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Teachers Retirement Association of Minnesota

**Actuarial Valuation Report
For Funding Purposes
As of July 1, 2016**



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Cavanaugh Macdonald

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The experience and dedication you deserve

November 30, 2016

Board of Trustees
Teachers Retirement Association of Minnesota
60 Empire Drive, Suite 400
St. Paul, MN 55103

Dear Board Members:

At your request, we have performed the annual actuarial valuation of the Teachers Retirement Association of Minnesota (TRA or System) as of July 1, 2016. The major findings of the actuarial valuation are contained in this report, which reflects the benefit provisions in place on July 1, 2016. There were several changes to the actuarial assumptions from the prior valuation as a result of the experience study prepared for the System that covered the six-year period from July 1, 2008 through June 30, 2014. It should be noted that while the Board adopted all of the recommendations presented in the experience study, the statutory approval of the change in the investment return assumption has not yet occurred, so the investment return assumption used in the July 1, 2016 valuation is unchanged from the prior valuation. While this report is prepared with the statutorily required investment return assumption, selected valuation measurements are also presented in the Board Summary section of this report to disclose the impact of an 8% investment return assumption on the valuation results.

In preparing this report, we relied, without audit, on information (some oral and some in writing) supplied by TRA staff. This information includes, but is not limited to, statutory provisions, member data and financial information. We found this information to be reasonable and comparable to information used in prior valuations. The valuation results depend on the integrity of this information. If any of this information is inaccurate or incomplete, our results may be different and our calculations may need to be revised.

The statutory benefits of the System are reflected in the actuarially calculated contribution rates which are developed using the Entry Age Normal (EAN) cost method. An asset smoothing method is used for actuarial valuation purposes. Gains and losses are reflected in the unfunded actuarial accrued liability and are amortized as a level percent of payroll over a closed period set in state statutes. Actuarial assumptions, including investment return, 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 Trustees. These parties are responsible for selecting the plan's funding policy, actuarial methods, asset valuation method, and actuarial assumptions. The policies, methods and assumptions used in this valuation are those that have been so prescribed and are described in Appendix C of this report.

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Board of Trustees
November 30, 2016
Page 2

Future actuarial results may differ significantly from the current results presented in this report due to factors such 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. Since the potential impact of such factors is outside the scope of a normal annual actuarial valuation, an analysis of the range of potential results is not presented herein.

The actuarial computations presented in this report are for purposes of determining the required contribution rates for funding the System. Actuarial computations for purposes of fulfilling financial accounting requirements for the System under the Governmental Accounting Standards Board (GASB) Statement Number 67 will be presented in a separate report. The calculations in the enclosed report have been made on a basis consistent with our understanding of the System's funding requirements and goals and the plan provisions described in Appendix B of this report. Determinations for purposes other than meeting these requirements may be significantly different from the results contained in this report. Accordingly, additional determinations may be needed for other purposes.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and that the valuation was prepared in accordance with principles of practice prescribed by the Actuarial Standards Board, and that the actuarial calculations were performed by qualified actuaries in accordance with accepted actuarial procedures, based on the current provisions of the System. In addition, to the best of our knowledge and belief the valuation 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 State of Minnesota Legislative Commission on Pensions and Retirement (LCPR). We are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein. Also, we meet the requirements of "approved actuary" under Minnesota Statutes, Section 356.215, Subdivision 1, Paragraph (c).

Respectfully submitted,

A handwritten signature in blue ink that reads 'Patrice Beckham'.

Patrice A. Beckham, FSA, EA, FCA, MAAA
Principal and Consulting Actuary

A handwritten signature in blue ink that reads 'Brent A. Banister'.

Brent A. Banister PhD, FSA, EA, FCA, MAAA
Chief Pension Actuary



TABLE OF CONTENTS

<u>Sections</u>	<u>Page</u>
Certification Letter	
I. Executive Summary	1
II. Plan Assets	
• Statement of Fiduciary Net Position	14
• Statement of Changes in Fiduciary Net Position	16
• Actuarial Value of Assets	17
III. Plan Liabilities	
• Actuarial Valuation Balance Sheet	22
• Determination of Unfunded Actuarial Accrued Liability	23
• Changes in Unfunded Actuarial Accrued Liability (UAAL)	24
IV. Contributions	
• Normal Cost	28
• Determination of Supplemental Contribution Rate	29
• Determination of Contribution Sufficiency/(Deficiency)	30
• Statutory and Required Contributions Amounts – Basic Members	31
• Statutory and Required Contributions Amounts – Coordinated Members	32
V. Additional Information	
• Summary of Membership Data	36
• Schedule of Funding Progress	37
• Schedule of Contributions from the Employer and Other Contributing Entities	38
• Projected Benefit Payments	39
 <u>Appendices</u>	
A. Membership Data	
• Reconciliation of Members	43
• Distribution of Active Members	44
• Distribution of Service Retirements	45
• Distribution of Survivors	46
• Distribution of Disability Retirements	47
B. Summary of Plan Provisions	51
C. Actuarial Methods and Assumptions	
• Actuarial Cost Method	65
• Amortization Method	65
• Asset Valuation Method	66
• Summary of Actuarial Assumptions	66
Glossary	74

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SECTION 1 – EXECUTIVE SUMMARY

The Teachers Retirement Association of Minnesota (TRA or System) provides retirement, disability, and death benefits to Minnesota public school teachers, administrators, and college faculty. This report presents the results of the July 1, 2016 actuarial funding valuation of the System. The primary purposes of performing the actuarial funding valuation are to:

- determine the Required Contribution Rate as set forth in Chapter 356 of the Minnesota statutes;
- determine the sufficiency of the Statutory Contribution Rate as set forth in Chapter 354 of the Minnesota statutes;
- determine the experience of the System since the last valuation date;
- disclose asset and liability measures as of the valuation date; and
- analyze and report on trends in System contributions, assets, and liabilities over the past several years.

