GRS Gabriel Roeder Smith & Company
Consultants & Actuaries

MINNESOTA STATE RETIREMENT SYSTEM
STATE PATROL RETIREMENT FUND
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2015

GRS
Gabriel Roeder Smith & Company
Consultants & Actuaries
100 South Fifth Street
Suite 1900
Minneapolis, MN 55402-1267
612.605.6200 phone
612.605.6203 fax
www.gabrielroeder.com

December 14, 2015

Minnesota State Retirement System
State Patrol Retirement Fund
St. Paul, Minnesota

Dear Board of Directors:

The results of the July 1, 2015 annual actuarial valuation of the State Patrol Retirement Fund are presented in this report. This report was prepared at the request of the Board and is intended for use by the Board and staff and those designated or approved by the Board. This report may be provided to parties other than the Fund only in its entirety. GRS is not responsible for the consequences of any unauthorized use of this report by persons other than intended users as described above.

The purpose of the valuation is to measure the Fund's funding progress and to determine the required contribution rate for the fiscal year beginning July 1, 2015. Note that we have not attempted to quantify the impact of GASB Statements No. 67 and No. 68 in this report. Please see the separate report dated November 30, 2015.

The valuation was based upon information furnished by the Minnesota State Retirement System (MSRS), concerning benefits, financial transactions, plan provisions and active members, terminated members, retirees and beneficiaries. We checked for internal and year-to-year consistency, but did not otherwise audit the data. We are not responsible for the accuracy or completeness of the information provided by MSRS.

Actuarial assumptions, including discount rates, mortality tables and others identified in this report, are prescribed by Minnesota Statutes Section 356.215, the Legislative Commission on Pensions and Retirement (LCPR), and the Board of Directors. These parties are responsible for selecting the plan's funding policy, actuarial valuation methods, asset valuation methods, and assumptions. The policies, methods and assumptions used in this valuation are those that have been so prescribed and are described in the Actuarial Basis of this report. MSRS is solely responsible for communicating to GRS any changes required thereto.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. Due to the limited scope of our assignment, we did not perform an analysis of the potential range of such future measurements.

Actuarial standards do not require the actuary to evaluate the ability of the plan sponsor or other contributing entity to make required contributions to the plan when due. Such an evaluation was not within the scope of this project and is not within the actuary's domain of expertise. Consequently, the actuary performed no such evaluation.

This report should not be relied on for any purpose other than the purpose described herein. Determinations of the financial results associated with the benefits described in this report in a manner other than the intended purpose may produce significantly different results.

The signing actuaries are independent of the plan sponsor. We are not aware of any relationship that would impair the objectivity of our work.

Brian B. Murphy and Bonita J. Wurst are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. In addition, Mr. Murphy meets the requirements of "approved actuary" under Minnesota Statutes Section 356.215, Subdivision 1, Paragraph (c).

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. To the best of our knowledge and belief, the information contained in this report is accurate and fairly presents the actuarial position of the State Patrol Retirement Fund as of the valuation date and was performed in accordance with the requirements of Minnesota Statutes Section 356.215, and the requirements of the Standards for Actuarial Work established by the LCPR. All calculations have been made in conformity with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board and with applicable statutes.

We are available to answer any questions or provide further details.

Respectfully submitted,

Brian B. Murphy, FSA, EA, MAAA

Bonita J. Wurst, ASA, EA, MAAA

BBM/BJW:rmn

Other Observations

General Implications of Contribution Allocation Procedure or Funding Policy on Future Expected Plan Contributions and Funded Status

Given the plan's contribution allocation procedure, if there are no changes in benefits or contributions (other than the statutory increase of 2.5% of payroll on July 1, 2016) and all actuarial assumptions are met (including the assumption of the plan earning 8.0%), it is expected that:

(1) The unfunded actuarial accrued liabilities on a market value of assets basis will be fully amortized after approximately 35 years,
(2) The funded status of the plan will increase gradually towards a 100% funding ratio, and
(3) The unfunded liability will grow initially as a dollar amount before beginning to decline.

Limitations of Funded Status Measurements

Unless otherwise indicated, a funded status measurement presented in this report is based upon the actuarial accrued liability and the actuarial value of assets. Unless otherwise indicated, with regard to any funded status measurements presented in this report:

(1) The measurement is inappropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations, in other words, of transferring the obligations to a unrelated third party in an arm's length market value type transaction.
(2) The measurement is dependent upon the actuarial cost method which, in combination with the plan's amortization policy, affects the timing and amounts of future contributions. The amounts of future contributions will most certainly differ from those assumed in this report due to future actual experience differing from assumed experience based upon the actuarial assumptions. A funded status measurement in this report of 100% is not synonymous with no required future contributions. If the funded status were 100%, the plan would still require future normal cost contributions (i.e., contributions to cover the cost of the active membership accruing an additional year of service credit).
(3) The measurement would produce a different result if the market value of assets were used instead of the actuarial value of assets, unless the market value of assets is used in the measurement.

Contents

Summary of Valuation Results

Contributions

The following table summarizes important contribution information as described in the Development of Costs section.

	Actuarial Valuation as of	
Contributions	**July 1, 2015**	**July 1, 2014**
Statutory Contributions - Chapter 352B (% of Payroll)	34.93%	34.98%
Required Contributions - Chapter 356 (% of Payroll)	42.91%	43.56%
Sufficiency / (Deficiency)	(7.98)%	(8.58)%

The contribution deficiency decreased from 8.58% of payroll to 7.98% of payroll. The primary reasons for the decreased contribution deficiency are the recognition of deferred gains on assets from prior years and the decrease in liability due to an assumed delay in the 1.5% and 2.5% postretirement benefit increases (see page 4 for detailed information). Member and employer contribution rates are scheduled to increase an additional 2.5% of payroll on July 1, 2016. The annual state contribution of $1 million (1.43% of payroll) is reflected in the statutory contribution rates shown above.

Based on the actuarial value of assets, statutory contributions are not sufficient to fully amortize the unfunded actuarial accrued liability over the statutory amortization period of 23 years. On a market value of assets basis, contributions are deficient by 5.52% of payroll. When the scheduled 2016 contribution increases of 2.5% are reflected, a deficiency of 3.02% remains (on a market value of assets basis). Based on current statutory contributions, the market value of assets, and other methods and assumptions described in this report, the unfunded liability will be eliminated in approximately 35 years.

The Plan Assets section provides detail on the plan assets used for the valuation including a development of the Actuarial Value of Assets (AVA). The Market Value of Assets (MVA) earned approximately 4.4% for the plan year ending June 30, 2015. The AVA earned approximately 12.7% for the plan year ending June 30, 2015 as compared to the assumed rate of 8.0%. The assumed rate is a prescribed assumption mandated by Minnesota Statutes.

Participant reconciliation and statistics are detailed in the Membership Data section. The Actuarial Basis section includes a summary of plan provisions and actuarial methods and assumptions used for the calculations in this report.

Accounting and financial reporting information prepared according to GASB Statements No. 67 and No. 68 has been provided in a separate report dated November 30, 2015.

Summary of Valuation Results

A summary of principal valuation results from the current valuation and the prior valuation follows. Any changes in plan provisions, actuarial assumptions or valuation methods and procedures between the two valuations are described after the summary.

	Actuarial Valuation as of	
	July 1, 2015	**July 1, 2014**
Contributions (*% of Payroll*)		
Statutory - Chapter 352B	34.93%	34.98%
Required - Chapter 356	42.91%	43.56%
Sufficiency / (Deficiency)	(7.98)%	(8.58)%
Funding Ratios (*dollars in thousands*)		
Assets		
- Current assets (AVA)	$ 639,863	$ 597,870
- Current assets (MVA)	664,530	667,340
Accrued Benefit Funding Ratio		
- Current benefit obligations	$ 810,894	$ 777,936
- Funding ratio (AVA)	78.91%	76.85%
- Funding ratio (MVA)	81.95%	85.78%
Accrued Liability Funding Ratio		
- Actuarial accrued liability	$ 833,033	$ 800,421
- Funding ratio (AVA)	76.81%	74.69%
- Funding ratio (MVA)	79.77%	83.37%
Projected Benefit Funding Ratio		
- Current and expected future assets	$ 899,720	$ 848,631
- Current and expected future benefit obligations	979,772	933,024
- Projected benefit funding ratio (AVA)	91.83%	90.95%
Participant Data		
Active members		
- Number	843	858
- Projected annual earnings *(000s)*	69,857	67,386
- Average projected annual earnings	82,867	78,538
- Average age	41.3	41.8
- Average service	11.9	12.4
Service retirements	816	776
Survivors	154	155
Disability retirements	57	54
Deferred retirements	52	44
Terminated other non-vested	17	17
Total	**1,939**	**1,904**

Summary of Valuation Results

Effects of Changes

The following changes in plan provisions, actuarial assumptions, and methods were recognized as of July 1, 2015:

- The discount rate was changed from 8.0% through June 30, 2017 and 8.5% thereafter to 8.0% for all years.
- The inflation assumption was changed from 3.00% to 2.75%.
- The payroll growth assumption was changed from 3.75% to 3.50%.
- Assumed increases in member salaries were decreased by 0.25% at all ages.
- The assumed post-retirement benefit increase rate was changed from 1.0% per year through 2017, 1.5% from 2018 through 2032 and 2.5% thereafter to 1.0% through 2029, 1.5% from 2030 through 2048 and 2.5% thereafter.

