	14,344,531
42	3,199,541,207	282,566,547	282,566,547	-	12,758,619	-	12,758,619
43	3,154,277,072	270,234,560	270,234,560	-	11,324,174	-	11,324,174
44	3,118,277,287	257,707,524	257,707,524	-	10,022,486	-	10,022,486
45	3,092,471,073	244,883,111	244,883,111	-	8,838,731	-	8,838,731
46	3,077,963,227	231,773,215	231,773,215	-	7,763,849	-	7,763,849
47	3,075,930,284	218,505,878	218,505,878	-	6,792,969	-	6,792,969
48	3,087,505,671	205,182,092	205,182,092	-	5,919,959	-	5,919,959
49	3,113,805,174	191,962,699	191,962,699	-	5,140,186	-	5,140,186
50	3,155,863,441	178,940,544	178,940,544	-	4,446,860	-	4,446,860

Single Discount Rate Development
Present Values of Projected Benefits Ending June 30, 2117
(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)-.5)	(g)=(e)*vf ^((a)-.5)	(h)=((c)/(1+sdr)^(a-.5)
51	$ 3,214,697,949	$ 166,191,669	$ 166,191,669	$ -	$ 3,832,981	$ -	$ 3,832,981
52	3,291,325,646	153,771,424	153,771,424	-	3,291,439	-	3,291,439
53	3,386,784,497	141,726,524	141,726,524	-	2,815,425	-	2,815,425
54	3,502,144,341	130,096,510	130,096,510	-	2,398,508	-	2,398,508
55	3,638,516,841	118,913,728	118,913,728	-	2,034,653	-	2,034,653
56	3,797,066,239	108,203,324	108,203,324	-	1,718,231	-	1,718,231
57	3,979,020,903	97,983,672	97,983,672	-	1,444,034	-	1,444,034
58	4,185,685,328	88,268,054	88,268,054	-	1,207,286	-	1,207,286
59	4,418,451,320	79,066,186	79,066,186	-	1,003,645	-	1,003,645
60	4,678,808,464	70,386,202	70,386,202	-	829,200	-	829,200
61	4,968,353,344	62,235,875	62,235,875	-	680,449	-	680,449
62	5,288,798,211	54,622,570	54,622,570	-	554,255	-	554,255
63	5,641,980,371	47,553,048	47,553,048	-	447,815	-	447,815
64	6,029,872,504	41,033,731	41,033,731	-	358,628	-	358,628
65	6,454,593,503	35,068,935	35,068,935	-	284,451	-	284,451
66	6,918,421,999	29,660,719	29,660,719	-	223,280	-	223,280
67	7,423,811,077	24,807,767	24,807,767	-	173,316	-	173,316
68	7,973,405,305	20,503,474	20,503,474	-	132,942	-	132,942
69	8,570,061,057	16,735,831	16,735,831	-	100,708	-	100,708
70	9,216,868,545	13,485,437	13,485,437	-	75,312	-	75,312
71	9,917,177,610	10,723,625	10,723,625	-	55,581	-	55,581
72	10,674,627,463	8,414,011	8,414,011	-	40,473	-	40,473
73	11,493,177,121	6,513,889	6,513,889	-	29,080	-	29,080
74	12,377,136,755	4,976,484	4,976,484	-	20,618	-	20,618
75	13,331,199,129	3,753,188	3,753,188	-	14,432	-	14,432
76	14,360,471,151	2,795,330	2,795,330	-	9,975	-	9,975
77	15,470,506,038	2,057,182	2,057,182	-	6,813	-	6,813
78	16,667,334,845	1,497,028	1,497,028	-	4,601	-	4,601
79	17,957,499,340	1,077,969	1,077,969	-	3,075	-	3,075
80	19,348,086,578	768,679	768,679	-	2,035	-	2,035
81	20,846,765,378	543,300	543,300	-	1,335	-	1,335
82	22,461,825,735	380,978	380,978	-	869	-	869
83	24,202,221,764	265,314	265,314	-	561	-	561
84	26,077,618,548	183,698	183,698	-	361	-	361
85	28,098,443,301	126,593	126,593	-	231	-	231
86	30,275,941,250	86,909	86,909	-	147	-	147
87	32,622,236,483	59,495	59,495	-	93	-	93
88	35,150,398,053	40,614	40,614	-	59	-	59
89	37,874,511,743	27,633	27,633	-	37	-	37
90	40,809,757,719	18,758	18,758	-	24	-	24
91	43,972,494,471	12,696	12,696	-	15	-	15
92	47,380,349,614	8,550	8,550	-	9	-	9
93	51,052,317,834	5,716	5,716	-	6	-	6
94	55,008,866,533	3,770	3,770	-	4	-	4
95	59,272,049,777	2,458	2,458	-	2	-	2
96	63,865,631,083	1,586	1,586	-	1	-	1
97	68,815,215,846	998	998	-	1	-	1
98	74,148,394,039	620	620	-	0	-	0
99	79,894,893,933	384	384	-	0	-	0
100	86,086,747,815	245	245	-	0	-	0
				Totals	$ 4,159,911,115	$ -	$ 4,159,911,115



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

Accrued Service Service credited under the system which was rendered before the date of the actuarial valuation.

Actuarial Accrued Liability (AAL) 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."

Actuarial Assumptions 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.

Actuarial Equivalent 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.

Actuarial Cost Method 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.

Actuarial Gain/(Loss) 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.

Actuarial Present Value (APV) 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.

Actuarial Valuation 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.

Actuarial Valuation Date The date as of which an actuarial valuation is performed.

Actuarially Determined Contribution (ADC) or Annual Required Contribution (ARC) 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

Amortization Method	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).
Amortization Payment	The amortization payment is the periodic payment required to pay off an interest-discounted amount with payments of interest and principal.
Cost-of-Living Adjustments	Postemployment benefit changes intended to adjust benefit payments for the effects of inflation.
Cost-Sharing Multiple-Employer Defined Benefit Pension Plan (cost-sharing pension plan)	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.
Covered-Employee Payroll	The payroll of covered employees, which is typically only the pensionable pay and does not include pay above any pay cap.
Deferred Inflows and Outflows	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.
Deferred Retirement Option Program (DROP)	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.
Discount Rate	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: 1. The benefit payments to be made while the pension plans' fiduciary net position is projected to be greater than the benefit payments that are projected to be made in the period; and 2. 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 ages(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

Other Postemployment Benefits (OPEB)	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.
Real Rate of Return	The real rate of return is the rate of return on an investment after adjustment to eliminate inflation.
Service Cost	The service cost is the portion of the actuarial present value of projected benefit payments that is attributed to a valuation year.
Total Pension Expense	The total pension expense is the sum of the following items that are recognized at the end of the employer's fiscal year: 1. Service Cost 2. Interest on the Total Pension Liability 3. Current-Period Benefit Changes 4. Employee Contributions (made negative for addition here) 5. Projected Earnings on Plan Investments (made negative for addition here) 6. Pension Plan Administrative Expense 7. Other Changes in Plan Fiduciary Net Position 8. Recognition of Outflow (Inflow) of Resources due to Liabilities 9. Recognition of Outflow (Inflow) of Resources due to Assets
Total Pension Liability (TPL)	The TPL is the portion of the actuarial present value of projected benefit payments that is attributed to past periods of member service.
Unfunded Actuarial Accrued Liability (UAAL)	The UAAL is the difference between actuarial accrued liability and valuation assets.
Valuation Assets	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.