There were several recommended changes to the actuarial assumptions from the prior valuation as a result of the experience study for the period July 1, 2008 through June 30, 2014. These changes include:

- Economic Assumptions
 - Lower price inflation from 3.00% to 2.75%.
 - Lower general wage growth and payroll growth from 3.75% to 3.50%.
 - Lower the investment return assumption from a select and ultimate rate (8.0% through June 30, 2017, then 8.5%) to 8.0% for all years.
 - Minor changes at some durations for the merit scale of the salary increase assumption.
- Demographic Assumptions
 - Changes to active, retiree, and disabled mortality tables, reflecting improved mortality experience (longer life expectancy).
 - Separate retirement assumptions for members hired before or after July 1, 1989 to better reflect each group's behavior in light of different requirements for retirement eligibility.
 - Change termination rates to be based solely on years of service in order to better fit the observed experience.
 - Minor adjustment and simplification of the assumption regarding the election of optional forms of payment at retirement.

While the Board adopted all of these recommended changes to the actuarial assumptions, the required statutory approval of the change in the investment return assumption to 8.0% has not yet been made. Therefore, the current investment return assumption (8.0% through June 30, 2017 and 8.5% thereafter) is used in this valuation. Later in this section of the report, comparative results using the 8.0% investment return assumption are presented.

The impact of the changes in assumptions due to the experience study on the July 1, 2016 valuation results, using the actuarial value of assets, is summarized in the table on the following page. Minnesota Statutes, Section 356.215, Subdivision 11 addresses the recalculation of the established date for full funding when there is a change in the actuarial assumptions, benefit structure, or actuarial cost method that produces a net increase in the unfunded actuarial accrued liability (UAAL). The change in the actuarial assumptions, first reflected in this valuation, resulted in a net increase in the UAAL so this section of statute was applicable for the 2016 valuation. Based on the required calculation in Minnesota Statutes, Section 356.215, Subdivision 11, the amortization period has been extended two years, from FY 2037 to FY 2039.



SECTION 1 – EXECUTIVE SUMMARY

Impact of Change in Actuarial Assumptions from Experience Study

	<u>Before Changes</u>	<u>After Changes</u>	<u>Impact of Changes</u>
Projected Benefit Funding Ratio	96.7%	94.0%	(2.7%)
Actuarial Accrued Liability Funding Ratio (AVA)	77.6%	75.6%	(2.0%)
Actuarial Value of Assets (AVA)	\$ 20.19B	\$ 20.19B	\$ 0.00B
Unfunded Actuarial Accrued Liability (UAAL)	\$ 5.84B	\$ 6.52B	\$ 0.68B
Normal Cost Rate (% of pay)	8.26%	8.79%	0.53%
Amortization of UAAL (% of pay)	8.95%	9.70%	0.75%
Expenses (% of pay)	0.23%	0.23%	0.00%
Total Required Contribution (% of pay)	17.44%	18.72%	1.28%
Member and Employer Contributions	15.20%	15.20%	0.00%
State Aid	0.74%	0.74%	0.00%
Contribution Deficiency (% of pay)	(1.50%)	(2.78%)	(1.28%)

The actuarial valuation results provide a “snapshot” view of the System’s financial condition on July 1, 2016. The results reflect net favorable experience for the past plan year as demonstrated by an UAAL that was lower than expected. The UAAL on July 1, 2016 is \$6.522 billion as compared to an expected UAAL of \$6.677 billion (reflecting the \$684 million increase due to the new assumptions adopted as a result of the experience study, other than the 8.0% investment return assumption). The net favorable experience of \$155 million was the combination of an experience gain of \$206 million on the System liabilities and an experience loss of \$51 million on the actuarial value of assets. The majority of the liability gain was due to the change in the projected date the COLA is expected to increase from 2.0% to 2.5%, which occurs when the System has been 90% funded for two consecutive years.

A summary of the key results from the July 1, 2016 actuarial valuation is shown below. Further detail on the valuation results can be found in the following sections of this Executive Summary.

	July 1, 2016 Valuation Results	July 1, 2015 Valuation Results
Total Required Contribution Rate (Chapter 356)	18.72%	17.87%
Statutory Contribution Rate (Chapter 354)	15.94%	15.97%
Sufficiency/(Deficiency)	(2.78%)	(1.90%)
Unfunded Actuarial Accrued Liability (\$M)	\$6,522	\$5,865
Funded Ratio (Actuarial Assets)	75.59%	77.05%

The contribution deficiency increased from 1.90% of payroll in last year’s valuation to 2.78% of payroll in the 2016 valuation. The most significant component of this increase was the impact of the new actuarial assumptions, adopted following the presentation of the experience study report.



SECTION 1 – EXECUTIVE SUMMARY

EXPERIENCE FOR THE LAST PLAN YEAR

Numerous factors contributed to the change in the System’s assets, liabilities and actuarial contribution rate between July 1, 2015 and July 1, 2016. The components are examined in the following discussion.

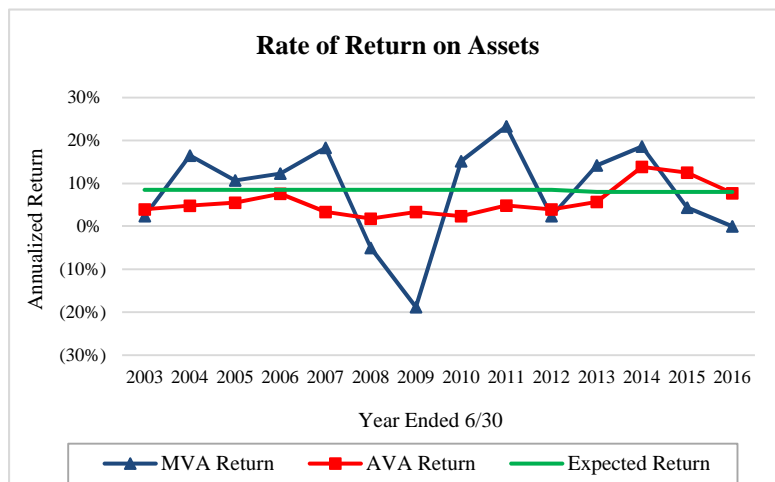
ASSETS

As of June 30, 2016, TRA had net assets of \$19.4 billion, when measured on a market value basis. This was a decrease of approximately \$1.0 billion from the prior year.

