

**MISSOURI DEPARTMENT OF TRANSPORTATION AND  
HIGHWAY PATROL EMPLOYEES' RETIREMENT SYSTEM**  
GASB STATEMENTS NOS. 67 AND 68 ACCOUNTING AND  
FINANCIAL REPORTING FOR PENSIONS  
JUNE 30, 2016

October 17, 2016

The Retirement Board  
Missouri Department of Transportation  
and Highway Patrol Employees' Retirement System  
1913 William Street  
Jefferson City, Missouri 65102-1930

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.

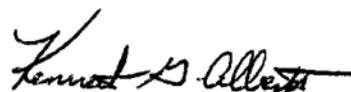
To the best of our knowledge, this report is complete, accurate, and in accordance with generally recognized actuarial methods. Heidi G. Barry is a Member of the American Academy of Actuaries (MAAA) and meets the Qualification Standards of the Academy of Actuaries to render the actuarial opinions herein.

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, ASA, MAAA



Kenneth G. Alberts

KGA/HGB:mrh

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**SECTION A**  
EXECUTIVE SUMMARY

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## Executive Summary as of June 30, 2016

Actuarial Valuation Date	June 30, 2016
Measurement Date of the Net Pension Liability	June 30, 2016
Employer's Fiscal Year Ending Date (Employer's Reporting Date)	June 30, 2017
Plan's Fiscal Year Ending Date (Plan's Reporting Date)	June 30, 2016

### Membership

Number of		
- Retirees and Beneficiaries		8,684
- Inactive, Nonretired Members		2,334
- Active Members		7,441
- Total		18,459
Valuation Payroll	\$	339,799,379
Covered Payroll (Reported Fiscal Year Payroll Paid)	\$	344,635,441

### Net Pension Liability

Total Pension Liability	\$	3,761,733,004
Plan Fiduciary Net Position		1,992,073,946
Net Pension Liability	\$	1,769,659,058
Plan Fiduciary Net Position as a Percentage of Total Pension Liability		52.96%
Net Pension Liability as a Percentage of Covered Payroll		513.49%

### 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*	2.85%
Last year ending June 30 in the 2017 to 2116 projection period for which projected benefit payments are fully funded	2116

**Total Pension Expense** \$ 153,455,510

### 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	\$ -	\$ 43,302,121
Changes in assumptions	-	-
Net difference between projected and actual earnings on pension plan investments	140,721,893	76,260,293
<b>Total</b>	\$ 140,721,893	\$ 119,562,414

\*Source: "20-Bond GO Index" is the Bond Buyer Index, general obligation, 20 years to maturity, mixed quality. In describing this index, the Bond Buyer notes that the bonds' average credit quality is roughly equivalent to Moody's Investors Service's Aa2 rating and Standard & Poor's Corp.'s AA. The rate shown is as of June 30, 2016, the most recent date available on or before the measurement date.

## 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 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, 2016 and a measurement date of June 30, 2016.

## 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 Bond Buyer 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 2.85% (based on the weekly rate closest to but not later than the measurement date of the 20-Bond GO Index as published by the Bond Buyer 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.



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## **SECTION B**

### **FINANCIAL STATEMENTS**

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**Statement of Pension Expense Under GASB Statement No. 68**  
**Fiscal Year Ended June 30, 2016**

**A. Expense**

1. Service Cost	\$ 45,441,305
2. Interest on the Total Pension Liability	280,432,068
3. Current-Period Benefit Changes	0
4. Member Contributions (made negative for addition here) <sup>#</sup>	(2,503,824)
5. Projected Earnings on Plan Investments (made negative for addition here)	(154,225,348)
6. Pension Plan Administrative Expense	4,370,860
7. Other Changes in Plan Fiduciary Net Position <sup>#</sup>	(3,708,368)
8. Recognition of Outflow (Inflow) of Resources due to Liabilities	(16,275,450)
9. Recognition of Outflow (Inflow) of Resources due to Assets	(75,733)
<b>10. Total Pension Expense</b>	<b>\$ 153,455,510</b>

<sup>#</sup> *Employee payments for service purchase of \$978,689 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, 2016

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

1. Difference between expected and actual experience of the Total Pension Liability (gains) or losses	\$	(39,810,009)
2. Assumption Changes (gains) or losses	\$	-
3. Recognition period for Liabilities: Average of the expected remaining service lives of all employees {in years }		4.3565
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	\$	(9,138,072)
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	\$	(9,138,072)
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	\$	(30,671,937)
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	\$	(30,671,937)

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

1. Net difference between projected and actual earnings on pension plan investments (gains) or losses	\$	132,793,253
2. Recognition period for Assets {in years }		5
3. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Assets	\$	26,558,651
4. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Assets	\$	106,234,602

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

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

	<u>Outflows of Resources</u>	<u>Inflows of Resources</u>	<u>Net Outflows of Resources</u>
1. Due to Liabilities	\$ -	\$ 16,275,450	\$ (16,275,450)
2. Due to Assets	38,054,414	38,130,147	(75,733)
<b>3. Total</b>	<b>\$ 38,054,414</b>	<b>\$ 54,405,597</b>	<b>\$ (16,351,183)</b>

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

	<u>Outflows of Resources</u>	<u>Inflows of Resources</u>	<u>Net Outflows of Resources</u>
1. Differences between expected and actual experience	\$ -	\$ 16,275,450	\$ (16,275,450)
2. Assumption Changes	-	-	-
3. Net Difference between projected and actual earnings on pension plan investments	38,054,414	38,130,147	(75,733)
<b>4. Total</b>	<b>\$ 38,054,414</b>	<b>\$ 54,405,597</b>	<b>\$ (16,351,183)</b>

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

	<u>Deferred Outflows of Resources</u>	<u>Deferred Inflows of Resources</u>	<u>Net Deferred Outflows of Resources</u>
1. Differences between expected and actual experience	\$ -	\$ 43,302,121	\$ (43,302,121)
2. Assumption Changes	-	-	-
3. Net Difference between projected and actual earnings on pension plan investments	140,721,893	76,260,293	64,461,600
<b>4. Total</b>	<b>\$ 140,721,893</b>	<b>\$ 119,562,414</b>	<b>\$ 21,159,479</b>

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

<u>Year Ending June 30</u>	<u>Net Deferred Outflows of Resources</u>
2017	\$ (16,351,183)
2018	(13,797,512)
2019	28,007,245
2020	23,300,929
2021	-
Thereafter	-
<b>Total</b>	<b>\$ 21,159,479</b>

## Statement of Fiduciary Net Position as of June 30, 2016

<b>Assets</b>	
Cash	\$ 492,832
Receivables	
Investment Sales	\$ 4,733,057
Accrued Interest and Income	6,406,558
Contributions	8,526,186
Other	36,374
Total Receivables	<u>\$ 19,702,175</u>
Investments	
Stocks and Rights/Warrants	\$ 389,770,000
Government Obligations	193,263,285
Corporate Bonds	15,073,506
Real Estate	211,308,244
Mortgages and Asset-Backed Securities	260,915,613
Hedge Funds (Absolute Return)	155,893,985
Short-Term Investments	128,659,065
Limited Partnerships	627,937,138
Total Investments	<u>\$ 1,982,820,836</u>
Invested Securities Lending Collateral	\$ 51,560,512
Prepaid Expenses	\$ -
Net Investment in Capital Assets	
Land	\$ 84,000
Building	581,619
Furniture, Equipment and Software	3,517,189
Accumulated Depreciation	(2,613,708)
Net Investment in Capital Assets	<u>\$ 1,569,100</u>
<b>Total Assets</b>	<u><u>\$ 2,056,145,455</u></u>
<b>Liabilities</b>	
Investment Purchases	\$ 8,912,823
OPEB Obligation	680,169
Security Lending Collateral	52,723,223
Other Accounts Payable	1,755,294
<b>Total Liabilities</b>	<u>\$ 64,071,509</u>
<b>Net Position Restricted for Pensions</b>	<u><u>\$ 1,992,073,946</u></u>