Refer to the Actuarial Basis section of this report for a complete description of these changes.

The combined impact of the above changes was to decrease the accrued liability by $5.3 million and decrease the required contribution by 0.7% of pay, as follows:

	Before Changes	Reflecting Assumption Changes
Normal Cost Rate, % of Pay	23.4%	23.4%
Amortization of Unfunded Accrued Liability, % of pay	20.0%	19.3%
Expenses (% of Pay)	0.2%	0.2%
Total Required Contribution, % of Pay	43.6%	42.9%
Accrued Liability Funding Ratio	76.3%	76.8%
Projected Benefit Funding Ratio	91.3%	91.8%
Unfunded Accrued Liability (in millions)	$198.5	$193.2

Summary of Valuation Results

Valuation of Future Annual Post-Retirement Benefit Increases

Benefit recipients receive a future annual compounding 1.0% post-retirement benefit increase. If the accrued liability funding ratio (determined on a market value of assets basis) reaches or exceeds 85% (based on a 1.5% post-retirement increase assumption) for two consecutive years, the benefit increase will revert to 1.5%. Similarly, if the accrued liability funding ratio reaches or exceeds 90% (based on a 2.5% post-retirement increase assumption) for two consecutive years, the benefit increase will revert to 2.5%. If, after reverting to a 1.5% benefit increase, the accrued liability funding ratio declines to 75% or less for one year or 80% or less for two consecutive years, the benefit increase rate will decrease to 1.0%. Benefit increases already granted, however, will not be affected.

To determine an assumption regarding future changes in the post-retirement benefit increase, we performed a projection of liabilities and assets based on the following methods and assumptions:

- Future investment returns and liability discount rates of 8.00%;
- Open group; stable active population (new member profile based on average new members hired in recent years);
- The post-retirement benefit increase rate is assumed to be 1.0% per year until the accrued liability funding ratio threshold required to pay a 1.5% post-retirement benefit increase is reached; and similarly, the post-retirement benefit increase is assumed to be 1.5% per year until the accrued liability funding ratio threshold required to pay a 2.5% post-retirement benefit increase is reached.
- Current statutory contribution levels including scheduled increases through 2016 (i.e., not including potential contribution increases under the contribution stabilizer statutes).

Based on these assumptions and methods, the projection indicates this plan is expected to attain the accrued liability funding ratio threshold to pay the 1.5% benefit increase in the year 2029 and the plan would begin paying 1.5% benefit increases on January 1, 2030. Similarly, the projection indicates this plan is expected to attain the accrued liability funding ratio threshold to pay the 2.5% benefit increase in the year 2048 and the plan would begin paying 2.5% benefit increases on January 1, 2049. This assumption is reflected in our calculations. This is only an assumption; actual timing will depend on actual experience.

Summary of Valuation Results

Risk Measures *(Dollars in Thousands)*

Valuation Date (July 1)	(1) Accrued Liabilities (AAL)	(2) Market Value of Assets	(3) Market Value Unfunded AAL (1) - (2)	(4) Valuation Payroll	(5) Market Value Funded Ratio (2) / (1)	(6) Retiree Liabilities	(7) RetLiab/ AAL (6) / (1)	(8) AAL/ Payroll (1) / (4)	(9) Assets/ Payroll (2) / (4)
2010	$683,360	$488,870	$194,490	$63,250	71.5%	$441,901	64.7%	1080.4%	772.9%
2011	700,898	568,279	132,619	63,250	81.1%	454,811	64.9%	1108.1%	898.5%
2012	760,955	549,956	210,999	62,524	72.3%	513,106	67.4%	1217.1%	879.6%
2013	741,850	593,201	148,649	62,121	80.0%	507,005	68.3%	1194.2%	954.9%
2014	800,421	667,340	133,081	63,952	83.4%	537,866	67.2%	1251.6%	1043.5%
2015	833,033	664,530	168,503	68,463	79.8%	570,541	68.5%	1216.8%	970.6%

Valuation Date (July 1)	(10) Portfolio StdDev	(11) Std Dev % of Pay (9) x (10)	(12) Unfunded / Payroll (3) / (4)	(13) Non-Investment Cash Flow (NICF)	(14) NICF/ Assets (13) / (2)	(15) SBI Market Rate of Return	(16) SBI 5-year Average
2010			307.5%	$(29,374)	-6.0%	15.2%	3.4%
2011			209.7%	(31,499)	-5.5%	23.3%	5.3%
2012			337.5%	(31,067)	-5.6%	2.4%	2.3%
2013			239.3%	(33,070)	-5.6%	14.2%	6.2%
2014			208.1%	(33,048)	-5.0%	18.6%	14.5%
2015	14.1%	136.9%	246.1%	(31,713)	-4.8%	4.4%	12.3%

Notes pertaining to numbered columns:

(5) The Funded ratio is the most widely known measure of a plan's financial strength, but the trend in the funded ratio is much more important than the absolute ratio. The funded ratio should trend to 100%. As it approaches 100%, it is important to re-evaluate the level of investment risk in the portfolio and potentially to re-evaluate the assumed rate of return.

(6) and (7). The ratio of Retiree liabilities to total accrued liabilities gives an indication of the maturity of the system. As the ratio increases, cash flow needs increase, and the liquidity needs of the portfolio change. A ratio on the order of 50% indicates a maturing system.

(8) and (9). The ratios of liabilities and assets to payroll gives an indication of both maturity and volatility. Many systems have ratios between 500% and 700%. Ratios significantly above that range may indicate difficulty in supporting the benefit level as a level % of payroll.

(10) and (11). The portfolio standard deviation measures the volatility of investment return. When multiplied by the ratio of assets to payroll it gives the effect of a one standard deviation asset move as a percent of payroll. This figure helps users understand the difficulty of dealing with investment volatility and the challenges volatility brings to sustainability.

(12) The ratio of unfunded liability to payroll gives an indication of the plan sponsor's ability to actually pay off the unfunded liability. A ratio above approximately 300% or 400% may indicate difficulty in discharging the unfunded liability within a reasonable time frame.

(13) The ratio of non-investment cash flow to assets is an important measure of sustainability. Negative ratios are common and expected for a maturing system. In the longer term, this ratio should be on the order of approximately -4%. A ratio that is significantly more negative than that for an extended period could be a leading indicator of potential exhaustion of assets.

(15) and (16). Investment return is probably the largest single risk that most systems face. The year by year return and the 5-year geometric average give an indicator of the realism of the systems assumed return. Of course, past performance is not a guarantee of future results. The performance data for the Combined Funds (pooled investments of major Minnesota Public Retirement Systems) is presented in these columns. The source of this data is the Minnesota State Board of Investment.

Information prior to 2012 provided by prior actuary. See prior reports for additional detail.

Supplemental Information

The remainder of the report includes information supporting the results presented in the previous sections.

- **Plan assets** presents information about the plan's assets as reported by the Minnesota State Retirement System. The assets represent the portion of total fund liabilities that has been funded.
- **Membership data** presents and describes the membership data used in the valuation.
- **Development of costs** shows the liabilities for plan benefits and the derivation of the contribution amount.
- **Actuarial basis** describes the plan provisions, as well as the methods and assumptions used to value the plan. The valuation is based on the premise that the plan is ongoing.
- **Additional Schedules** includes a summary of funding progress and contributions over the long term.
- **Glossary** defines the terms used in this report.