The market value of assets is not used directly in the calculation of the unfunded actuarial accrued liability and the Required Contribution Rate (actuarial contribution rate). An asset valuation method, which smoothes the effect of market fluctuations, is used to determine the value of assets used in the valuation, called the “actuarial value of assets”. In this year’s valuation, the actuarial value of assets as of June 30, 2016 was \$20.2 billion, an increase of \$0.5 billion from the value in the prior valuation. The components of change in the asset values are shown in the following table:

	Actuarial Value (\$M)	Market Value (\$M)
Net Assets, June 30, 2015	\$ 19,697	\$ 20,442
- Employer and Member Contributions and State Aid	+ 738	+ 738
- Benefit Payments and Administrative Expenses	- 1,739	- 1,739
- Investment Income	+ 1,498	+ -21
Net Assets, June 30, 2016	\$ 20,194	\$ 19,420
Asset Return	7.7%	-0.1%

On a market value basis, the rate of return was -0.1% as reported by the State Board of Investment (SBI). Due to the application of the asset smoothing method, including the scheduled recognition of the deferred investment experience, the rate of return, measured on the actuarial value of assets, was 7.7%. Because this rate of return was slightly lower than the assumed rate of return for this period of 8.0%, there was an actuarial loss of \$51 million. Please see Section II of this report for more detailed information on the market and actuarial value of assets.



Market value returns have been very volatile. An asset smoothing method is used to calculate the actuarial value of assets that recognizes investment gains and losses equally over a five year period. As can be seen in this graph, the return on actuarial assets is much smoother than the return on market value.



SECTION 1 – EXECUTIVE SUMMARY

LIABILITIES

The actuarial accrued liability is that portion of the present value of future benefits that will not be paid by future normal costs. The difference between this liability and the actuarial value of assets at the same date is called the unfunded actuarial accrued liability (UAAL). The dollar amount of unfunded actuarial accrued liability is reduced if the contributions to the System exceed the normal cost for the year plus interest on the prior year's UAAL.

The unfunded actuarial accrued liability is shown as of July 1, 2016 in the following table:

	Actuarial Value of Assets	Market Value of Assets
<i>(\$Millions)</i>		
Actuarial Accrued Liability	\$26,716	\$26,716
Value of Assets	20,194	19,420
Unfunded Actuarial Accrued Liability*	6,522	7,296
Funded Ratio	75.59%	72.69%

*Numbers may not add due to rounding

See Section III of the report for the detailed development of the unfunded actuarial accrued liability.

Changes in the UAAL occur for various reasons. The net increase in the UAAL from July 1, 2015 to July 1, 2016 was \$657 million. The components of this net change are shown in the table below (in millions):

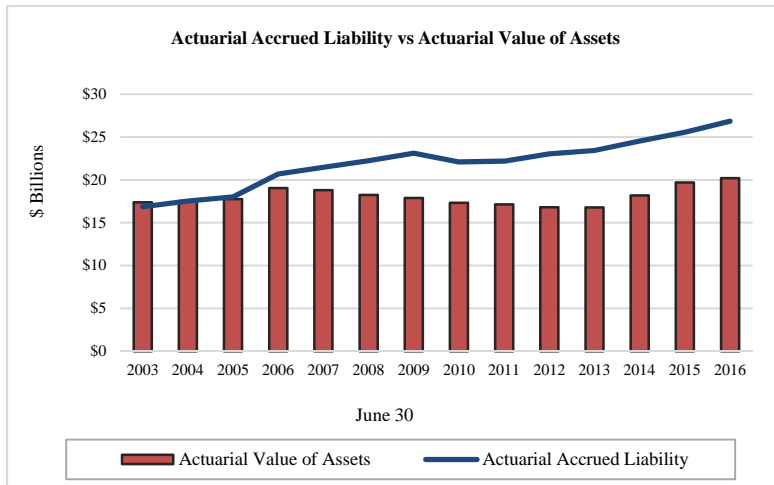
Unfunded Actuarial Accrued Liability, July 1, 2015 (\$M)	\$5,865
• Expected increase from amortization method	\$29
• Expected increase from contributions below Required Rate	92
• Investment experience	51
• Liability experience	(206)
• Other experience	7
• Assumption changes	684
• Total	<u>657</u>
Unfunded Actuarial Accrued Liability, July 1, 2016	\$6,522

As shown above, various components impacted the UAAL. Actuarial gains (losses), which result from actual experience that is more (less) favorable than anticipated based on the actuarial assumptions, are reflected in the UAAL and are measured as the difference between the expected unfunded actuarial accrued liability and the actual unfunded actuarial accrued liability, taking into account any changes due to actuarial assumptions and methods or benefit provision changes. Overall, the System experienced a net actuarial gain of \$155 million. The actuarial gain may be explained by considering the separate experience of assets and liabilities. As noted



SECTION 1 – EXECUTIVE SUMMARY

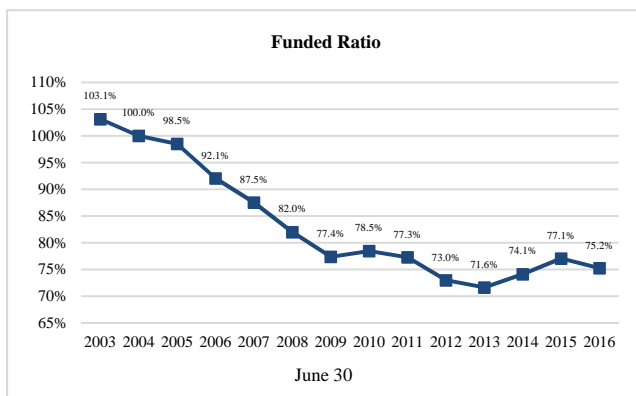
earlier, there was a \$206 million gain on liabilities and a \$51 million loss on the actuarial value of assets. The liability gain primarily arose from the fact that because of the 0% return on the market value of assets, the funded ratio is not expected to reach 90% and therefore the COLA is not expected to increase from 2.0% to 2.5% in the future.