## Statement of Changes in Fiduciary Net Position for Year Ended June 30, 2016

### Additions

Contributions	
Employer	\$ 199,609,396
Employee	2,503,824
Service Transfers from Other Systems	2,729,679
Other	978,689
Total Contributions	<u>\$ 205,821,588</u>
Investment Income	
Net Appreciation in Fair Value of Investments	\$ (10,145,015)
Interest and Dividends	55,077,632
Less Investment Expense	<u>(23,703,885)</u>
Net Investment Income	<u>\$ 21,228,732</u>
Income from Securities Lending Activities	
Securities Lending Gross Income	\$ 369,159
Less Securities Lending Expenses (Income), net	<u>(165,801)</u>
Net Income from Securities Lending Activities	<u>\$ 203,358</u>
Other	<u>\$ 5</u>
<b>Total Additions</b>	<u><u>\$ 227,253,683</u></u>

### Deductions

Benefit Payments, Including Refunds	\$ 240,176,011
Administrative Expenses	<u>4,370,860</u>
<b>Total Deductions</b>	<u>\$ 244,546,871</u>
<b>Net Increase in Net Position</b>	\$ (17,293,188)

### Net Position Restricted for Pensions

Beginning of Year	\$ 2,009,367,134
End of Year	<u><u>\$ 1,992,073,946</u></u>

### Schedule of Proportionate Employer Share for Year Ended June 30, 2016

		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	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	Changes of Assum.	Changes in Proportion and Differences Between Employer Cont. and Share of Cont.	Total Deferred Inflows of Resources	Prop. Share of Plan Pension Expense	Net Amortization of Deferred Amounts from Changes in Proportion and Differences Between Employer Contributions and	Proportionate Share of Contributions	Total Employer Pension Expense
1	\$ 123,196,058	MoDOT	62.03%	\$ 1,097,719,514	\$ -	\$ 87,289,790	\$ -	\$ 87,289,790	\$ 26,860,306	\$ 47,304,260	\$ -	\$ 18,103,184	\$ 92,267,750	\$ 95,188,453	\$ (7,513,143)	\$ 87,675,310	
2	75,416,960	Highway Patrol	37.97%	671,939,544	-	53,432,103	-	18,103,184	16,441,815	28,956,033	-	-	45,397,848	58,267,057	7,513,143	65,780,200	
<b>\$ 198,613,018</b>		<b>Total for All Employers</b>	<b>100.0000%</b>	<b>\$ 1,769,659,058</b>	<b>\$ -</b>	<b>\$140,721,893</b>	<b>\$ -</b>	<b>\$ 18,103,184</b>	<b>\$ 43,302,121</b>	<b>\$ 76,260,293</b>	<b>\$ -</b>	<b>\$ 18,103,184</b>	<b>\$137,665,598</b>	<b>\$ 153,455,510</b>	<b>\$ -</b>	<b>\$ 153,455,510</b>	

# Excludes \$996,378 in contributions for Retirement System members. Retirement System members' cost were spread proportionately to the other two employers.

Schedule of Deferred Inflows and Outflows								
Employer	Employer Allocation Percentage	2017	2018	2019	2020	2021	Thereafter	Total
Modot	62.03%	\$ (17,655,782)	\$ (16,071,740)	\$ 14,589,715	\$ 14,159,847	\$ -	\$ -	\$ (4,977,959)
Highway Patrol	37.97%	1,304,599	2,274,228	13,417,530	9,141,082	-	-	26,137,438
<b>TOTAL</b>	<b>100.00%</b>	<b>\$ (16,351,183)</b>	<b>\$ (13,797,512)</b>	<b>\$ 28,007,245</b>	<b>\$ 23,300,929</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 21,159,479</b>

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**SECTION C**

REQUIRED SUPPLEMENTARY INFORMATION

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**Schedule of Changes in Net Pension Liability and  
Related Ratios Current Period  
Fiscal Year Ended June 30, 2016**

<b>A. Total pension liability</b>	
1. Service Cost	\$ 45,441,305
2. Interest on the Total Pension Liability	280,432,068
3. Changes of Benefit Terms	0
4. Difference between expected and actual experience of the Total Pension Liability	(39,810,009)
5. Changes of Assumptions	0
6. Benefit Payments, including Refunds of Employee Contributions	(236,686,735)
7. Disability Premiums	(1,567,825)
8. Transfers to Other Retirement Systems	(1,921,451)
9. Net change in Total Pension Liability	\$ 45,887,353
10. Total Pension Liability – beginning	3,715,845,651
11. Total Pension Liability – ending	<u><u>\$ 3,761,733,004</u></u>
<b>B. Plan fiduciary net position</b>	
1. Contributions – employer	\$ 199,609,396
2. Contributions –employee	3,482,513
3. Net investment income	21,432,095
4. Benefit payments, including refunds of employee contributions	(236,686,735)
5. Disability Premiums	(1,567,825)
6. Pension Plan Administrative Expense	(4,370,860)
7. Net Transfers to Other Retirement Systems	808,228
8. Other	-
9. Net change in plan fiduciary net position	\$ (17,293,188)
10. Plan fiduciary net position – beginning	2,009,367,134
11. Plan fiduciary net position – ending	<u><u>\$ 1,992,073,946</u></u>
<b>C. Net pension liability</b>	<u><u>\$ 1,769,659,058</u></u>
<b>D. Plan fiduciary net position as a percentage of the total pension liability</b>	<b>52.96%</b>
<b>E. Covered Payroll (Reported Fiscal Year Payroll Paid) #</b>	<b>\$ 344,635,441</b>
<b>F. Net pension liability as a percentage of covered employee payroll</b>	<b>513.49%</b>

# Valuation Payroll was \$339,799,379.

**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,	<b>2016</b>	<b>2015</b>	<b>2014</b>	<b>2013*</b>
<b>Total Pension Liability</b>				
Service Cost	\$ 45,441,305	\$ 45,358,095	\$ 44,739,603	\$ 44,446,279
Interest on the Total Pension Liability	280,432,068	275,284,910	270,525,608	265,339,848
Benefit Changes	-	-	-	-
Difference between Expected and Actual Experience	(39,810,009)	(13,324,219)	(17,614,321)	(13,690,794)
Assumption Changes	-	-	-	204,396,180
Benefit Payments	(236,488,629)	(236,905,323)	(227,958,108)	(220,623,394)
Refunds	(198,106)	(107,395)	(18,686)	(29,300)
Disability Premiums	(1,567,825)	(1,554,676)	(1,531,578)	(1,512,685)
Transfers to Other Retirement Systems	(1,921,451)	(3,147,482)	(1,876,336)	(629,246)
<b>Net Change in Total Pension Liability</b>	<b>45,887,353</b>	<b>65,603,910</b>	<b>66,266,182</b>	<b>277,696,888</b>
<b>Total Pension Liability - Beginning</b>	<b>3,715,845,651</b>	<b>3,650,241,741</b>	<b>3,583,975,559</b>	<b>3,306,278,671</b>
<b>Total Pension Liability - Ending (a)</b>	<b>\$ 3,761,733,004</b>	<b>\$ 3,715,845,651</b>	<b>\$ 3,650,241,741</b>	<b>\$ 3,583,975,559</b>
<b>Plan Fiduciary Net Position</b>				
Contributions - Employer	\$ 199,609,396	\$ 200,638,571	\$ 183,353,841	\$ 170,836,117
Contributions - Member	3,482,513	3,294,162	2,260,563	1,139,450
Pension Plan Net Investment Income	21,432,095	92,645,571	319,445,780	198,141,088
Benefit Payments	(236,488,629)	(236,905,323)	(227,958,108)	(220,619,035)
Refunds	(198,106)	(107,395)	(18,686)	(29,300)
Disability Premiums	(1,567,825)	(1,554,676)	(1,531,578)	(1,512,685)
Pension Plan Administrative Expense	(4,370,860)	(4,066,944)	(3,736,355)	(2,997,225)
Net Transfers	808,228	(2,033,045)	(91,954)	(629,246)
Other	-	-	-	-
<b>Net Change in Plan Fiduciary Net Position</b>	<b>(17,293,188)</b>	<b>51,910,921</b>	<b>271,723,503</b>	<b>144,329,164</b>
<b>Plan Fiduciary Net Position - Beginning</b>	<b>2,009,367,134</b>	<b>1,957,456,213</b>	<b>1,685,732,710</b>	<b>1,541,403,546</b>
<b>Plan Fiduciary Net Position - Ending (b)</b>	<b>\$ 1,992,073,946</b>	<b>\$ 2,009,367,134</b>	<b>\$ 1,957,456,213</b>	<b>\$ 1,685,732,710</b>
<b>Net Pension Liability - Ending (a) - (b)</b>	<b>1,769,659,058</b>	<b>1,706,478,517</b>	<b>1,692,785,528</b>	<b>1,898,242,849</b>
<b>Plan Fiduciary Net Position as a Percentage of Total Pension Liability</b>	<b>52.96 %</b>	<b>54.08 %</b>	<b>53.63 %</b>	<b>47.04 %</b>
<b>Covered Employee Payroll</b>	<b>\$ 344,635,441</b>	<b>\$ 342,264,593</b>	<b>\$ 336,590,797</b>	<b>\$ 323,205,767</b>
<b>Net Pension Liability as a Percentage of Covered Employee Payroll</b>	<b>513.49 %</b>	<b>498.58 %</b>	<b>502.92 %</b>	<b>587.32 %</b>
<b>Notes to Schedule:</b>	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)**