Plan Assets

Statement of Fiduciary Net Position *(Dollars in Thousands)*

	Market Value	
Assets	**June 30, 2015**	**June 30, 2014**
Cash, equivalents, short term securities	$ 12,692	$ 17,480
Fixed income	156,362	155,810
Equity	494,996	493,728
Other*	67,725	72,256
Total cash, investments, and other assets	**$ 731,775**	**$ 739,274**
Amounts receivable	876	701
Total Assets	**$ 732,651**	**$ 739,975**
Amounts payable*	(68,121)	(72,635)
Net Position Restricted for Pensions	**$ 664,530**	**$ 667,340**

** Includes $67,725 in Securities Lending Collateral as of June 30, 2015 and $72,256 as of June 30, 2014.*

Plan Assets

Reconciliation of Plan Assets *(Dollars in Thousands)*

The following exhibit shows the revenue, expenses and resulting assets of the Fund as reported by the Minnesota State Retirement System for the Plan's prior two fiscal years.

Change in Assets	**Market Value**	
Year Ending	**June 30, 2015**	**June 30, 2014**
1. Fund balance at market value at beginning of year	**$ 667,340**	**$ 593,201**
2. Contributions		
a. Member	9,174	7,930
b. Employer	13,763	11,894
c. Other sources - Supplemental State Aid	1,000	1,000
d. Total contributions	$ 23,937	$ 20,824
3. Investment income		
a. Investment income/(loss)	29,833	108,116
b. Investment expenses	(930)	(929)
c. Net investment income/(loss)	28,903	107,187
4. Other	0	0
5. Total income: *(2.d.) + (3.c.) + (4.)*	**$ 52,840**	**$ 128,011**
6. Benefits Paid		
a. Annuity benefits	(55,465)	(53,697)
b. Refunds	(15)	(25)
c. Total benefits paid	(55,480)	(53,722)
7. Expenses		
a. Other	0	0
b. Administrative	(170)	(150)
c. Total expenses	(170)	(150)
8. Total disbursements: *(6.c.) + (7.c.)*	**(55,650)**	**(53,872)**
9. Fund balance at market value at end of year: *(1.) + (5.) + (8.)*	**$ 664,530**	**$ 667,340**
10. State Board of Investment calculated investment return	4.4%	18.6%

Plan Assets

Actuarial Asset Value *(Dollars in Thousands)*

	June 30, 2015	June 30, 2014
1. Market value of assets available for benefits	**$ 664,530**	**$ 667,340**
2. Determination of average balance		
a. Total assets available at beginning of year	667,340	593,201
b. Total assets available at end of year	664,530	667,340
c. Net investment income for fiscal year	28,903	107,187
d. Average balance *[a. + b. - c.] / 2*	651,484	576,677
3. Expected return *[8.0% x 2.d.]*	52,119	46,134
4. Actual return	28,903	107,187
5. Current year asset gain/(loss) *[4. - 3.]*	(23,216)	61,053
6. Unrecognized asset returns		

	Original Amount	Unrecognized Amount %	Unrecognized Amount $	Unrecognized Amount %	Unrecognized Amount $
a. Year ended June 30, 2015	$(23,216)	80%	$ (18,573)		N/A
b. Year ended June 30, 2014	61,053	60%	36,632	80%	$ 48,842
c. Year ended June 30, 2013	33,641	40%	13,456	60%	20,185
d. Year ended June 30, 2012	(34,239)	20%	(6,848)	40%	(13,696)
e. Year ended June 30, 2011	70,693		N/A	20%	14,139
f. Unrecognized return adjustment			**$ 24,667**		**$ 69,470**

7. **Actuarial value at end of year** *(1. - 6.f.)*	**$ 639,863**	**$ 597,870**
8. Approximate return on actuarial value of assets during fiscal year	12.7%	14.7%
9. Ratio of actuarial value of assets to market value of assets	0.96	0.90

Membership Data

Distribution of Active Members

	Years of Service as of June 30, 2015									
Age	**<3***	**3 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25 - 29**	**30 - 34**	**35+**	**Total**
< 25	18									**18**
Avg. Earnings	34,969									**34,969**
25 - 29	54	16	10							**80**
Avg. Earnings	49,135	71,675	74,185							**56,775**
30 - 34	36	11	40	12						**99**
Avg. Earnings	56,462	68,469	75,676	84,084						**68,907**
35 - 39	24	10	29	63	16					**142**
Avg. Earnings	56,575	75,697	80,054	87,651	88,239					**80,072**
40 - 44	13	5	36	48	68	3				**173**
Avg. Earnings	59,001	73,244	83,409	87,023	86,972	87,806				**83,760**
45 - 49	8	1	21	26	67	24	14			**161**
Avg. Earnings	62,055	77,298	82,948	83,930	86,189	84,528	82,197			**83,552**
50 - 54	4	3	5	20	30	19	36	8		**125**
Avg. Earnings	77,405	85,439	85,975	88,358	89,991	87,052	90,624	85,760		**88,522**
55 - 59	2	1	6		7	10	11	6		**43**
Avg. Earnings	92,323	127,392	94,383		91,079	82,261	92,925	100,669		**92,202**
60 - 64				2						**2**
Avg. Earnings				99,704						**99,704**
65 - 69										
Avg. Earnings										
70+										
Avg. Earnings										
Total	**159**	**47**	**147**	**171**	**188**	**56**	**61**	**14**		**843**
Avg. Earnings	**53,025**	**74,131**	**80,484**	**86,882**	**87,435**	**85,155**	**89,105**	**92,150**		**78,927**

* *This exhibit does not reflect service earned in other MSRS or Combined Service Annuity benefits. It should not be relied upon as an indicator of non-vested status.*

In each cell, the top number is the count of active participants for the age/service combination and the bottom number is average valuation earnings for the fiscal year ending on the valuation date.

Membership Data

Distribution of Service Retirements

	Years Retired as of June 30, 2015							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<50								
Avg. Benefit								
50 - 54	16	14						**30**
Avg. Benefit	53,778	42,863						**48,685**
55 - 59	34	88	24					**146**
Avg. Benefit	62,192	58,359	42,447					**56,636**
60 - 64	5	38	95	22				**160**
Avg. Benefit	45,205	51,278	55,406	44,996				**52,675**
65 - 69			26	95	20			**141**
Avg. Benefit			47,234	56,805	57,665			**55,162**
70 - 74			7	28	98	3		**136**
Avg. Benefit			47,500	60,122	63,444	44,765		**61,527**
75 - 79				1	34	47		**82**
Avg. Benefit				12,425	73,241	64,076		**67,246**
80 - 84					3	21	36	**60**
Avg. Benefit					75,487	78,173	67,274	**71,499**
85 - 89						3	38	**41**
Avg. Benefit						58,545	69,574	**68,767**
90+							20	**20**
Avg. Benefit							73,009	**73,009**
Total	**55**	**140**	**152**	**146**	**155**	**74**	**94**	**816**
Avg. Benefit	**58,200**	**54,887**	**51,598**	**55,357**	**65,080**	**67,070**	**69,424**	**59,297**

In each cell, the top number is the count of retired participants for the age/years retired combination and the bottom number is the average annual benefit amount.

Membership Data

Distribution of Survivors

	Years Since Death as of June 30, 2015							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<45			3	7	1			**11**
Avg. Benefit			16,760	14,321	11,736			**14,751**
45 - 49								
Avg. Benefit								
50 - 54				2	1			**3**
Avg. Benefit				24,125	61,734			**36,661**
55 - 59		1		1	2			**4**
Avg. Benefit		26,564		14,123	27,418			**23,881**
60 - 64	2	2	3	3				**10**
Avg. Benefit	45,872	19,781	33,443	40,325				**35,261**
65 - 69		2	4	8	4			**18**
Avg. Benefit		30,090	35,535	21,327	43,593			**30,406**
70 - 74	1	5	3	6	4		1	**20**
Avg. Benefit	4,369	37,242	41,320	44,610	27,943		32,436	**36,320**
75 - 79	1	6	2	3	4	1	2	**19**
Avg. Benefit	14,732	42,019	49,659	35,492	42,817	5,532	28,626	**37,194**
80 - 84	1	4	4	4	4	3		**20**
Avg. Benefit	47,703	38,396	27,668	31,645	44,586	32,617		**35,737**
85 - 89	1	4	5	6	4	6	3	**29**
Avg. Benefit	29,001	30,728	47,836	37,678	42,737	28,171	51,323	**38,314**
90+	3	3	6	2	4	1	1	**20**
Avg. Benefit	32,109	29,796	35,601	20,170	29,665	31,264	24,455	**30,702**
Total	**9**	**27**	**30**	**42**	**28**	**11**	**7**	**154**
Avg. Benefit	**31,542**	**34,464**	**35,983**	**29,079**	**37,631**	**27,607**	**38,302**	**33,381**

In each cell, the top number is the count of survivors for the age/years since death combination and the bottom number is the average annual benefit amount.