The actuarial value of assets was slightly higher than the actuarial accrued liability in the early part of the period. Investment experience below the assumed rate of return of 8.5%, the merger of the Post Fund into TRA, and the mergers of the Minneapolis and Duluth Teacher Retirement Funds have all served to increase the difference between the actuarial accrued liability and actuarial assets.

An evaluation of the unfunded actuarial accrued liability on a pure dollar basis may not provide a complete analysis since only the difference between the assets and liabilities (which are both very large numbers) is reflected. Another way to evaluate the unfunded actuarial accrued liability and the progress made in its funding is to track the funded ratio, the ratio of the actuarial value of assets to the actuarial accrued liability. Note that if the funded status were calculated using the market value of assets, the results could differ. The funded ratios and unfunded actuarial accrued liability measures, as shown, are not indicative of whether or not the System could settle all current benefit obligations with existing assets. Furthermore, these results do not, on their own, indicate whether or not future funding of the System will be required, nor the amount. The funded status information is shown below (in millions).

	7/1/12	7/1/13	7/1/14	7/1/15	7/1/16
Funded Ratio	73.0%	71.6%	74.1%	77.1%	75.6%
Unfunded Actuarial Accrued Liability (\$M)	\$6,219	\$6,644	\$6,347	\$5,865	\$6,522



The funded ratio has decreased over this period largely due to investment experience less than the 8.5% assumed rate of return and the dissolution of the Minnesota Post Retirement Investment Fund (MPRIF) with the associated transfer of assets and liabilities to TRA. The benefit reductions passed by the 2010 legislature, the final recognition of the 2008 and 2009 losses, and the strong investment returns since FY10 have resulted in the funded ratio beginning to rebound from the funded level in 2013.



SECTION 1 – EXECUTIVE SUMMARY

CONTRIBUTION RATE

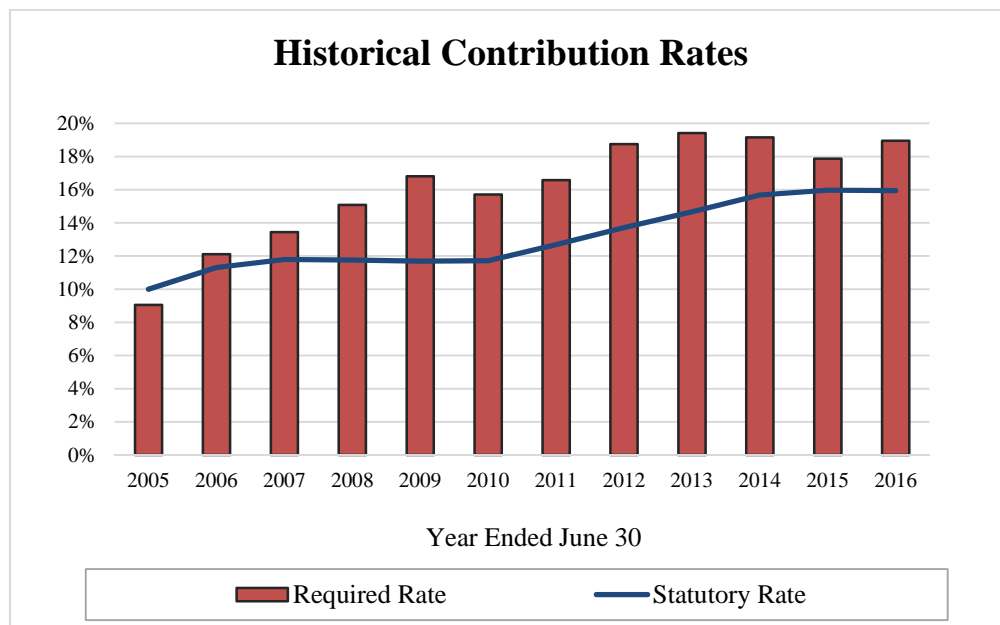
Under the Entry Age Normal cost method, the actuarial contribution rate consists of three components:

- a "normal cost" for the portion of projected liabilities allocated by the actuarial cost method to service of members during the year following the valuation date,
- an "unfunded actuarial accrued liability contribution" for the excess of the portion of projected liabilities allocated to service to date over the actuarial value of assets (unfunded actuarial accrued liability); and
- an amount to cover estimated administrative expenses for the plan year.

See Section IV of the report for the detailed development of these contribution rates which are summarized in the following table:

Contribution Rates	July 1, 2016	July 1, 2015
1. Normal Cost Rate	8.79%	8.57%
2. UAAL Contribution Rate	9.70%	9.07%
3. Expenses	<u>0.23%</u>	<u>0.23%</u>
4. Total Required Contribution Rate	18.72%	17.87%
5. Statutory Contribution Rate	15.94%	15.97%
6. Contribution Deficiency (4) - (5)	2.78%	1.90%

A historical summary of the Statutory and Required Contribution Rates is shown in the graph below:





SECTION 1 – EXECUTIVE SUMMARY

When the Statutory Contribution Rate is less than the Required Contribution Rate, the resulting contribution deficiency creates an increase in the unfunded actuarial accrued liability. For the plan year ending June 30, 2016, the contribution deficiency increased the UAAL by an estimated \$92 million.

The actuarial contribution rate (Required Contribution Rate) is determined based on the snapshot of the System taken on the valuation date, July 1, 2016. The actuarial contribution rate in future years will change each year as the deferred actuarial investment experience is recognized and other experience (both investment and demographic) impacts the System. The most volatile component of the actuarial contribution rate is typically the actual investment return, although the asset smoothing method helps to dampen the impact. Further, the date the funded ratio is projected to reach 90% for two consecutive years, triggering the increase in the COLA from 2.0% to 2.5% can move significantly with the actual investment return on the market value of assets. As a result, actual returns above the assumed rate of return tend to move the projected date forward and increase the actuarial accrued liability, while actual investment returns below the expected return extend the projected date, lowering the actuarial accrued liability. This interactive dynamic between liabilities and asset performance somewhat dampens the impact of investment return volatility on the System’s funding.