<b>FY Ending June 30,</b>	<b>Total Pension Liability</b>	<b>Plan Net Position</b>	<b>Net Pension Liability</b>	<b>Plan Net Position as a % of Total Pension Liability</b>	<b>Covered Payroll</b>	<b>Net Pension Liability as a % of Covered Payroll</b>
2013	\$ 3,583,975,559	\$ 1,681,869,871	\$ 1,902,105,688	46.93%	\$ 323,205,767	588.51%
2014	3,650,241,741	1,957,456,213	1,692,785,528	53.63%	336,590,797	502.92%
2015	3,715,845,651	2,009,367,134	1,706,478,517	54.08%	342,264,593	498.58%
2016	3,761,733,004	1,992,073,946	1,769,659,058	52.96%	344,635,441	513.49%

**Schedule of Contributions (Multiyear)**  
**Last 10 Fiscal Years**

<b>FY Ending June 30,</b>	<b>Actuarially Determined Contribution</b>	<b>Actual Contribution</b>	<b>Contribution Deficiency (Excess)</b>	<b>Covered Payroll *</b>	<b>Actual Contribution as a % of Covered Payroll</b>
2007	\$ 121,243,361	\$ 121,243,361	\$ -	\$ 372,140,457	32.58%
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%

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

## Notes to Schedule of Contributions

### Valuation Date:

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 Contribution Rates:

Actuarial Cost Method	Entry-Age
Amortization Method	Level Percentage of Payroll, Closed #
Remaining Amortization Period	16 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 \$188.3 million was added to the unfunded for purposes of determining the FY 18 contribution rate.*

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**SECTION D**

NOTES TO FINANCIAL STATEMENTS

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### **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**

	Current Single Discount		
	1% Decrease 6.75%	Rate Assumption 7.75%	1% Increase 8.75%
<b>Total Pension Liability</b>	\$4,202,663,004	\$3,761,733,004	\$3,393,218,008
<b>Plan Fiduciary Net Position</b>	1,992,073,946	1,992,073,946	1,992,073,946
<b>Net Pension Liability</b>	\$2,210,589,058	\$1,769,659,058	\$1,401,144,062

**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, 2016 is \$188,315,769.

**Disclosure Regarding the Deferred Retirement Option Program**

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



### Summary of Population Statistics

Inactive Plan Members or Beneficiaries Currently Receiving Benefits	8,684
Inactive Plan Members Entitled to But Not Yet Receiving Benefits	2,334
Active Plan Members	<u>7,441</u>
Total Plan Members	18,459

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## **SECTION E**

### **SUMMARY OF BENEFITS**

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**Missouri Department of Transportation and  
Highway Patrol Employees' Retirement System  
Summary of Benefit Provisions Evaluated  
as of June 30, 2016**

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

<b>Closed Plan</b>	<b>Year 2000 Plan</b>	<b>2011 Tier</b>
<p><b>Normal Retirement Eligibility (unreduced benefit)</b></p> <p><i>Non-Uniformed Employees:</i> The earlier of attaining:</p> <ol style="list-style-type: none"> <li>Age 65 with at least 4 years of creditable service.</li> <li>Age 60 with at least 15 years of creditable service.</li> <li>Age 48 with age plus creditable service equal to 80 or more.</li> </ol> <p><i>Uniformed Patrol Employees Only:</i> The earlier of attaining:</p> <ol style="list-style-type: none"> <li>Age 55 with at least 4 years of creditable service.</li> <li>Mandatory retirement at age 60 with 5 or more years of creditable service.</li> <li>Age 48 with age plus creditable service equal to 80 or more.</li> </ol> <p><b>Final Average Pay Used for Benefit Determination</b></p> <p>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).</p>	<p><b>Normal Retirement Eligibility (unreduced benefit)</b></p> <p><i>Non-Uniformed Employees:</i> The earlier of attaining:</p> <ol style="list-style-type: none"> <li>Age 62 with at least 5 years of creditable service.</li> <li>Age 48 with age plus creditable service equal to 80 or more.</li> </ol> <p><i>Uniformed Patrol Employees Only:</i> The earlier of attaining:</p> <ol style="list-style-type: none"> <li>Mandatory retirement at age 60 with at least 5 years of creditable service.</li> <li>Age 48 with age plus creditable service equal to 80 or more.</li> </ol> <p><b>Final Average Pay Used for Benefit Determination</b></p> <p>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).</p>	<p><b>Normal Retirement Eligibility (unreduced benefit)</b></p> <p><i>Non-Uniformed Employees:</i> The earlier of attaining:</p> <ol style="list-style-type: none"> <li>Age 67 with at least 10 years of creditable service.</li> <li>Age 55 with age plus creditable service equal to 90 or more.</li> </ol> <p><i>Uniformed Patrol Employees Only:</i> The earlier of attaining:</p> <ol style="list-style-type: none"> <li>Age 55 with at least 10 years of creditable service.</li> <li>Mandatory retirement at age 60.</li> </ol> <p><b>Final Average Pay Used for Benefit Determination</b></p> <p>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).</p>

<b>Closed Plan</b>	<b>Year 2000 Plan</b>	<b>2011 Tier</b>
<b>Normal Retirement Benefit Amount</b>	<b>Normal Retirement Benefit Amount</b>	<b>Normal Retirement Benefit Amount</b>
<p><i>Non-Uniformed Employees:</i> Life Benefit: 1.6% of final average pay times years of creditable service.</p> <p><i>Uniformed Patrol Employees:</i> 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.</p>	<p><i>All Employees:</i> 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.</p>	<p><i>All Employees:</i> 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.</p>
<b>Early Retirement (reduced benefit)</b>	<b>Early Retirement (reduced benefit)</b>	<b>Early Retirement (reduced benefit)</b>
<p><i>Eligibility: Non-Uniformed Employees</i> Age 55 with at least 10 years of creditable service. <i>Amount:</i> Normal retirement amount reduced by 0.6% for each month that retirement precedes eligibility for normal retirement. <i>Uniformed Patrol</i> members are not eligible for early retirement.</p>	<p><i>Eligibility: All Employees</i> Age 57 with at least 5 years of creditable service. <i>Amount:</i> Normal retirement amount reduced by 0.5% for each month that retirement precedes eligibility for normal retirement.</p>	<p><i>Eligibility: All Active Non-Uniformed Employees</i> Age 62 with at least 10 years of creditable service. <i>Amount:</i> Normal retirement amount reduced by 0.5% for each month that retirement precedes eligibility for normal retirement. <i>Uniformed Patrol</i> members are not eligible for early retirement.</p>

**Closed Plan****Year 2000 Plan****2011 Tier****Vested Deferred Benefits*****Eligibility: All Employees***

Fully vested in accrued pension with 5 years of creditable service. The benefit will commence at the age the individual is eligible for early or normal retirement, considering years of creditable service.

**Minimum Base Benefit**

Receive a monthly base benefit of no less than \$15 for each full year of creditable service. Must be eligible to receive a normal or early retirement benefit the first of the month immediately following the date you leave state employment. Not required to immediately start drawing a benefit.

**Death Prior to Retirement**

The spouse of the member who dies after accruing 5 years of creditable service may elect to receive an annuity as if the employee had retired on the date of death and elected a joint and 100% survivor annuity.