Membership Data

Distribution of Disability Retirements

	Years Disabled as of June 30, 2015							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
< 45	1	1	2					**4**
Avg. Benefit	41,314	49,765	30,531					**38,035**
45 - 49	1	3	1					**5**
Avg. Benefit	42,623	41,574	37,450					**40,959**
50 - 54	2	3	7		1			**13**
Avg. Benefit	58,191	55,689	48,229		30,659			**50,132**
55 - 59	1	1	3	1				**6**
Avg. Benefit	29,312	40,815	54,079	41,773				**45,689**
60 - 64			2	4	3	2		**11**
Avg. Benefit			45,771	39,612	31,021	45,262		**39,416**
65 - 69				8	1			**9**
Avg. Benefit				41,184	49,707			**42,131**
70 - 74				1		2	2	**5**
Avg. Benefit				33,763		60,130	35,381	**44,957**
75+						1	3	**4**
Avg. Benefit						69,505	50,770	**55,454**
Total	**5**	**8**	**15**	**14**	**5**	**5**	**5**	**57**
Avg. Benefit	**45,926**	**47,796**	**45,993**	**40,247**	**34,686**	**56,058**	**44,614**	**44,599**

In each cell, the top number is the count of disabled participants for the age/years since disability combination and the bottom number is the average annual benefit amount.

Membership Data

Reconciliation of Members

		Terminated		Recipients			
	Actives	Deferred Retirement	Other Non-Vested	Service Retirement	Disability Retirement	Survivor	Total
Members on 7/1/2014	**858**	**44**	**17**	**776**	**54**	**155**	**1,904**
New members	56	0	0	0	0	0	**56**
Return to active	0	0	0	0	0	0	**0**
Terminated non-vested	(5)	0	5	0	0	0	**0**
Service retirements	(51)	(2)	0	53	0	0	**0**
Terminated deferred	(8)	8	0	0	0	0	**0**
Terminated refund/transfer	(2)	0	(5)	0	0	0	**(7)**
Deaths	0	0	0	(15)	(2)	(9)	**(26)**
New beneficiary	0	0	0	0	0	8	**8**
Disabled	(5)	0	0	0	5	0	**0**
Unexpected status change	0	2	0	2	0	0	**4**
Net change	(15)	8	0	40	3	(1)	**35**
Members on 6/30/2015	**843**	**52**	**17**	**816**	**57**	**154**	**1,939**

Terminated Member Statistics on June 30, 2015	Deferred Retirement	Other Non-Vested	Total
Number	52	17	69
Average age	44.3	35.4	42.1
Average service	7.8	0.7	6.1
Average annual benefit, with augmentation to Normal Retirement Date and 30% CSA load	$ 27,183	N/A	$ 27,183
Average refund value, with 30% CSA load	$ 96,310	$ 6,205	$ 74,111

Development of Costs

Actuarial Valuation Balance Sheet *(Dollars in Thousands)*

The actuarial balance sheet is based on the principle that the long-term projected benefit obligations of the plan should be ideally equal to the long-term resources available to fund those obligations. The resources available to meet projected obligations for current members consist of current fund assets plus the present value of anticipated future contributions intended to fund benefits for current members. In the exhibit below, B.2 is the estimated present value of contributions to fund the normal cost rate for current members until their respective termination dates. Item B.1 is the present value of the total 34.93% statutory contribution net of normal cost and anticipated plan expenses during the period from the valuation date to the statutory unfunded amortization date.

The contributions made in excess of amounts required for current benefit payments are accumulated as a reserve to help meet benefit payments in later years. It is this reserve system which permits the establishment of a level rate of contribution each year.

					June 30, 2015
A. Actuarial Value of Assets					$ 639,863
B. Expected Future Assets					
1. Present value of expected future statutory supplemental contributions*					$ 113,118
2. Present value of future normal cost contributions					146,739
3. Total expected future assets: *(1.) + (2.)*					$ 259,857
C. Total Current and Expected Future Assets					$ 899,720
D. Current Benefit Obligations**					
1. Benefit recipients	**Non-Vested**		**Vested**		**Total**
a. Service retirements	$	0	$	502,010	$ 502,010
b. Disability retirements		0		30,425	30,425
c. Survivors		0		38,106	38,106
2. Deferred retirements with augmentation		0		9,289	9,289
3. Former members without vested rights***		52		0	52
4. Active members		2,943		228,069	231,012
5. Total Current Benefit Obligations	$	2,995	$	807,899	$ 810,894
E. Expected Future Benefit Obligations					168,878
F. Total Current and Expected Future Benefit Obligations****					979,772
G. Unfunded Current Benefit Obligations: *(D.5.) - (A.)*					171,031
H. Unfunded Current and Future Benefit Obligations: *(F.) - (C.)*					80,052
I. Accrued Benefit Funding Ratio: *(A.)/(D.5.)*					78.91%
J. Projected Benefit Funding Ratio: *(C.)/(F.)*					91.83%

* *Includes $1,000,000 state contribution; excludes future scheduled contribution increases.*

** *Present value of credited projected benefits (projected compensation, current service).*

*** *Former members who have not satisfied vesting requirements and have not collected a refund of member contributions as of the valuation date.*

**** *Present value of projected benefits (projected compensation, projected service).*

Development of Costs

Determination of Unfunded Actuarial Accrued Liability and Supplemental Contribution Rate (*Dollars in Thousands)*

	Actuarial Present Value of Projected Benefits	Actuarial Present Value of Future Normal Costs	Actuarial Accrued Liability
A. Determination of Actuarial Accrued Liability (AAL)			
1. Active members			
a. Retirement annuities	$ 370,130	$ 127,551	$ 242,579
b. Disability benefits	20,046	11,439	8,607
c. Survivor's benefits	4,815	3,371	1,444
d. Deferred retirements	4,501	3,764	737
e. Refunds*	398	614	(216)
f. Total	$ 399,890	$ 146,739	$ 253,151
2. Deferred retirements with future augmentation	9,289	0	9,289
3. Former members without vested rights	52	0	52
4. Benefit recipients	570,541	0	570,541
5. Total	$ 979,772	$ 146,739	$ 833,033
B. Determination of Unfunded Actuarial Accrued Liability (UAAL)			
1. Actuarial accrued liability			$ 833,033
2. Current assets (AVA)			639,863
3. Unfunded actuarial accrued liability			$ 193,170
C. Determination of Supplemental Contribution Rate**			
1. Present value of future payrolls through the amortization date of June 30, 2038			$ 1,003,711
2. Supplemental contribution rate: *(B.3.) / (C.1.)*			19.25% ***

* *Includes non-vested refunds and non-married survivor benefits only.*

** *The amortization of the Unfunded Actuarial Accrued Liability (UAAL) using the current amortization method results in initial payments less than the "interest only" payment on the UAAL. Payments less than the interest only amount will result in the UAAL increasing for an initial period of time.*

*** *The amortization factor as of June 30, 2015 is 14.36808.*

Development of Costs

Changes in Unfunded Actuarial Accrued Liability (UAAL) *(Dollars in Thousands)*

	Year Ending June 30, 2015		
	Actuarial Accrued Liability	Current Assets	Unfunded Actuarial Accrued Liability
A. Unfunded Actuarial Accrued Liability at beginning of year	$ 800,421	$ 597,870	$ 202,551
B. Changes due to interest requirements and current rate of funding			
1. Normal cost, including expenses	$ 15,494	$ 0	$ 15,494
2. Benefit payments	(55,480)	(55,480)	0
3. Contributions	0	23,937	(23,937)
4. Interest on A., B.1., B.2. and B.3.	65,556	46,568	18,988
5. Total *(B.1. + B.2. + B.3. + B.4.)*	25,570	15,025	10,545
C. Expected Unfunded Actuarial Accrued Liability at end of year *(A. + B.5.)*	$ 825,991	$ 612,895	$ 213,096
D. Increase (decrease) due to actuarial losses (gains) because of experience deviations from expected			
1. Age and service retirements			$ 1,446
2. Disability retirements			1,074
3. Death-in-service benefits			(187)
4. Withdrawals			(265)
5. Salary increases			2,546
6. Investment income			(26,968)
7. Mortality of annuitants			648
8. Other items			7,096
9. Total			(14,610)
E. Unfunded Actuarial Accrued Liability at end of year before plan amendments and changes in actuarial assumptions *(C. + D.9.)*			$ 198,486
F. Change in Unfunded Actuarial Accrued Liability due to changes in plan provisions			0
G. Change in Unfunded Actuarial Accrued Liability due to changes in actuarial assumptions			(5,316)
H. Change in Unfunded Actuarial Accrued Liability due to changes in methodology			0
I. Unfunded Actuarial Accrued Liability at end of year *(E. + F. + G. + H.)**			$ 193,170

** The Unfunded Actuarial Accrued Liability on a market value of assets basis is $168,503.*

Development of Costs

Determination of Contribution Sufficiency/(Deficiency) *(Dollars in Thousands)*

The required contribution is defined in Minnesota Statutes as the sum of normal cost, a supplemental contribution to amortize the UAAL, and an allowance for expenses.