SUMMARY

The investment return on the market value of assets for FY 2016 was -0.1%, as reported by SBI. However, due to the application of the asset smoothing method, the return on the actuarial value of assets was 7.7%. Since this return was slightly below the assumed rate of return of 8.0%, there was an actuarial loss on the actuarial value of assets and the funded ratio decreased from 77.05% in last year’s valuation to 75.59% this year.

As mentioned earlier, the System utilizes an asset smoothing method in the valuation process. While this is a common procedure for public retirement systems, it is important to identify the potential impact of the deferred investment experience. The asset smoothing method impacts only the timing of when the actual market experience is recognized in the valuation process. The net deferred investment loss of \$0.8 billion represents about 4% of the market value of assets.

The key valuation results from the July 1, 2016 actuarial valuation are shown below, using both actuarial and market value of assets.

	<u>Actuarial Value</u>	<u>Market Value</u>
Statutory Contribution Rate	15.94%	15.94%
Required Contribution Rate		
Normal Cost	8.79%	8.79%
UAAL Contribution	9.70%	10.85%
Expenses	<u>0.23%</u>	<u>0.23%</u>
Total Required Contribution	18.72%	19.87%
Contribution (Deficiency)/Sufficiency	2.78%	(3.93%)
UAAL (\$M)	\$6,522	\$7,296
Funded Ratio	75.59%	72.69%



SECTION 1 – EXECUTIVE SUMMARY

As discussed earlier, following the presentation of the experience study results during 2015, the Board adopted all of the recommended assumptions, including an 8.0% investment return assumption. However, for purposes of the statutorily required actuarial valuation report for funding, the investment return assumption is set in statute. The relevant sections of state law were not changed during the 2016 legislative session because the changes were contained in a bill vetoed by the Governor. Therefore, the results in this report have been prepared using an investment return assumption of 8.0% through June 30, 2017, and 8.5% thereafter as specified in statute. Had the lower investment return assumption of 8.0% for all years been changed in statute, the valuation results presented in this report would have been different. The following table provides a summary of the key valuation measurements using the valuation investment return assumption and the 8.0% investment return assumption.

	Valuation Results	8% Assumption
Projected Benefit Funding Ratio	94.0%	88.3%
Actuarial Accrued Liability Funding Ratio (AVA)	75.6%	71.7%
Actuarial Value of Assets (AVA)	\$ 20.19B	\$ 20.19B
Unfunded Actuarial Accrued Liability (UAAL)	\$ 6.52B	\$ 7.98B
Normal Cost Rate (% of pay)	8.79%	9.99%
Amortization of UAAL (% of pay)	9.70%	11.15% *
Expenses (% of pay)	0.23%	0.23%
Total Required Contribution (% of pay)	18.72%	21.37%
Member and Employer Contributions	15.20%	15.20%
State Aid	0.74%	0.74%
Contribution Deficiency (% of pay)	(2.78%)	(5.43%)

*Reflects extension of amortization period to 24 years following Minnesota Statute Section 356.215, Subdivision 11

If the Total Required Contribution Rate is calculated, based on the UAAL using the market value of assets, the rate increases to 22.45% and the resulting Contribution Deficiency is 6.51%.

The long-term financial health of this retirement System, like all retirement systems, is heavily dependent on two key items: (1) future investment returns and (2) contributions to the System. Changes were made by the 2010 Legislature to strengthen the funding of TRA and enhance its long term sustainability. Contributions were increased by a total of 4%, phased in over four years beginning July 1, 2011, and benefit reductions were implemented. These changes, along with strong investment performance in several of the following years, significantly improved the projected long term funding of the System. However, the recommended assumption changes and two recent years of actual investment experience significantly below the expected investment return have eroded some of this progress. If the investment return assumption of 8.0%, as adopted by the Board, is changed in statute, the subsequent valuation results will reflect further erosion. It is important to note that it is the actual investment returns, not the assumed investment return, that will ultimately determine the cost to provide the promised benefits.

We conclude this executive summary by presenting comparative statistics and actuarial information on both the July 1, 2016 and July 1, 2015 valuations.



SECTION I - EXECUTIVE SUMMARY

Principal Valuation Results

A summary of principal valuation results from the current valuation and the prior valuation follows.

	Actuarial Valuation as of	
	July 1, 2016	July 1, 2015
1. PARTICIPANT DATA		
A. Active members		
1. Number	80,530	79,406
2. Projected annual earnings for fiscal year (000s)	4,858,593	4,672,229
3. Average projected annual earnings for fiscal year 2017	60,333	58,840
4. Average age	43.3	43.3
5. Average service	11.9	12.0
B. Service retirements	57,891	56,589
C. Survivors	5,091	4,826
D. Disability retirements	521	571
E. Deferred retirements	13,680	13,314
F. Non-vested terminated members	31,850	31,026
G. Total	189,563	185,732
2. LIABILITIES AND FUNDING RATIOS (dollars in thousands)		
A. Accrued Benefit Funding Ratio		
1. Current assets (AVA)	\$ 20,194,279	\$ 19,696,893
2. Current benefit obligations	25,304,940	24,402,760
3. Funding ratio	79.80%	80.72%
B. Actuarial Accrued Liability Funding Ratio		
1. Current assets (AVA)	\$ 20,194,279	\$ 19,696,893
2. Market value of assets (MVA)	19,420,131	20,441,993
3. Actuarial accrued liability	26,716,216	25,562,155
4. Unfunded actuarial accrued liability (B.3. - B.1.)	6,521,937	5,865,262
5. Funding ratio (AVA) (B.1. / B.3.)	75.59%	77.05%
6. Funding ratio (MVA) (B.2. / B.3.)	72.69%	79.97%
C. Projected Benefit Funding Ratio		
1. Current and expected future assets	\$ 29,080,864	\$ 27,943,500
2. Current and expected future benefit obligations	30,950,072	29,172,991
3. Funding ratio (AVA)	93.96%	95.79%
3. CONTRIBUTIONS (% of Payroll)		
A. Normal Cost Rate	8.79%	8.57%
B. UAAL Amortization Payment	9.70%	9.07%
C. Expenses	0.23%	0.23%
D. Total Required Contribution (Chapter 356)	18.72%	17.87%
E. Statutory Contribution (Chapter 354)	15.94%	15.97%
F. Contribution (Deficiency)/Sufficiency (3.E. - 3.D.)	(2.78%)	(1.90%)



SECTION I - EXECUTIVE SUMMARY

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SECTION II - PLAN ASSETS

SECTION II
PLAN ASSETS



SECTION II - PLAN ASSETS

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SECTION II - PLAN ASSETS

In this section, the values assigned to the assets held by the System are presented. These assets are valued on two different bases: the market value and the actuarial value.