If no eligible spouse survives or upon the death of the spouse, 80% of the member's accrued annuity will be paid to eligible children until age 21.

If the death is duty-related, there is no service requirement and the minimum annuity is 50% of the Final Average Pay (FAP) to the surviving spouse or eligible children.

**Vested Deferred Benefits*****Eligibility: All Employees***

Fully vested in accrued pension with 5 years of creditable service. The benefit will commence at the age the individual is eligible for early or normal retirement considering years of creditable service.

**Minimum Base Benefit**

Same.

**Death Prior to Retirement**

The spouse of the member who dies after accruing 5 years of creditable service may elect to receive an annuity as if the employee had retired on the date of death and elected a joint and 100% survivor annuity.

If no eligible spouse survives or upon the death of the spouse, 80% of the member's accrued annuity will be paid to eligible children until age 21.

If the death is duty related, there is no service requirement and the minimum annuity is 50% of the Final Average Pay (FAP) to the surviving spouse or eligible children.

**Vested Deferred Benefits*****Eligibility: All Employees***

Fully vested in accrued pension with 10 years of creditable service. The benefit will commence at the age the individual is eligible for normal retirement considering years of creditable service.

**Minimum Base Benefit**

Same.

**Death Prior to Retirement**

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.

<b>Closed Plan</b>	<b>Year 2000 Plan</b>	<b>2011 Tier</b>
<p><b><u>Death After Retirement</u></b></p> <p>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.</p> <p>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.</p> <p>For period certain annuities, beneficiaries may be changed at any time.</p> <p><b><u>Pop-Up Provision</u></b></p> <p>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.</p>	<p><b><u>Death After Retirement</u></b></p> <p>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.</p> <p>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.</p> <p>For period certain annuities, beneficiaries may be changed at any time.</p> <p><b><u>Pop-Up Provision</u></b></p> <p>Same.</p>	<p><b><u>Death After Retirement</u></b></p> <p>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.</p> <p>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.</p> <p>For period certain annuities, beneficiaries may be changed at any time.</p> <p><b><u>Pop-Up Provision</u></b></p> <p>Same.</p>

**Closed Plan****Year 2000 Plan****2011 Tier****\$5,000 Death Benefit**

MPERS provides a \$5,000 death benefit for a designated beneficiary(ies) of members who retire from service or were approved for normal or work-related disability benefits after September 28, 1985. Members who die while on terminated vested status or long-term disability status do not qualify for this benefit. Long-term disability recipients who retire on or after September 28, 1985 are eligible to receive this benefit.

**Purchase of Service**

**Military:** Prior to retirement, qualifying members may purchase up to a maximum of 4 years military service that includes active service, and/or active and inactive duty training from which they were honorably discharged. All months the member is eligible for must be purchased. This service credit can be used to satisfy the vesting requirement. Periods of military service cannot coincide with employment in a state agency.

**Police Service:** Prior to retirement, uniformed patrol members only, may purchase up to a maximum of 4 years police service. Members must purchase all months of service they are eligible for.

**\$5,000 Death Benefit**

MPERS provides a \$5,000 death benefit for a designated beneficiary(ies) of members who retire from service or were approved for work-related disability benefits. Members who die while on terminated vested status or long-term disability status do not qualify for this benefit. Long-term disability recipients who retire are eligible to receive this benefit.

**Purchase of Service**

**Military:** Prior to retirement, qualifying members may purchase up to a maximum of 4 years military service that includes active service from which they were honorably discharged. All months the member is eligible for must be purchased. This service credit cannot be used to satisfy the vesting requirement. Periods of military service cannot coincide with employment in a state agency.

**Police Service:** Not available.

**\$5,000 Death Benefit**

MPERS provides a \$5,000 death benefit for a designated beneficiary(ies) of members who retire from service or were approved for work-related disability benefits. Members who die while on terminated vested status or long-term disability status do not qualify for this benefit. Long-term disability recipients who retire are eligible to receive this benefit.

**Purchase of Service**

**Military:** Not available.

**Police Service:** Not available.



<b>Closed Plan</b>	<b>Year 2000 Plan</b>	<b>2011 Tier</b>
<p><b>Portability:</b> Section 105.691 allows vested members to acquire (purchase/transfer) service credit for any non-federal, full-time public sector employment within Missouri.</p> <p>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 <b>not covered</b> by a retirement plan must be purchased.</p>	<p><b>Portability:</b> Same as Closed Plan Section 105.691.</p> <p>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.</p> <p>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 <b>not covered</b> by a retirement plan must be purchased.</p>	<p><b>Portability:</b> Same as Closed Plan Section 105.691.</p>
<p><b>Public Employment Prior Service (Subsidized purchase):</b></p> <p>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.</p>	<p><b>Public Employment Prior Service (Subsidized purchase):</b></p> <p>Not available.</p>	<p><b>Public Employment Prior Service (Subsidized purchase):</b></p> <p>Not available.</p>
<p><b>Disability</b></p> <p>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.</p> <p>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.</p>	<p><b>Disability</b></p> <p>Same.</p>	<p><b>Disability</b></p> <p>Same.</p>

<b>Closed Plan</b>	<b>Year 2000 Plan</b>	<b>2011 Tier</b>
<p><b><u>Post-Retirement Benefit Adjustments</u></b>            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.</p> <p>For employees hired on or after August 28, 1997 the annual percentage increase is equal to the lesser of:</p> <ul style="list-style-type: none"> <li>i) 80% of the CPI-U increase, or</li> <li>ii) 5%.</li> </ul>	<p><b><u>Post-Retirement Benefit Adjustments</u></b>            Benefits are increased to retired members (including survivors) annually in accordance with the following:</p> <p>Annual benefit percentage increase equal to the lesser of:</p> <ul style="list-style-type: none"> <li>i) 80% of the CPI-U increase, or</li> <li>ii) 5%.</li> </ul>	<p><b><u>Post-Retirement Benefit Adjustments</u></b>            Benefits are increased to retired members (including survivors) annually in accordance with the following:</p> <p>Annual benefit percentage increase equal to the lesser of:</p> <ul style="list-style-type: none"> <li>i) 80% of the CPI-U increase, or</li> <li>ii) 5%.</li> </ul>
<p><b><u>Member Contributions</u></b>            None.</p>	<p><b><u>Member Contributions</u></b>            None.</p>	<p><b><u>Member Contributions</u></b>            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.</p>

## **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.

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**SECTION F**

**ACTUARIAL COST METHOD AND ACTUARIAL ASSUMPTIONS**

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## Summary of Valuation Method and Assumptions June 30, 2016

*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.

### Economic Assumptions

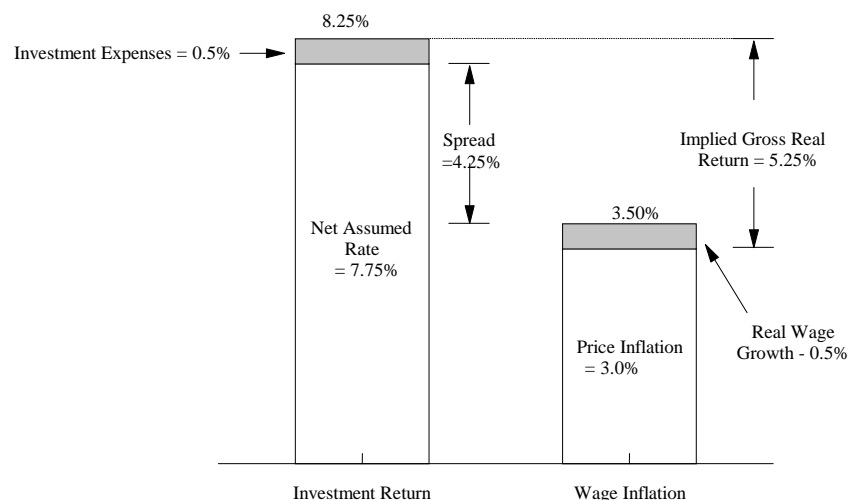
*The investment return rate* used in making the valuations was 7.75% per year, compounded annually (net after investment expenses). The *wage inflation rate* was assumed to be 3.50%. The real rate of return over wage growth is defined to be the portion of total investment return, which is more than the 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 30 and 31. 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.