	Percent of Payroll	Dollar Amount
A. Statutory contributions - Chapter 352B		
1. Employee contributions	13.40%	$ 9,361
2. Employer contributions	20.10%	14,041
3. State contributions***	1.43%	1,000
4. Total	34.93%	$ 24,402
B. Required contributions - Chapter 356		
1. Normal cost		
a. Retirement benefits	20.32%	$ 14,195
b. Disability benefits	1.87%	1,306
c. Survivors	0.57%	398
d. Deferred retirement benefits	0.56%	391
e. Refunds*	0.09%	63
f. Total	23.41%	$ 16,353
2. Supplemental contribution amortization of Unfunded Actuarial Accrued Liability by June 30, 2038	19.25%	$ 13,447
3. Allowance for expenses	0.25%	$ 175
4. Total	42.91% **	$ 29,975
C. Contribution Sufficiency/(Deficiency) *(A.4. - B.4.)*	(7.98)%	$ (5,573)

Note: Projected annual payroll for fiscal year beginning on the valuation date: $69,857.

** Includes non-vested refunds and non-married survivor benefits only.*

*** The required contribution on a Market Value of Assets basis is 40.45% of payroll.*

**** Contributions paid until both the Public Employees Retirement Association Police and Fire Plan and the State Patrol Retirement Fund reach 90% funding (on a Market Value of Assets basis).*

Actuarial Basis

Actuarial Methods

All actuarial methods are prescribed by Minnesota Statutes, the Legislative Commission on Pensions and Retirement, or the MSRS Board of Directors. Different methodologies may also be reasonable and results based on other methodologies would be different.

Actuarial Cost Method

Actuarial Accrued Liability and required contributions in this report are computed using the Entry Age Normal Cost Method. This method is prescribed by Minnesota Statute. Under this method, a normal cost is developed by amortizing the actuarial value of benefits expected to be received by each active participant (as a level percentage of pay) over the total working lifetime of that participant, from hire to termination. Age as of the valuation date was calculated based on the dates of birth provided by the Fund. Entry age for valuation purposes was calculated as the age on the valuation date minus the provided years of service on the valuation date.

To the extent that current assets and future normal costs do not support participants' expected future benefits, an Unfunded Actuarial Accrued Liability ("UAAL") develops. The UAAL is amortized over the statutory amortization period using level percent of payroll assuming payroll increases. The total contribution developed under this method is the sum of normal cost, expenses, and the payment toward the UAAL.

Valuation of Future Post-Retirement Benefit Increases

If the plan has reached the accrued liability funding ratio threshold (determined on a market value of assets basis) required to pay a 1.5% or 2.5% benefit increase, Minnesota Statutes require the 1.5% or 2.5% benefit increase rate to be reflected in the liability calculations. If the plan has not yet reached the accrued liability funding ratio threshold required to pay a 1.5% or 2.5% benefit increase, Minnesota Statutes require a projection to be performed to determine the expected attainment of the accrued liability funding ratio thresholds, and the expected payment of 1.5% or 2.5% benefit increases must be reflected in the liability calculations.

Funding Objective

The fundamental financing objective of the Fund is to establish contribution rates which, when expressed as a percentage of active member payroll, will remain approximately level from generation to generation and meet the required deadline for full funding.

Decrement Timing

All decrements are assumed to occur mid-fiscal year.

Actuarial Basis

Actuarial Methods (Concluded)

Asset Valuation Method

The assets are valued based on a five-year moving average of expected and market values (five-year average actuarial value) determined as follows:

- At the end of each plan year, an average asset value is calculated as the average of the market asset value at the beginning and end of the fiscal year net of investment income for the fiscal year;
- The investment gain or (loss) is taken as the excess of actual investment income over the expected investment income based on the average asset value as calculated above;
- The investment gain or (loss) so determined is recognized over five years at 20% per year; and
- The asset value is the sum of the market asset value plus the scheduled recognition of investment gains or (losses) during the current and the preceding four fiscal years.

Payment on the Unfunded Actuarial Accrued Liability

Payment equals a level percentage of payroll each year to the statutory amortization date of June 30, 2038 assuming payroll increases of 3.50% per annum. If there is a negative Unfunded Actuarial Accrued Liability, the surplus amount is amortized over 30 years as a level percentage of payroll. If the unfunded liability increases due to changes in benefits, assumptions, or methods, the statutory amortization date will be re-determined. Projected payroll is multiplied by 0.959 in the determination of the present value of future payroll to account for timing differences (as required by the Standards for Actuarial Work).

Changes in Methods since Prior Valuation

Based on direction from the LCPR's actuary, the July 1, 2014 entry age normal accrued liability and normal cost were calculated using an equivalent single interest rate of 8.40% due to the statutory select and ultimate discount rate structure. This method is no longer needed since the discount rate was changed from the select and ultimate assumptions to 8.00% for all years effective July 1, 2015.

Actuarial Basis

Summary of Actuarial Assumptions

The following assumptions were used in valuing the liabilities and benefits under the plan. All actuarial assumptions are prescribed by Minnesota Statutes, the Legislative Commission on Pensions and Retirement (LCPR), or the MSRS Board of Directors. These parties are responsible for selecting the assumptions used for this valuation. The assumptions prescribed are based on the last experience study, dated February 2012, prepared by a former actuary. The economic assumptions are based on a review of inflation and investment return assumptions dated September 11, 2014.

The Allowance for Combined Service Annuity was also based on a recommendation by a former actuary. We are unable to judge the reasonableness of this assumption without performing a substantial amount of additional work beyond the scope of the assignment.

Investment return	8.00% per annum.
Benefit increases after retirement	1.00% per annum through 2029, 1.50% per annum from 2030 to 2048, and 2.5% per annum thereafter.
Salary increases	Reported salary at valuation date increased according to the rate table, to current fiscal year and annually for each future year. Prior fiscal year salary is annualized for members with less than one year of service.
Inflation	2.75% per year.
Payroll growth	3.50% per year.
Mortality rates	
Healthy Pre-retirement	RP-2000 employee generational mortality table projected with mortality improvement scale AA, white collar adjustment.
Healthy Post-retirement	RP-2000 annuitant generational mortality table projected with mortality improvement scale AA, white collar adjustment, set back two years for males and set forward one year for females. The RP-2000 employee mortality table as published by the Society of Actuaries (SOA) contains mortality rates for ages 15 to 70 and the annuitant mortality table contains mortality rates for ages 50 to 95. We have applied the annuitant mortality table for active members beyond age 70 until the assumed retirement age and the employee mortality table for annuitants younger than age 50.
Disabled	RP-2000 annuitant generational mortality table projected with mortality improvement scale AA, white collar adjustment, set back two years for males and set forward one year for females.
Retirement	Members retiring from active status are assumed to retire according to the age related rates shown in the rate table. Members who have attained the highest assumed retirement age are assumed to retire in one year.
Withdrawal	Select and Ultimate rates based on actual experience. Ultimate rates after the third year are shown in rate table. Select rates in the first three years are:

Year	Select Withdrawal Rates
1	5%
2	2%
3	2%

Actuarial Basis

Summary of Actuarial Assumptions (Continued)

Disability	Age-related rates based on experience; see table of sample rates. All incidences are assumed to be duty-related.
Allowance for combined service annuity	Liabilities for former members are increased by 30.00% to account for the effect of some participants having eligibility for a Combined Service Annuity.
Administrative expenses	Prior year administrative expenses expressed as percentage of prior year projected payroll.
Refund of contributions	All employees withdrawing after becoming eligible for a deferred benefit take the larger of their contributions accumulated with interest or the value of their deferred benefit. Account balances for deferred members accumulate interest until normal retirement date and are discounted back to the valuation date.
Commencement of deferred benefits	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 55.
Percentage married	85% of active members are assumed to be married. Actual marital status is used for members in payment status.
Age of spouse	Females are assumed to be two years younger than their spouses, and males are assumed to be two years older than their spouses.
Eligible children	Each member may have two dependent children depending on member's age. Assumed first born child born at member's age 28 and second born child at member's age 31.
Form of payment	Married members retiring from active status are assumed to elect subsidized joint and survivor form of annuity as follows: Males: 15% elect 50% Joint & Survivor option 25% elect 75% Joint & Survivor option 35% elect 100% Joint & Survivor option Females: 25% elect 50% Joint & Survivor option 30% elect 75% Joint & Survivor option 5% elect 100% Joint & Survivor option Remaining married members and unmarried members are assumed to elect the Straight Life option.
Eligibility testing	Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.
Decrement operation	Withdrawal decrements do not operate during retirement eligibility.
Service credit accruals	It is assumed that members accrue one year of service credit per year.