Market Value of Net Assets

Market values represent a "snapshot" of the fair value of System assets as of the valuation date.

Actuarial Value of Net Assets

The market value of assets may not necessarily be the best measure of the System's ongoing ability to meet its obligations.

To arrive at a suitable value for the actuarial valuation, a technique for determining the actuarial value of assets is used which dampens volatility in the market value while still indirectly recognizing market value. The methodology used to determine the actuarial value of assets is prescribed in Minnesota Statutes, Section 356.215, Subdivision 1, Paragraph (f). 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 determined 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;
- The asset value is the sum of the market value plus the scheduled recognition of investment gains or (losses) during the current and the preceding four fiscal years.



SECTION II - PLAN ASSETS

TABLE 1

STATEMENT OF FIDUCIARY NET POSITION
(Dollars in Thousands)

	June 30, 2016	June 30, 2015
	<u>Amount</u>	<u>Amount</u>
Cash and short-term investments		
Cash	\$ 8,491	\$ 8,821
Building account cash	64	16
Short term investments	410,605	400,181
Total cash and short term investments	\$ 419,160	\$ 409,018
Accounts Receivable	21,765	23,111
Investments (at fair value)		
Fixed income pool	\$ 4,788,125	\$ 4,804,240
Alternative investments pool	2,482,640	2,519,315
Indexed equity pool	2,995,720	3,173,250
Domestic equity pool	5,996,792	6,476,020
Global equity pool	2,714,605	3,040,212
Total investments	\$ 18,977,882	\$ 20,013,037
Securities lending collateral	\$ 2,748,476	\$ 2,076,138
Building		
Land	\$ 171	\$ 171
Building & equipment net of depreciation	6,523	7,001
Deferred bond charge net of amortization	0	0
Total building	\$ 6,694	\$ 7,172
Capital assets net of depreciation	14,902	11,809
Total Assets	\$ 22,188,879	\$ 22,540,285



SECTION II - PLAN ASSETS

TABLE 1 (continued)

STATEMENT OF FIDUCIARY NET POSITION

(Dollars in Thousands)

	June 30, 2016	June 30, 2015
Liabilities	<u>Amount</u>	<u>Amount</u>
Current		
Accounts payable	\$ 9,136	\$ 10,558
Accrued compensated absences	111	82
Accrued expenses - building	4	3
Bonds payable	603	604
Bonds interest payable	12	13
Securities lending collateral	2,748,477	2,076,138
Total current liabilities	\$ 2,758,343	\$ 2,087,398
Long term		
Accrued compensated absences	\$ 808	\$ 726
Bonds payable	5,297	6,070
Total long term liabilities	\$ 6,105	\$ 6,796
Total Liabilities	\$ 2,764,448	\$ 2,094,194
Net position restricted for pensions	\$ 19,424,431	\$ 20,446,091
Earnings Limitation Savings Account (ELSA) accounts payable	(4,300)	(4,098)
Net position restricted for pensions, after adjustment for ELSA accounts	\$ 19,420,131	\$ 20,441,993



SECTION II - PLAN ASSETS

TABLE 2

STATEMENT OF CHANGES IN FIDUCIARY NET POSITION

(Dollars in Thousands)

The following exhibit shows the revenue, expenses and resulting assets of the Fund as reported by the Teachers Retirement Association for the Plan's fiscal years ended June 30, 2016 and 2015.

	For Year Ended	
	June 30, 2016	June 30, 2015
Additions		
Contributions		
Member	\$ 347,256	\$ 331,905
Employer	354,961	337,366
Direct aid (state/city/district)	35,587	21,001
Earnings Limitation Savings Account (ELSA)	1,961	1,347
Total contributions	<u>\$ 739,765</u>	<u>\$ 691,619</u>
Investment Income		
Investment appreciation in fair value	\$ (9,471)	\$ 896,823
Less investment expenses	(26,265)	(28,464)
Net Investment Income	<u>\$ (35,736)</u>	<u>\$ 868,359</u>
Securities Lending activities		
Securities lending income	\$ 20,348	\$ 15,577
Securities lending expenses:		
Borrowing rebates	(4,065)	(614)
Management fees	(4,219)	(4,262)
Total securities lending expenses	<u>(8,284)</u>	<u>(4,876)</u>
Net income from securities lending	<u>12,064</u>	<u>10,701</u>
Total Net Investment Income	<u>\$ (23,672)</u>	<u>\$ 879,060</u>
Other Income	<u>3,569</u>	<u>3,278</u>
Total Additions	\$ 719,662	\$ 1,573,957
Deductions		
Benefits Paid		
Retirement benefits	\$ (1,716,733)	\$ (1,630,157)
Refunds of contributions to members	(11,290)	(11,627)
Total benefits paid	<u>\$ (1,728,023)</u>	<u>\$ (1,641,784)</u>
Administrative Expenses	<u>(11,338)</u>	<u>(10,368)</u>
Total Deductions	\$ (1,739,361)	\$ (1,652,152)
Increase/(Decrease) in ELSA Account Value	(2,163)	(1,354)
Net Increase (Decrease)	(1,021,862)	(79,549)
Net Position Restricted for Pensions		
Beginning of Year	\$ 20,441,993	\$ 20,289,594
Adjustment to reflect DTRFA merger at End of Year	0	231,948
End of Year	<u>\$ 19,420,131</u>	<u>\$ 20,441,993</u>