*The municipal bond rate* is 2.85% (based on the weekly rate closest to but not later than the measurement date of the 20-Year Bond Buyer Index as published by the Federal Reserve).



## Summary of Valuation Method and Assumptions June 30, 2016 (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 32. 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 34. 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 36 and 37. *The probabilities of disability* are shown on page 35.

*The entry age normal actuarial cost method of valuation* was used in determining liabilities and normal cost.

Differences in the past between assumed experience and actual experience (“actuarial gains and losses”) become part of actuarial accrued liabilities. Unfunded actuarial accrued liabilities are amortized to produce payments (principal & interest) which are level percents of payroll contributions.

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

*Present assets (cash & investments)* are equal to the market value.

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

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

## 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

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

### Uniformed Plan Participants

<b>% Merit Increases in Salaries Next Year*</b>	
<b>Service Index</b>	<b>Rate</b>
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 30.



### 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	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

Age	Closed and Year 2000 Plans					2011 Tier			
	Non-Uniformed				Uniformed	Non-Uniformed			Uniformed
	Male		Female			Normal		Early	
	Normal	Early	Normal	Early	Normal	Age & Service	Rule of 90		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		0.3000
61	0.1800	0.0400	0.2200	0.0500	1.0000		0.3000		0.3000
62	0.4500	0.3000	0.3600	0.3000	1.0000		0.3000	0.1000	0.3000
63	0.3700	0.4000	0.2200	0.3000	1.0000		0.3000	0.1000	0.3000
64	0.2500	0.4000	0.2000	0.2500	1.0000		0.3000	0.1000	0.3000
65	0.3500		0.3500		1.0000		0.3000	0.1000	0.3000
66	0.4000		0.4500		1.0000		0.3000	0.1000	0.3000
67	0.2500		0.4000		1.0000	0.5000	0.3000		0.3000
68	0.3000		0.4000		1.0000	0.5000	0.3000		0.3000
69	0.3000		0.4000		1.0000	0.5000	0.3000		0.3000
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**

<b>Service</b>	<b>Non-Uniformed</b>		<b>Uniformed</b>	
	<b>Male</b>	<b>Female</b>	<b>Male</b>	<b>Female</b>
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

Age	Non-Uniformed		Uniformed	
	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

<b>Administrative Expenses:</b>	1.20% of payroll, based upon actual results from previous year.
<b>Disability Expenses:</b>	0.53% of payroll included in contribution. Retirement System pays premium directly to an outside insurance company or TPA.
<b>Marriage Assumption:</b>	90% of participants are assumed to be married for purposes of death-in-service benefits. Applies to disabled members entitled to future retirement benefits also.
<b>Pay Increase Timing:</b>	Beginning of (Fiscal) year.  This is equivalent to assuming that reported pays represent amounts paid to members during the year ended on the valuation date.
<b>Decrement Timing:</b>	Decrements of all types are assumed to occur mid-year.
<b>Eligibility Testing:</b>	Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.
<b>Benefit Service:</b>	Exact fractional service is used to determine the amount of benefit payable.
<b>Decrement Relativity:</b>	Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.
<b>Normal Form of Benefit:</b>	The assumed normal form of benefit is a 50% joint & survivor benefit for married members in the Closed Plan and a straight life benefit for all other members.
<b>Optional Benefit Factors:</b>	Optional Benefit Factors are in accordance with tables adopted by the Board. We believe these factors are reasonably close to actuarial equivalence based on valuation assumptions.
<b>Deferred Joint and Survivor:</b>	For the purpose of valuing the Joint and Survivor option, it was assumed that all deferred members would choose closed plan benefits.
<b>Active Member Data:</b>	Actual census date of data was May 31. Data was assumed to be statistically equivalent to June 30.
<b>Other:</b>	Turnover decrements do not operate during retirement eligibility.
<b>Miscellaneous Loading:</b>	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 retiree liabilities are increased by 23% to account for future survivor benefits.
<b>Contribution Stabilization Reserve Fund:</b>	The Contribution Stabilization Reserve Fund affects the total amount of UAAL financed and is assumed to grow at the investment return rate until reaching the \$250 million maximum.

## Method of Financial 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;
- (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 38.

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, 2016, resulted in *Unfunded Actuarial Accrued Liabilities* which were amortized using the following funding policy.

*Permanent Policy:* The total contribution will be based on normal cost plus a 19-year amortization of unfunded actuarial accrued liabilities. The amortization period is a closed 19-year period starting July 1, 2017.

*Temporary Accelerated Policy:* The total contribution is based on normal cost plus a 8-year amortization period for unfunded retiree liabilities and a 23-year amortization period for other unfunded liabilities. Both amortization periods are closed periods starting July 1, 2017.

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.



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## **SECTION G**

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

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## 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 Bond Buyer 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 2.85%; 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 41 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, 2016 valuation report and includes the effects of the \$188,315,769 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 45 and 46 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, 2066

Year	Valuation Payroll for Current Employees	Contributions from Current Employees	Service Cost and Expense Contributions	UAL Contributions	Total Contributions
0	\$ 339,799,378				
1	342,986,054	\$ 2,630,360	\$ 44,313,545	\$ 178,129,464	\$ 225,073,370
2	331,860,152	2,557,828	42,901,831	184,363,995	229,823,653
3	322,215,610	2,544,896	41,578,226	190,816,735	234,939,857
4	312,839,174	2,554,735	40,241,566	197,495,321	240,291,622
5	303,181,068	2,579,917	38,825,515	204,407,657	245,813,089
6	292,772,455	2,611,952	37,272,074	211,561,925	251,445,951
7	281,403,610	2,638,876	35,560,065	218,966,593	257,165,535
8	269,316,423	2,657,709	33,734,211	226,630,424	263,022,344
9	256,485,756	2,669,231	31,804,315	234,562,488	269,036,035
10	243,225,083	2,672,735	29,812,194	140,810,364	173,295,292
11	230,164,420	2,674,077	27,840,907	145,738,726	176,253,710
12	217,346,737	2,679,525	25,914,668	150,839,582	179,433,775
13	204,801,670	2,688,635	24,049,349	156,118,967	182,856,952
14	192,481,290	2,697,116	22,242,440	161,583,131	186,522,687
15	180,565,247	2,705,518	20,520,462	167,238,540	190,464,519
16	168,942,431	2,713,859	18,862,278	173,091,890	194,668,027
17	157,603,099	2,719,856	17,261,798	179,150,105	199,131,759
18	146,654,241	2,723,353	15,739,690	185,420,359	203,883,402
19	136,202,027	2,723,986	14,302,755	191,910,071	208,936,812
20	126,393,400	2,721,999	12,960,956	198,626,924	214,309,880
21	116,935,148	2,715,950	11,675,393	59,979,547	74,370,890
22	107,814,389	2,705,306	10,444,192	(10,444,192)	2,705,306
23	99,219,780	2,688,750	9,285,576	(9,285,576)	2,688,750
24	91,452,318	2,660,475	8,251,808	(8,251,808)	2,660,475
25	84,670,083	2,619,503	7,368,445	-	9,987,948
26	78,439,599	2,557,444	6,588,742	-	9,146,186
27	72,265,138	2,459,996	5,863,440	-	8,323,436
28	65,816,310	2,320,506	5,164,715	-	7,485,221
29	58,608,039	2,126,618	4,445,765	-	6,572,383
30	50,671,436	1,882,870	3,712,431	-	5,595,301
31	42,362,457	1,603,919	3,002,839	-	4,606,758
32	33,811,917	1,297,995	2,322,722	-	3,620,717
33	25,699,750	994,625	1,715,658	-	2,710,283
34	18,649,259	723,973	1,213,170	-	1,937,142
35	13,033,140	506,629	824,623	-	1,331,252
36	8,939,082	347,799	549,436	-	897,235
37	6,014,073	234,152	355,695	-	589,847
38	4,016,184	156,491	227,693	-	384,184
39	2,736,651	106,842	150,783	-	257,624
40	1,886,319	73,853	102,320	-	176,173
41	1,298,773	51,018	69,928	-	120,946
42	883,295	34,816	46,844	-	81,660
43	579,475	22,911	30,393	-	53,304
44	362,874	14,387	18,971	-	33,358
45	213,564	8,487	11,236	-	19,723
46	114,914	4,574	5,959	-	10,534
47	57,545	2,294	2,986	-	5,280
48	27,209	1,086	1,415	-	2,502
49	11,500	460	600	-	1,059
50	3,161	126	151	-	277