Actuarial Basis

Summary of Actuarial Assumptions (Continued)

Unknown data for certain members	To prepare this report, GRS has used and relied on participant data supplied by the Fund. Although GRS has reviewed the data in accordance with Actuarial Standards of Practice No. 23, GRS has not verified or audited any of the data or information provided. There are no members reported with missing gender or birth dates. In cases where submitted data was missing or incomplete, the following assumptions were applied: Data for active members: There were no members reported with missing salary and no members reported with missing service. Data for terminated members: There was one member reported without a benefit. We calculated benefits for this member using the reported Credited Service and Termination Date. Average Salary was not reported, so we assumed a value of $35,000. Data for members receiving benefits: There were no members reported without a benefit. There were no survivors reported with an expired benefit. There were five retirees reported with a bounce back annuity but were not reported with a reasonable reduction factor. A factor of 0.80, 0.85 and 0.90 was assumed for the 100%, 75% and 50% joint and survivor annuity, respectively. There were 10 retirees reported with a survivor option and a survivor date of death. We assumed no benefit was payable to the survivor, and the member benefit already reflected the increase to the life annuity value (i.e. "bounce back"), if applicable. For retirees that elected a survivor benefit option, we used the valuation assumptions if the survivor date of birth was missing or invalid (227 members) and/or the survivor gender was missing or invalid (211 members).
Changes in actuarial assumptions	The discount rate was changed from 8.0% through June 30, 2017 and 8.5% thereafter to 8.0% for all years. The inflation assumption was changed from 3.00% to 2.75%. The payroll growth assumption was changed from 3.75% to 3.50%. Assumed increases in member salaries were decreased by 0.25% at all ages. The assumed post-retirement benefit increase rate was changed from 1.0% per year through 2017, 1.5% per year from 2018 to 2032 and 2.5% per year thereafter to 1.0% per year through 2029, 1.5% per year from 2030 to 2048 and 2.5% per year thereafter. See page 4 for additional detail about this assumption.

Actuarial Basis

Summary of Actuarial Assumptions (Continued)

	Percent of Members Dying Each Year					
	Healthy Post-Retirement Mortality**		Healthy Pre-Retirement Mortality**		Disability Mortality*	
Age	Male	Female	Male	Female	Male	Female
20	0.03%	0.02%	0.03%	0.02%	0.03%	0.02%
25	0.04	0.02	0.04	0.02	0.04	0.02
30	0.04	0.03	0.04	0.03	0.04	0.03
35	0.05	0.05	0.06	0.05	0.05	0.05
40	0.08	0.07	0.09	0.06	0.08	0.07
45	0.11	0.11	0.13	0.10	0.11	0.11
50	0.17	0.25	0.20	0.16	0.17	0.25
55	0.57	0.39	0.27	0.24	0.57	0.39
60	0.57	0.61	0.43	0.38	0.57	0.61
65	0.92	1.01	0.67	0.59	0.92	1.01
70	1.58	1.69	0.98	0.88	1.58	1.69

* *Generally, mortality rates are expected to increase as age increases. Due to the combination of pre-retirement rates, post-retirement rates, the white collar adjustment, and Projection Scale AA, the prescribed mortality tables have a few ages where assumed mortality decreases slightly instead of increases. We have used the rates as prescribed, but note that the prescribed assumption may not be reasonable at every age. If the rates were reasonably adjusted so that they decreased at all ages, we would not expect the valuation results to be materially different.*

*** These rates were adjusted for mortality improvements using projection scale AA.*

	Percent of Members Decrementing Each Year			
	Withdrawal Rates After Third Year		Disability Retirement	
Age	Male	Female	Male	Female
20	1.47%	1.47%	0.03%	0.03%
25	1.13	1.13	0.05	0.05
30	0.80	0.80	0.06	0.06
35	0.47	0.47	0.09	0.09
40	0.40	0.40	0.14	0.14
45	0.40	0.40	0.23	0.23
50	0.00	0.00	0.40	0.40
55	0.00	0.00	0.70	0.70
60	0.00	0.00	1.13	1.13
65	0.00	0.00	0.00	0.00

Actuarial Basis

Summary of Actuarial Assumptions (Concluded)

Age	Percent Retiring
50	7 %
51	6
52	6
53	6
54	3
55	65
56	50
57	30
58	20
59	20
60+	100

Salary Scale	
Year	Increase
1	7.75%
2	7.25
3	6.75
4	6.50
5	6.25
6	6.00
7	5.75
8	5.60
9	5.45
10	5.30
11	5.15
12	5.00
13	4.85
14	4.70
15	4.55
16	4.40
17	4.25
18	4.10
19	3.95
20	3.80
21+	3.75

Actuarial Basis

Summary of Plan Provisions

Following is a summary of the major plan provisions used in the valuation of this report. MSRS is solely responsible for the validity, accuracy and comprehensiveness of this information. If any of the plan provisions shown below are not accurate and complete, the valuation results may differ significantly from those shown in this report and may require a revision of this report.

Plan year	July 1 through June 30
Eligibility	State troopers, conservation officers, certain crime bureau and gambling enforcement officers, and certain other persons listed in Minnesota Statutes 352B.011 subdivision 10.
Contributions	Percent of Salary Effective Date — Member — Employer July 1, 2014 – June 30, 2016 — 13.40% — 20.10% July 1, 2016 and later — 14.40% — 21.60% Member contributions are "picked up" according to the provisions of Internal Revenue Code 414(h).
State Contributions	$1 million paid annually on October 1 until both the Public Employees Retirement Association Police and Fire Plan and the State Patrol Retirement Fund become 90% funded (on a Market Value of Assets basis).
Allowable service	Service during which member contributions were deducted. Includes period receiving temporary Worker's Compensation and reduced salary from employer. See Normal Retirement benefit definition below for information about service limits.
Salary	Salaries excluding lump sum payments at separation.
Average salary	Average of the five highest years of Salary. Average Salary is based on all Allowable Service if less than five years. Average Salary is based on all years without regard to any service limits.
Retirement	
Normal retirement benefit	
Age/Service requirement	Age 55 and three years (ten years if first hired after June 30, 2013) of Allowable Service.
Amount	3.00% of Average Salary for each year of Allowable Service up to 33 years. Members with at least 28 years of service as of July 1, 2013 are not subject to this service limit. Member contributions made after the service cap will be refunded at retirement.
Early retirement benefit	
Age/Service requirement	Age 50 and three years (ten years if first hired after June 30, 2013) of Allowable Service.
Amount	Normal Retirement Benefit based on Allowable Service and Average Salary at retirement reduced by 1/10% for each month that the member is under age 55. If the effective date of retirement is after June 30, 2015, the reduction is 0.34% for each month that the member is under age 55 at the time of retirement.