SECTION II - PLAN ASSETS

TABLE 3

ACTUARIAL VALUE OF ASSETS AS OF JUNE 30, 2016

(Dollars in Thousands)

1. Market value of assets available for benefits				\$ 19,420,131
2. Determination of average balance				
a. Assets available at July 1, 2015*			\$	20,446,091
b. Assets available at June 30, 2016*				19,424,431
c. Net investment income for fiscal year ending June 30, 2016				(23,672)
d. Average balance $(a. + b. - c.) / 2$			\$	19,947,097
3. Expected return $(8.0\% * 2.d.)$				1,595,768
4. Actual return				(23,672)
5. Current year unrecognized asset return (4. - 5.)				(1,619,440)
6. Unrecognized asset returns				
		Original	% Not	
		<u>Amount</u>	<u>Recognized</u>	
a. Year ended June 30, 2016	\$	(1,619,440)	80%	\$ (1,295,552)
b. Year ended June 30, 2015		(706,091)	60%	(423,655)
c. Year ended June 30, 2014		1,855,481	40%	742,192
d. Year ended June 30, 2013		1,014,336	20%	202,867
e. Total return not yet recognized				\$ (774,148)
7. Actuarial value of assets at June 30, 2016 (1. - 6.e.)				\$ 20,194,279

* Before recognition of ELSA accounts payable.



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SECTION III - PLAN LIABILITIES

SECTION III
PLAN LIABILITIES



SECTION III - PLAN LIABILITIES

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SECTION III - PLAN LIABILITIES

In the previous section, an analysis was given of the assets of the System as of the valuation date, July 1, 2016. In this section, the discussion will focus on the commitments of the System, which are referred to as its liabilities.

Table 5 contains an analysis of the actuarial present value of all projected benefits for contributing members, inactive members, retirees and their beneficiaries. The analysis is provided for each group.

The liabilities summarized in Table 5 include the actuarial present value of all projected benefits expected to be paid with respect to each member. For an active member, this value includes measures of both benefits already earned and future benefits expected to be earned. For all members, active and retired, the value extends over benefits earnable and payable for the rest of their lives and, if an optional benefit is chosen, for the lives of the surviving beneficiaries.

The actuarial assumptions used to determine liabilities are based on the results of the 2008-2014 Experience Study. This set of assumptions is shown in Appendix C.

The liabilities reflect the benefit structure in place as of July 1, 2016.

Actuarial Liabilities

A fundamental principle in financing the liabilities of a retirement program is that the cost of its benefits should be related to the period in which benefits are earned, rather than to the period of benefit distribution. An actuarial cost method is a mathematical technique that allocates the present value of future benefits into annual costs. In order to perform this allocation, it is necessary for the funding method to “breakdown” the present value of future benefits into two components:

- (1) that which is attributable to the past and
- (2) that which is attributable to the future.

Actuarial terminology calls the part attributable to the past the “past service liability” or the “actuarial accrued liability”. The portion allocated to the future is known as the present value of future normal costs, with the specific piece of it allocated to the current year being called the “normal cost”. Table 5 contains the calculation of the unfunded actuarial accrued liability.



SECTION III - PLAN LIABILITIES

TABLE 4

ACTUARIAL VALUATION BALANCE SHEET AS OF JULY 1, 2016

(Dollars in Thousands)

The actuarial balance sheet is based on the fundamental equation that, at any given time, the present value of benefits to be paid in the future must be equal to the assets on hand plus the present value of future contributions to be received. The total contribution rate is determined as that amount which will make the total present and potential assets balance with the total present value of projected benefits.

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. This reserve system is designed to enable the establishment of a level rate of contribution each year.

A. Actuarial Value of Assets	\$ 20,194,279
B. Expected Future Assets	
1. Present value of expected future statutory supplemental contributions*	\$ 4,652,729
2. Present value of expected future normal cost contributions	4,233,856
3. Total expected future assets (1. + 2.)	\$ 8,886,585
C. Total Current and Expected Future Assets**	\$ 29,080,864

	<u>Non-Vested</u> <u>Benefits</u>	<u>Vested</u> <u>Benefits</u>	<u>Total</u>
D. Current Benefit Obligations			
1. Benefit recipients			
a. Service retirements	\$ 0	\$ 15,988,969	\$ 15,988,969
b. Disability	0	144,388	144,388
c. Survivors	0	1,053,975	1,053,975
2. Deferred retirements with augmentation to Normal Retirement Date	0	594,186	594,186
3. Former members without vested rights***	77,015	0	77,015
4. Active members	61,345	7,385,062	7,446,407
5. Total Current Benefit Obligations	\$ 138,360	\$ 25,166,580	\$ 25,304,940
E. Expected Future Benefit Obligations			5,645,132
F. Total Current and Expected Future Benefit Obligations			30,950,072
G. Unfunded Current Benefit Obligations (D.5. - A.)			5,110,661
H. Unfunded Current and Future Benefit Obligations (F. - C.)			1,869,208

* Under LCPR guidelines, this amount does not include supplemental payments which could occur after the expiration of the remaining 23 year amortization period.

** Does not reflect deferred investment experience in the asset smoothing method. Total expected future assets on a market value basis is \$ 28,306,716.

*** Former members with insufficient service to vest who have not collected a refund of member contributions as of the valuation date.