## Single Discount Rate Development

### Projection of Plan Fiduciary Net Position Ending June 30, 2116

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	\$ 1,992,073,946	\$ 225,073,370	\$ 241,015,897	\$ 4,115,833	\$ 153,622,972	\$ 2,125,638,558
2	2,125,638,558	229,823,653	247,733,658	3,982,322	163,904,489	2,267,650,721
3	2,267,650,721	234,939,857	254,641,983	3,866,587	174,846,684	2,418,928,691
4	2,418,928,691	240,291,622	262,164,666	3,754,070	186,492,452	2,579,794,029
5	2,579,794,029	245,813,089	270,168,341	3,638,173	198,869,532	2,750,670,135
6	2,750,670,135	251,445,951	278,190,246	3,513,269	212,026,332	2,932,438,903
7	2,932,438,903	257,165,535	286,861,462	3,376,843	226,006,358	3,125,372,490
8	3,125,372,490	263,022,344	295,945,016	3,231,797	240,841,523	3,330,059,544
9	3,330,059,544	269,036,035	305,739,379	3,077,829	256,566,857	3,546,845,228
10	3,546,845,228	173,295,292	316,039,273	2,918,701	269,341,394	3,670,523,941
11	3,670,523,941	176,253,710	326,109,310	2,761,973	278,662,021	3,796,568,389
12	3,796,568,389	179,433,775	335,278,664	2,608,161	288,208,560	3,926,323,898
13	3,926,323,898	182,856,952	344,551,155	2,457,620	298,047,905	4,060,219,980
14	4,060,219,980	186,522,687	353,315,793	2,309,775	308,236,578	4,199,353,678
15	4,199,353,678	190,464,519	361,573,090	2,166,783	318,860,773	4,344,939,096
16	4,344,939,096	194,668,027	369,780,063	2,027,309	329,996,707	4,497,796,458
17	4,497,796,458	199,131,759	377,155,302	1,891,237	341,737,611	4,659,619,288
18	4,659,619,288	203,883,402	384,232,371	1,759,851	354,195,447	4,831,705,915
19	4,831,705,915	208,936,812	389,689,345	1,634,424	367,521,584	5,016,840,542
20	5,016,840,542	214,309,880	394,890,258	1,516,721	381,880,540	5,216,623,982
21	5,216,623,982	74,370,890	398,599,176	1,403,222	391,905,578	5,282,898,052
22	5,282,898,052	2,705,306	401,963,435	1,293,773	394,192,822	5,276,538,973
23	5,276,538,973	2,688,750	404,252,012	1,190,637	393,616,258	5,267,401,333
24	5,267,401,333	2,660,475	404,409,260	1,097,428	392,904,581	5,257,459,700
25	5,257,459,700	9,987,948	403,166,801	1,016,041	392,463,088	5,255,727,893
26	5,255,727,893	9,146,186	399,986,856	941,275	392,420,630	5,256,366,579
27	5,256,366,579	8,323,436	396,165,435	867,182	392,586,976	5,260,244,373
28	5,260,244,373	7,485,221	392,144,351	789,796	393,011,482	5,267,806,929
29	5,267,806,929	6,572,383	388,717,670	703,296	393,696,464	5,278,654,810
30	5,278,654,810	5,595,301	385,339,598	608,057	394,632,098	5,292,934,555
31	5,292,934,555	4,606,758	381,890,687	508,349	395,836,131	5,310,978,407
32	5,310,978,407	3,620,717	378,062,210	405,743	397,346,520	5,333,477,691
33	5,333,477,691	2,710,283	373,320,018	308,397	399,239,627	5,361,799,186
34	5,361,799,186	1,937,142	367,625,335	223,791	401,624,911	5,397,512,114
35	5,397,512,114	1,331,252	360,310,330	156,398	404,650,353	5,443,026,991
36	5,443,026,991	897,235	351,269,464	107,269	408,506,917	5,501,054,410
37	5,501,054,410	589,847	340,808,643	72,169	413,391,481	5,574,154,926
38	5,574,154,926	384,184	329,486,770	48,194	419,480,398	5,664,484,544
39	5,664,484,544	257,624	317,518,355	32,840	426,931,838	5,774,122,811
40	5,774,122,811	176,173	305,386,078	22,636	435,887,448	5,904,777,718
41	5,904,777,718	120,946	293,243,960	15,585	446,473,099	6,058,112,219
42	6,058,112,219	81,660	281,007,243	10,600	458,820,544	6,235,996,579
43	6,235,996,579	53,304	268,611,199	6,954	473,077,026	6,440,508,757
44	6,440,508,757	33,358	255,907,733	4,354	489,409,135	6,674,039,163
45	6,674,039,163	19,723	242,924,437	2,563	508,001,006	6,939,132,892
46	6,939,132,892	10,534	229,750,567	1,379	529,046,428	7,238,437,907
47	7,238,437,907	5,280	216,476,841	691	552,747,153	7,574,712,809
48	7,574,712,809	2,502	203,146,813	327	579,315,267	7,950,883,437
49	7,950,883,437	1,059	189,886,283	138	608,972,701	8,369,970,776
50	8,369,970,776	277	176,800,441	38	641,949,558	8,835,120,132

## Single Discount Rate Development

### Projection of Plan Fiduciary Net Position Ending June 30, 2116 (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	\$ 8,835,120,132	\$ -	\$ 163,969,967	\$ -	\$ 678,486,530	\$ 9,349,636,740
52	9,349,636,740	-	151,456,791	-	718,837,404	9,917,017,352
53	9,917,017,352	-	139,314,629	-	763,271,131	10,540,973,854
54	10,540,973,854	-	127,590,484	-	812,073,594	11,225,456,963
55	11,225,456,963	-	116,323,785	-	865,549,473	11,974,682,651
56	11,974,682,651	-	105,547,153	-	924,024,267	12,793,159,764
57	12,793,159,764	-	95,285,664	-	987,846,456	13,685,720,556
58	13,685,720,556	-	85,556,842	-	1,057,389,875	14,657,553,589
59	14,657,553,589	-	76,373,518	-	1,133,056,149	15,714,236,220
60	15,714,236,220	-	67,744,629	-	1,215,277,184	16,861,768,775
61	16,861,768,775	-	59,676,926	-	1,304,517,747	18,106,609,596
62	18,106,609,596	-	52,175,848	-	1,401,278,154	19,455,711,902
63	19,455,711,902	-	45,244,718	-	1,506,097,153	20,916,564,337
64	20,916,564,337	-	38,885,674	-	1,619,555,032	22,497,233,695
65	22,497,233,695	-	33,099,002	-	1,742,276,956	24,206,411,649
66	24,206,411,649	-	27,881,583	-	1,874,936,651	26,053,466,717
67	26,053,466,717	-	23,227,268	-	2,018,260,408	28,048,499,857
68	28,048,499,857	-	19,124,284	-	2,173,031,500	30,202,407,073
69	30,202,407,073	-	15,554,012	-	2,340,095,076	32,526,948,137
70	32,526,948,137	-	12,491,313	-	2,520,363,474	35,034,820,298
71	35,034,820,298	-	9,903,402	-	2,714,821,977	37,739,738,872
72	37,739,738,872	-	7,750,633	-	2,924,535,029	40,656,523,269
73	40,656,523,269	-	5,987,999	-	3,150,652,848	43,801,188,117
74	43,801,188,117	-	4,567,468	-	3,394,418,392	47,191,039,041
75	47,191,039,041	-	3,440,853	-	3,657,174,680	50,844,772,869
76	50,844,772,869	-	2,561,168	-	3,940,372,504	54,782,584,204
77	54,782,584,204	-	1,884,341	-	4,245,578,620	59,026,278,483
78	59,026,278,483	-	1,370,970	-	4,574,484,449	63,599,391,961
79	63,599,391,961	-	986,710	-	4,928,915,355	68,527,320,606
80	68,527,320,606	-	702,749	-	5,310,840,624	73,837,458,481
81	73,837,458,481	-	495,488	-	5,722,384,190	79,559,347,183
82	79,559,347,183	-	345,922	-	6,165,836,252	85,724,837,513
83	85,724,837,513	-	239,162	-	6,643,665,813	92,368,264,164
84	92,368,264,164	-	163,744	-	7,158,534,246	99,526,634,667
85	99,526,634,667	-	111,025	-	7,713,309,965	107,239,833,606
86	107,239,833,606	-	74,569	-	8,311,084,269	115,550,843,306
87	115,550,843,306	-	49,608	-	8,955,188,470	124,505,982,167
88	124,505,982,167	-	32,707	-	9,649,212,374	134,155,161,834
89	134,155,161,834	-	21,364	-	10,397,024,230	144,552,164,699
90	144,552,164,699	-	13,803	-	11,202,792,239	155,754,943,135
91	155,754,943,135	-	8,832	-	12,071,007,757	167,825,942,061
92	167,825,942,061	-	5,591	-	13,006,510,297	180,832,446,767
93	180,832,446,767	-	3,485	-	14,014,514,492	194,846,957,774
94	194,846,957,774	-	2,134	-	15,100,639,146	209,947,594,786
95	209,947,594,786	-	1,266	-	16,270,938,548	226,218,532,068
96	226,218,532,068	-	732	-	17,531,936,207	243,750,467,543
97	243,750,467,543	-	419	-	18,890,661,219	262,641,128,343
98	262,641,128,343	-	235	-	20,354,687,438	282,995,815,545
99	282,995,815,545	-	131	-	21,932,175,700	304,927,991,114
100	304,927,991,114	-	77	-	23,631,919,308	328,559,910,345