Actuarial Basis

Summary of Plan Provisions (Continued)

Retirement (Concluded)	
Form of payment	Life annuity. Actuarially equivalent options are: 50%, 75%, or 100% Joint and Survivor, or 15-year certain. If a Joint and Survivor benefit is elected and the beneficiary predeceases the annuitant, the annuitant's benefit increases to the Life Annuity amount. This "bounce back" is subsidized by the plan.
Benefit increases	Since January 1, 2014, benefit recipients receive annual 1.0% benefit increases. When the accrued liability funding ratio (determined on a market value of assets basis) reaches or exceeds 85% for two consecutive years, the benefit increase will increase to 1.5%; the benefit will revert to 2.5% when the accrued liability funding ratio (determined on a market value of assets basis) reaches or exceeds 90% for two consecutive years . If, after reverting to a 1.5% increase, the accrued liability funding ratio declines to 75% or less for the most recent valuation year or 80% or less for two consecutive years, the benefit increase will decrease to 1.0%. A benefit recipient who has been receiving a benefit for at least 12 full months as of the June 30 of the calendar year immediately before the adjustment will receive a full increase. Members receiving benefits for at least one month but less than 12 full months as of the June 30 of the calendar year immediately before the adjustment will receive a pro rata increase.
Disability	
Occupational disability benefit	
Age/Service requirement	Member who cannot perform his duties as a direct result of a disability relating to an act of duty.
Amount	60% of Average Salary plus 3.00% of Average Salary for each year in excess of 20 years of Allowable Service (pro rata for completed months). Payments cease at age 65 (age 55 if disabled after June 30, 2015) or the 5-year anniversary of the effective date of the disability benefit, whichever is later. Payments stop earlier if disability ceases or death occurs. Benefits may be paid upon re-employment but salary plus benefit cannot exceed current salary of position held at time of disability.
Non-duty disability benefit	
Age/Service requirement	At least one year of Allowable Service and disability not related to covered employment.
Amount	Normal Retirement Benefit based on Allowable Service (minimum of 15 years) and Average Salary at disability without reduction for commencement before age 55. Payments cease at age 65 (age 55 if disabled after June 30, 2015) or earlier if disability ceases or death occurs. Benefits may be paid upon re-employment but salary plus benefit cannot exceed current salary of position held at time of disability.

Actuarial Basis

Summary of Plan Provisions (Continued)

Disability (continued)

Retirement after disability	
Age/Service requirement	Age 65 (age 55 if disabled after June 30, 2015) with continued disability.
Amount	Optional annuity continues. Otherwise, normal retirement benefit equal to the disability benefit paid, or an actuarially equivalent option.
Form of payment	Same as for retirement.
Benefit increases	Same as for retirement.

Death

Surviving spouse benefit	
Age/Service requirement	Member who is active or receiving a disability benefit or former member.
Amount	50% of Average Salary if member was active or occupational disability and either had less than three years (five years if first hired after June 30, 2013) of Allowable Service or was under age 55. Annuity is paid for life. Surviving spouse receives the 100% joint and survivor benefit commencing on the member's 55th birthday if member was active or a disability with three years (five years if first hired after June 30, 2013) of Allowable Service. A spouse who had been receiving the 50% benefit shall be entitled to the greater benefit. The surviving spouse of a former member receives the 100% joint and survivor benefit commencing on the member's 55th birthday if former member had three years (five years if first hired after June 30, 2013) of Allowable Service.
Benefit increases	Same as for retirement.
Surviving dependent children's benefit	
Age/Service requirement	Member who is active or receiving a disability benefit. Child must be unmarried, under age 18 (or 23 if full-time student) and dependent upon the member.
Amount	10% of Average Salary for each child and $20 per month prorated among all dependent children. Benefit must not be less than 50% nor exceed 70% of Average Salary.
Benefit increases	Same as for retirement.
Refund of contributions	
Age/Service requirement	Member dies before receiving any retirement benefits and survivor benefits are not payable.
Amount	Member contributions with 6.00% interest compounded daily until June 30, 2011 and 4.00% thereafter.

Actuarial Basis

Summary of Plan Provisions (Continued)

Termination	
Refund of contributions	
Age/service requirement	Termination of state service.
Amount	Member contributions with 6.00% interest compounded daily to June 30, 2011 and 4.00% thereafter. If a member is vested, a deferred annuity may be elected in lieu of a refund.
Deferred benefit	
Age/service requirement	Three years (ten years if first hired after June 30, 2013) of Allowable Service.
Amount	Benefit is computed under law in effect at termination and increased by the following annual augmentation percentage: (a.) 0.00% before July 1, 1971; (b.) 5.00% from July 1, 1971 to January 1, 1981; (c.) 3.00% thereafter (2.50% if hired after June 30, 2006) until January 1, 2012; and (d.) 2.00% after December 31, 2011 until the annuity begins. Amount is payable at normal or early retirement. If a member terminated employment prior to July 1, 1997 but was not eligible to commence their pension before July 1, 1997, an actuarial increase shall be made for the change in the post-retirement interest rates from 5.00% to 6.00%.
Optional form conversion factors	Actuarially equivalent factors based on RP-2000 for healthy annuitants, white collar adjustment, projected to 2027 using scale AA, set back two years for males and set forward one year for females, blended 95% males, 6.5% post-retirement interest, and 8.5% pre-retirement interest.
Combined service annuity	Members are eligible for combined service benefits if they: (a.) Have sufficient allowable service in total that equals or exceeds the applicable service credit vesting requirement of the retirement plan with the longest applicable service credit vesting requirement; and (b.) Have at least six months of allowable service credit in each plan worked under; and (c.) Are not in receipt of a benefit from another plan, or have applied for benefits with an effective date within one year. Members who meet the above requirements must have their benefit based on the following: (a.) Allowable service in all covered plans are combined in order to determine eligibility for early retirement. (b.) Average salary is based on the high five consecutive years during their entire service in all covered plans.

Actuarial Basis

Summary of Plan Provisions (Concluded)

Contribution stabilizer

The following is a summary of the contribution stabilizer provisions in Minnesota Statute 352.045:

- If a contribution sufficiency of at least 2.0% exists, member and employer contributions may be adjusted by the MSRS Board of Directors to a level necessary to maintain a 2.0% sufficiency. Member and employer contributions may not be less than the sum of normal cost and administrative expenses. Employer contributions must be equal to 60% of the sum of member and employer contributions.
- If a contribution deficiency of at least 0.5% exists, member and employer contribution rates may be increased by the MSRS Board of Directors to eliminate the deficiency. Employer contributions must be equal to 60% of the sum of member and employer contributions.
- Any adjustment to the contribution rates must be reported to the Legislative Commission on Pensions and Retirement (LCPR) by January 15 following the most recent valuation report. If the LCPR does not recommend against or alter the change in rates, the adjustment becomes effective on the first day of the first full payroll period of the next fiscal year.

Changes in plan provisions

The Contribution Stabilizer statutes were revised to make changes to contribution rates less prescriptive and more flexible.

Effective July 1, 2015, a provision was added so that if the 1.5% post-retirement benefit increase is triggered and the accrued liability funding ratio (determined on a market value of assets basis) subsequently drops below 75% or less for the most recent valuation year or 80% or less for two consecutive years, the post-retirement benefit increase will change to 1.0% until the plan again reaches or exceeds an 85% accrued liability funding ratio for two consecutive years.

The age that disabilitants change from disabled status to retired status changed from age 65 to age 55 for disabilities after June 30, 2015.

Additional Schedules

Schedule of Funding Progress[1] *(Dollars in Thousands)*

Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL) (b)	Unfunded (Overfunded) AAL (UAAL) (b) - (a)	Funded Ratio (a)/(b)	Actual Covered Payroll (Previous FY) (c)	UAAL as a Percentage of Covered Payroll [(b)-(a)]/(c)
7-1-1991	$ 200,068	$ 224,033	$ 23,965	89.30%	$ 32,365	74.05 %
7-1-1992	222,314	233,656	11,342	95.15	32,882	34.49
7-1-1993	244,352	258,202	13,850	94.64	35,765	38.73
7-1-1994	262,570	275,377	12,807	95.35	35,341	36.24
7-1-1995	284,918	283,078	(1,840)	100.65	37,518	(4.90)
7-1-1996	323,868	303,941	(19,927)	106.56	41,476	(48.04)
7-1-1997	375,650	332,427	(43,223)	113.00	41,996	(102.92)
7-1-1998	430,011	371,369	(58,642)	115.79	43,456	(134.95)
7-1-1999	472,687	406,215	(66,472)	116.36	45,333	(146.63)
7-1-2000	528,573	458,384	(70,189)	115.31	48,167	(145.72)
7-1-2001	572,815	489,483	(83,332)	117.02	48,935	(170.29)
7-1-2002	591,383	510,344	(81,039)	115.88	49,278	(164.45)
7-1-2003	591,521	538,980	(52,541)	109.75	54,175	(96.98)
7-1-2004	594,785	545,244	(49,542)	109.09	51,619	(95.98)
7-1-2005	601,220	566,764	(34,456)	106.08	55,142	(62.49)
7-1-2006	618,990	641,479	22,489	96.49	57,765	38.93
7-1-2007	617,901	673,444	55,543	91.75	61,498	90.32
7-1-2008	595,082	693,686	98,604	85.79	60,029	164.26
7-1-2009	584,501	725,334	140,833	80.58	61,511	228.96
7-1-2010	567,211	683,360	116,149	83.00	63,250	183.63
7-1-2011	563,046	700,898	137,852	80.33	63,250	217.95
7-1-2012	554,244	760,955	206,711	72.84	62,524 [2]	330.61
7-1-2013	552,319	741,850	189,531	74.45	62,121 [2]	305.10
7-1-2014	597,870	800,421	202,551	74.69	63,952 [2]	316.72
7-1-2015	639,863	833,033	193,170	76.81	68,463 [3]	282.15