## Single Discount Rate Development

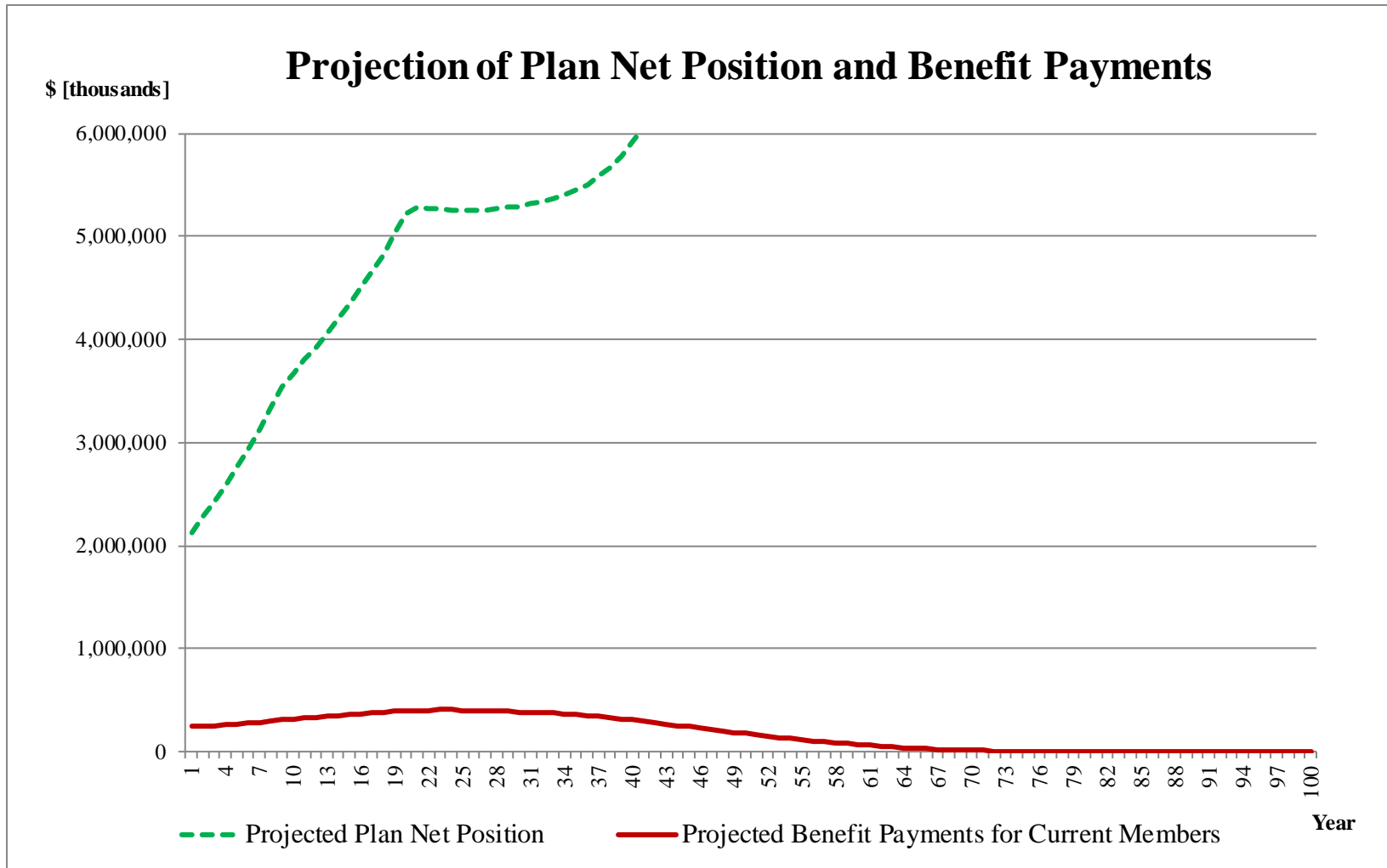
### Present Values of Projected Benefits Ending June 30, 2016

Year	Projected Beginning Plan Net Position	Projected Benefit Payments	Funded Portion of Benefit Payments	Unfunded Portion of Benefit Payments	Present Value of Funded Benefit Payments using Expected Return Rate (v)	Present Value of Unfunded Benefit Payments using Municipal Bond Rate (vf)	Present Value of Benefit Payments using Single Discount Rate (sdr)
(a)	(b)	(c)	(d)	(e)	(f)=(d)*v <sup>a</sup> ((a)-.5)	(g)=(e)*vf <sup>a</sup> ((a)-.5)	(h)=(c)/(1+sdr) <sup>a</sup> ((a)-.5)
1	\$ 1,992,073,946	\$ 241,015,897	\$ 241,015,897	\$ -	\$ 232,186,545	\$ -	\$ 232,186,545
2	2,125,638,558	247,733,658	247,733,658	-	221,492,537	-	221,492,537
3	2,267,650,721	254,641,983	254,641,983	-	211,293,828	-	211,293,828
4	2,418,928,691	262,164,666	262,164,666	-	201,889,477	-	201,889,477
5	2,579,794,029	270,168,341	270,168,341	-	193,088,630	-	193,088,630
6	2,750,670,135	278,190,246	278,190,246	-	184,521,453	-	184,521,453
7	2,932,438,903	286,861,462	286,861,462	-	176,587,474	-	176,587,474
8	3,125,372,490	295,945,016	295,945,016	-	169,075,795	-	169,075,795
9	3,330,059,544	305,739,379	305,739,379	-	162,108,023	-	162,108,023
10	3,546,845,228	316,039,273	316,039,273	-	155,516,654	-	155,516,654
11	3,670,523,941	326,109,310	326,109,310	-	148,929,856	-	148,929,856
12	3,796,568,389	335,278,664	335,278,664	-	142,104,297	-	142,104,297
13	3,926,323,898	344,551,155	344,551,155	-	135,530,713	-	135,530,713
14	4,060,219,980	353,315,793	353,315,793	-	128,982,202	-	128,982,202
15	4,199,353,678	361,573,090	361,573,090	-	122,502,671	-	122,502,671
16	4,344,939,096	369,780,063	369,780,063	-	116,272,141	-	116,272,141
17	4,497,796,458	377,155,302	377,155,302	-	110,061,421	-	110,061,421
18	4,659,619,288	384,232,371	384,232,371	-	104,061,857	-	104,061,857
19	4,831,705,915	389,689,345	389,689,345	-	97,948,744	-	97,948,744
20	5,016,840,542	394,890,258	394,890,258	-	92,116,936	-	92,116,936
21	5,216,623,982	398,599,176	398,599,176	-	86,294,314	-	86,294,314
22	5,282,898,052	401,963,435	401,963,435	-	80,763,486	-	80,763,486
23	5,276,538,973	404,252,012	404,252,012	-	75,381,264	-	75,381,264
24	5,267,401,333	404,409,260	404,409,260	-	69,986,623	-	69,986,623
25	5,257,459,700	403,166,801	403,166,801	-	64,753,229	-	64,753,229
26	5,255,727,893	399,986,856	399,986,856	-	59,621,804	-	59,621,804
27	5,256,366,579	396,165,435	396,165,435	-	54,804,812	-	54,804,812
28	5,260,244,373	392,144,351	392,144,351	-	50,346,675	-	50,346,675
29	5,267,806,929	388,717,670	388,717,670	-	46,317,151	-	46,317,151
30	5,278,654,810	385,339,598	385,339,598	-	42,612,196	-	42,612,196
31	5,292,934,555	381,890,687	381,890,687	-	39,193,321	-	39,193,321
32	5,310,978,407	378,062,210	378,062,210	-	36,009,657	-	36,009,657
33	5,333,477,691	373,320,018	373,320,018	-	33,000,439	-	33,000,439
34	5,361,799,186	367,625,335	367,625,335	-	30,159,670	-	30,159,670
35	5,397,512,114	360,310,330	360,310,330	-	27,433,461	-	27,433,461
36	5,443,026,991	351,269,464	351,269,464	-	24,821,441	-	24,821,441
37	5,501,054,410	340,808,643	340,808,643	-	22,350,123	-	22,350,123
38	5,574,154,926	329,486,770	329,486,770	-	20,053,493	-	20,053,493
39	5,664,484,544	317,518,355	317,518,355	-	17,935,092	-	17,935,092
40	5,774,122,811	305,386,078	305,386,078	-	16,009,093	-	16,009,093
41	5,904,777,718	293,243,960	293,243,960	-	14,266,889	-	14,266,889
42	6,058,112,219	281,007,243	281,007,243	-	12,688,212	-	12,688,212
43	6,235,996,579	268,611,199	268,611,199	-	11,256,147	-	11,256,147
44	6,440,508,757	255,907,733	255,907,733	-	9,952,491	-	9,952,491
45	6,674,039,163	242,924,437	242,924,437	-	8,768,035	-	8,768,035
46	6,939,132,892	229,750,567	229,750,567	-	7,696,095	-	7,696,095
47	7,238,437,907	216,476,841	216,476,841	-	6,729,890	-	6,729,890
48	7,574,712,809	203,146,813	203,146,813	-	5,861,237	-	5,861,237
49	7,950,883,437	189,886,283	189,886,283	-	5,084,586	-	5,084,586
50	8,369,970,776	176,800,441	176,800,441	-	4,393,676	-	4,393,676