[1] *Information prior to 2012 provided by prior actuary. See prior reports for additional detail.*
[2] *Assumed equal to actual member contributions divided by 12.4%.*
[3] *Assumed equal to actual member contributions divided by 13.4%.*

Additional Schedules

Schedule of Contributions from the Employer and Other Contributing Entities[1]

(Dollars in Thousands)

Plan Year Ended June 30	Actuarially Required Contribution Rate (a)	Actual Covered Payroll (b)	Actual Member Contributions (c)	Annual Required Contributions [(a)x(b)] - (c) = (d)	Actual Employer Contributions[2] (e)	Percentage Contributed (e)/(d)
1991	22.15%	$ 32,365	$ 2,751	$ 4,418	$ 4,825	109.21%
1992	22.58	32,882	2,795	4,630	4,893	105.68
1993	22.27	35,765	3,040	4,925	5,288	107.37
1994	21.94	35,341	3,004	4,750	5,159	108.61
1995	21.79	37,518	3,189	4,986	5,583	111.97
1996	21.34	41,476	3,484	5,367	5,742	106.99
1997	21.33	41,996	3,746	5,212	6,151	118.02
1998	15.67	43,456	3,634	3,176	5,475	172.39
1999	14.14	45,333	3,850	2,560	5,712	223.13
2000	15.17	48,167	4,044	3,263	6,069	185.99
2001	15.48	48,935	4,145	3,430	6,166	179.77
2002	14.00	49,278	4,215	2,684	6,209	231.33
2003	14.34	54,175	4,555	3,214	6,826	212.38
2004	17.81	51,619	4,493	4,700	6,504	138.39
2005	18.15	55,142	4,517	5,491	6,670	121.47
2006	19.84	57,765	4,719	6,741	7,055	104.66
2007	26.69	61,498	4,987	11,427	7,461	65.30
2008	29.90	60,029	5,594	12,355	8,279	67.01
2009	34.49	61,511	6,216	14,999	9,178	61.19
2010	38.16	63,250	6,726	17,410	10,104	58.04
2011	33.84	63,250	6,578	14,826	9,873	66.59
2012	36.25	62,524 [3]	7,753	14,912	11,620	77.92
2013	42.52	62,121 [3]	7,703	18,711	11,482	61.37
2014	41.24	63,952 [3]	7,930	18,444	12,894	69.91
2015	43.56	68,463 [4]	9,174	20,648	14,763	71.50
2016	42.91	N/A	N/A	N/A	N/A	N/A

[1] Information prior to 2012 provided by prior actuary. See prior reports for additional detail.

[2] Includes contributions from other sources (if applicable).

[3] Assumed equal to actual member contributions divided by 12.4%.

[4] Assumed equal to actual member contributions divided by 13.4%.

Glossary of Terms

Accrued Benefit Funding Ratio	The ratio of assets to Current Benefit Obligations.
Accrued Liability Funding Ratio	The ratio of assets to Actuarial Accrued Liability.
Actuarial Accrued Liability (AAL)	The difference between the Actuarial Present Value of Future Benefits, and the Actuarial Present Value of Future Normal Costs.
Actuarial Assumptions	Assumptions about future plan experience that affect costs or liabilities, such as: mortality, withdrawal, disablement, and retirement; future increases in salary; future rates of investment earnings; future investment and administrative expenses; characteristics of members not specified in the data, such as marital status; characteristics of future members; future elections made by members; and other items.
Actuarial Cost Method	A procedure for allocating the Actuarial Present Value of Future Benefits between the Actuarial Present Value of future Normal Costs and the Actuarial Accrued Liability.
Actuarial Equivalent	Of equal Actuarial Present Value, determined as of a given date and based on a given set of Actuarial Assumptions.
Actuarial Present Value (APV)	The amount of funds required to provide a payment or series of payments in the future. It is determined by discounting the future payments with an assumed interest rate and with the assumed probability each payment will be made.
Actuarial Present Value of Projected Benefits	The Actuarial Present Value of amounts which are expected to be paid at various future times to active members, retired members, beneficiaries receiving benefits, and inactive, non-retired members entitled to either a refund or a future retirement benefit. Expressed another way, it is the value that would have to be invested on the valuation date so that the amount invested plus investment earnings would provide sufficient assets to pay all projected benefits and expenses when due.
Actuarial Valuation	The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a plan. An Actuarial Valuation for a governmental retirement system typically also includes calculations of items needed for developing and monitoring a retirement system's funding policy, such as the Funded Ratio and the Annual Required Contribution (ARC).
Actuarial Value of Assets	The value of the assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets or a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the actuarially required contribution (ARC).

Glossary of Terms (Continued)

Amortization Method A method for determining the Amortization Payment. Under the Level Percentage of Pay method, the Amortization payment is one of a stream of increasing payments, whose Actuarial Present Value is equal to the UAAL. The stream of payments increases at the rate at which total covered payroll of all active members is assumed to increase.

Amortization Payment That portion of the plan contribution or ARC which is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.

Amortization Period The period used in calculating the Amortization Payment.

Annual Required Contribution (ARC) The employer's periodic required contributions, expressed as a dollar amount or a percentage of covered plan compensation. The ARC consists of the Employer Normal Cost and Amortization Payment.

Augmentation Annual increases to deferred benefits.

Closed Amortization Period A specific number of years that is reduced by one each year, and declines to zero with the passage of time. For example if the amortization period is initially set at 30 years, it is 29 years at the end of one year, 28 years at the end of two years, etc.

Current Benefit Obligations The present value of benefits earned to the valuation date, based on current service and including future salary increases to retirement.

Employer Normal Cost The portion of the Normal Cost to be paid by the employer. This is equal to the Normal Cost less expected member contributions.

Expected Assets The present value of anticipated future contributions intended to fund benefits for current members.

Experience Gain/Loss A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions, during the period between two actuarial valuations. To the extent that actual experience differs from that assumed, Unfunded Actuarial Accrued Liabilities emerge which may be larger or smaller than projected. Gains are due to favorable experience, e.g., the assets earn more than projected, salaries do not increase as fast as assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, losses are the result of unfavorable experience, i.e., actual results that produce Unfunded Actuarial Accrued Liabilities which are larger than projected.

Glossary of Terms (Concluded)

GASB	Governmental Accounting Standards Board.
GASB Statements No. 25 and No. 27	These are the governmental accounting standards that set the accounting and financial reporting rules for public retirement systems and the employers that sponsor or contribute to them. Statement No. 27 sets the accounting and financial reporting rules for the employers that sponsor or contribute to public retirement systems, while Statement No. 25 sets the rules for the systems themselves. These statements remain in effect only for pension plans that are not administered as trusts or equivalent arrangements. Please refer to the definition for GASB Statements No. 67 and No. 68 below.
GASB Statement No. 50	The accounting standard governing a state or local governmental employer's accounting for pensions. This statement remains in effect for pension plans that are not administered as trusts. Please refer to the definition of GASB Statements No. 67 and No. 68 below.
GASB Statements No. 67 and No. 68	Statements No. 67 and No. 68, issued in June 2012, replace the requirements of Statements No. 25, No. 27 and No. 50, respectively, for pension plans administered as trusts. Statement No. 68 sets the accounting and financial reporting rules for the employers that sponsor or contribute to public retirement systems, while Statement No. 67 sets the rules for the systems themselves. Accounting and financial reporting information prepared according to Statements No. 67 and No. 68 is provided in a separate report beginning with the June 30, 2014 actuarial valuation.
Normal Cost	The annual cost assigned, under the Actuarial Cost Method, to the current plan year.
Projected Benefit Funding Ratio	The ratio of the sum of Actuarial Value of Assets and Expected Assets to the Actuarial Present Value of Projected Benefits.
Unfunded Actuarial Accrued Liability	The difference between the Actuarial Accrued Liability and Actuarial Value of Assets.
Valuation Date	The date as of which the Actuarial Present Value of Future Benefits is determined. The benefits expected to be paid in the future are discounted to this date.