## Single Discount Rate Development

### Present Values of Projected Benefits Ending June 30, 2116 (Concluded)

Year	Projected Beginning Plan Net Position	Projected Benefit Payments	Funded Portion of Benefit Payments	Unfunded Portion of Benefit Payments	Present Value of Funded Benefit Payments using Expected Return Rate (v)	Present Value of Unfunded Benefit Payments using Municipal Bond Rate (vf)	Present Value of Benefit Payments using Single Discount Rate (sdr)
(a)	(b)	(c)	(d)	(e)	(f)=(d)*v <sup>(a)-.5</sup>	(g)=(e)*vf <sup>(a)-.5</sup>	(h)=((c)/(1+sdr) <sup>(a)-.5</sup> )
51	\$ 8,835,120,132	\$ 163,969,967	\$ 163,969,967	\$ -	\$ 3,781,741	\$ -	\$ 3,781,741
52	9,349,636,740	151,456,791	151,456,791	-	3,241,895	-	3,241,895
53	9,917,017,352	139,314,629	139,314,629	-	2,767,512	-	2,767,512
54	10,540,973,854	127,590,484	127,590,484	-	2,352,306	-	2,352,306
55	11,225,456,963	116,323,785	116,323,785	-	1,990,338	-	1,990,338
56	11,974,682,651	105,547,153	105,547,153	-	1,676,052	-	1,676,052
57	12,793,159,764	95,285,664	95,285,664	-	1,404,272	-	1,404,272
58	13,685,720,556	85,556,842	85,556,842	-	1,170,203	-	1,170,203
59	14,657,553,589	76,373,518	76,373,518	-	969,465	-	969,465
60	15,714,236,220	67,744,629	67,744,629	-	798,081	-	798,081
61	16,861,768,775	59,676,926	59,676,926	-	652,471	-	652,471
62	18,106,609,596	52,175,848	52,175,848	-	529,428	-	529,428
63	19,455,711,902	45,244,718	45,244,718	-	426,077	-	426,077
64	20,916,564,337	38,885,674	38,885,674	-	339,854	-	339,854
65	22,497,233,695	33,099,002	33,099,002	-	268,473	-	268,473
66	24,206,411,649	27,881,583	27,881,583	-	209,887	-	209,887
67	26,053,466,717	23,227,268	23,227,268	-	162,274	-	162,274
68	28,048,499,857	19,124,284	19,124,284	-	123,999	-	123,999
69	30,202,407,073	15,554,012	15,554,012	-	93,596	-	93,596
70	32,526,948,137	12,491,313	12,491,313	-	69,760	-	69,760
71	35,034,820,298	9,903,402	9,903,402	-	51,329	-	51,329
72	37,739,738,872	7,750,633	7,750,633	-	37,282	-	37,282
73	40,656,523,269	5,987,999	5,987,999	-	26,732	-	26,732
74	43,801,188,117	4,567,468	4,567,468	-	18,924	-	18,924
75	47,191,039,041	3,440,853	3,440,853	-	13,231	-	13,231
76	50,844,772,869	2,561,168	2,561,168	-	9,140	-	9,140
77	54,782,584,204	1,884,341	1,884,341	-	6,241	-	6,241
78	59,026,278,483	1,370,970	1,370,970	-	4,214	-	4,214
79	63,599,391,961	986,710	986,710	-	2,815	-	2,815
80	68,527,320,606	702,749	702,749	-	1,860	-	1,860
81	73,837,458,481	495,488	495,488	-	1,217	-	1,217
82	79,559,347,183	345,922	345,922	-	789	-	789
83	85,724,837,513	239,162	239,162	-	506	-	506
84	92,368,264,164	163,744	163,744	-	322	-	322
85	99,526,634,667	111,025	111,025	-	202	-	202
86	107,239,833,606	74,569	74,569	-	126	-	126
87	115,550,843,306	49,608	49,608	-	78	-	78
88	124,505,982,167	32,707	32,707	-	48	-	48
89	134,155,161,834	21,364	21,364	-	29	-	29
90	144,552,164,699	13,803	13,803	-	17	-	17
91	155,754,943,135	8,832	8,832	-	10	-	10
92	167,825,942,061	5,591	5,591	-	6	-	6
93	180,832,446,767	3,485	3,485	-	3	-	3
94	194,846,957,774	2,134	2,134	-	2	-	2
95	209,947,594,786	1,266	1,266	-	1	-	1
96	226,218,532,068	732	732	-	1	-	1
97	243,750,467,543	419	419	-	0	-	0
98	262,641,128,343	235	235	-	0	-	0
99	282,995,815,545	131	131	-	0	-	0
100	304,927,991,114	77	77	-	0	-	0
<b>Totals</b>					\$ 4,114,018,666	\$ -	\$ 4,114,018,666



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.



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## **SECTION H**

### **GLOSSARY OF TERMS**

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## Glossary of Terms

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

## Glossary of Terms

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

## Glossary of Terms

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

## Glossary of Terms

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

October 17, 2016


The Retirement Board  
Missouri Department of Transportation  
and Highway Patrol Employees' Retirement System  
1913 William Street  
Jefferson City, Missouri 65102-1930

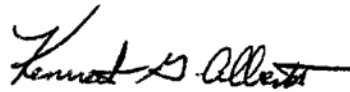
Dear Board Members:

Please find enclosed 5 copies of the GASB Statement Nos. 67 and 68 Accounting and Financial Reporting for Pensions report of the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS).

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

Respectfully submitted,

  
Heidi G. Barry, ASA, MAAA

  
Kenneth G. Alberts

HGB/KGA:mrh  
Enclosures