SECTION III - PLAN LIABILITIES

TABLE 5

**DETERMINATION OF UNFUNDED ACTUARIAL ACCRUED LIABILITY
AS OF JULY 1, 2016
(Dollars in Thousands)**

	Actuarial Present Value of Projected Benefits	Actuarial Present Value of Future Normal Costs	Actuarial Accrued Liability
1. Active Members			
a. Retirement annuities	\$ 12,304,339	\$ (3,470,774)	\$ 8,833,565
b. Disability Benefits	265,720	(108,812)	156,908
c. Survivor benefits	99,342	(36,704)	62,638
d. Deferred retirements	406,959	(466,699)	(59,740)
e. Refunds	15,179	(150,867)	(135,688)
f. Total	<u>\$ 13,091,539</u>	<u>\$ (4,233,856)</u>	<u>\$ 8,857,683</u>
2. Deferred Retirements with Future Augmentation to Normal Retirement Date	594,186	0	594,186
3. Former Members Without Vested Rights	77,015	0	77,015
4. Benefit Recipients	<u>17,187,332</u>	<u>0</u>	<u>17,187,332</u>
5. Total Actuarial Accrued Liability	\$ 30,950,072	\$ (4,233,856)	\$ 26,716,216
6. Actuarial Value of Assets			\$ 20,194,279
7. Unfunded Actuarial Accrued Liability (UAAL)			\$ 6,521,937

* On a market value of assets basis, the unfunded actuarial accrued liability is \$7,296,085.



SECTION III - PLAN LIABILITIES

TABLE 6

CHANGES IN UNFUNDED ACTUARIAL ACCRUED LIABILITY (UAAL)
(Dollars in Thousands)

A. Unfunded actuarial accrued liability at beginning of year	\$	5,865,262
B. Changes due to interest requirements and current rate of funding*		
1. Normal cost and actual administrative expenses	\$	411,786
2. Contributions		(739,765)
3. Interest on A., B.1., and B.2. at 8.0%		456,354
4. Total (B.1. + B.2. + B.3.)	\$	<u>128,375</u>
C. Expected unfunded actuarial accrued liability at end of year (A. + B.4.)	\$	5,993,637
D. Increase (decrease) due to actuarial losses (gains) because of experience deviations from expected		
1. Salary increases	\$	(122,517)
2. Investment return (actuarial assets)		51,338
3. Mortality of active members		(469)
4. Mortality of benefit recipients		2,843
5. Retirement from active service		51,523
6. Change in date COLA is expected to increase		(203,316)
7. Other items		65,336
8. Total	\$	<u>(155,262)</u>
E. Unfunded actuarial accrued liability at end of year before plan amendments and changes in actuarial assumptions (C. + D.8.)	\$	5,838,375
F. Change in unfunded actuarial accrued liability due change in demographic assumptions	\$	683,562
G. Unfunded actuarial accrued liability at end of year (E. + F.)	\$	6,521,937

* *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 in the absence of actuarial gains.*



SECTION IV
SYSTEM CONTRIBUTIONS



SECTION IV – SYSTEM CONTRIBUTIONS

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SECTION IV - CONTRIBUTIONS

Sections II and III were devoted to a discussion of the assets and liabilities of the System. A comparison of Tables 3 and 4 indicates that current assets fall short of meeting the actuarial present value of future projected benefits (total liability). This is expected in all but a fully closed fund, where no further contributions are anticipated.

In an active system, there will almost always be a difference between the actuarial value of assets and total liabilities. This deficiency has to be made up by future contributions and investment returns. An actuarial valuation sets out a schedule of future contributions that will finance this deficiency in an orderly fashion.

The method used to determine the incidence of the contributions in various years is called the actuarial cost method. Under an actuarial cost method, the contributions required to meet the difference between current assets and current liabilities are allocated each year between two elements: (1) the normal cost and (2) the payment on the unfunded actuarial accrued liability.

The term “fully funded” is often applied to a system in which contributions at the normal cost rate are sufficient to pay for the benefits of existing employees as well as for those of new employees. More often than not, systems are not fully funded, either because of past benefit improvements that have not been completely funded and/or because of actuarial deficiencies that have occurred because experience has not been as favorable as anticipated. Under these circumstances, an unfunded actuarial accrued liability (UAAL) exists.

Description of Rate Components

The actuarial cost method for the System is the traditional Entry Age Normal (EAN) – level percent of pay cost method. Under the EAN cost method, the actuarial present value of each member’s projected benefits is allocated on a level basis over the member’s compensation between the entry age of the member and the assumed exit ages. The portion of the actuarial present value allocated to the valuation year is called the normal cost. The actuarial present value of benefits allocated to prior years of service is called the actuarial accrued liability. The unfunded actuarial accrued liability (UAAL) represents the difference between the actuarial accrued liability and the actuarial value of assets as of the valuation date. The unfunded actuarial accrued liability is calculated each year and reflects experience gains/losses (actual experience versus experience expected based on the actuarial assumptions). The UAAL is amortized over a period set in state statute (by June 30, 2039). Contributions to fund the UAAL are determined as a level percentage of payroll assuming payroll increases 3.50% each year.



SECTION IV - CONTRIBUTIONS

TABLE 7

NORMAL COST AT JULY 1, 2016
(Dollars in Thousands)

	<u>Percent of Pay</u>	<u>Dollar Amount</u>
1. Normal Cost Rate		
a. Retirement benefits	7.27%	\$ 353,245
b. Disability benefits	0.21%	10,204
c. Survivor benefits	0.08%	3,888
d. Deferred retirement benefits*	0.91%	44,216
e. Refunds	0.32%	15,548
f. Total	<u>8.79%</u>	<u>\$ 427,101</u>

* For vested members, includes the greater of the refund amount or the present value of the deferred monthly benefit.



SECTION IV - CONTRIBUTIONS

TABLE 8

DETERMINATION OF SUPPLEMENTAL CONTRIBUTION RATE
(Dollars in Thousands)

	<u>Amount</u>
A. Determination of Unfunded Actuarial Accrued Liability (UAAL)*	
1. Actuarial accrued liability	\$ 26,716,216
2. Actuarial value of assets	20,194,279
3. Unfunded actuarial accrued liability	\$ <u>6,521,937</u>
B. Determination of Supplemental Contribution Rate*	
1. Present value of future payrolls through the amortization date of June 30, 2039	\$ 67,235,963
2. Supplemental contribution rate (A.3. / B.1.)**	9.70%

* *On a market value of assets basis, the unfunded actuarial accrued liability is \$7,296,085 and the supplemental contribution rate is 10.85% of payroll.*

** *The amortization factor as of July 1, 2016 is 13.8386.*



SECTION IV - CONTRIBUTIONS

TABLE 9

DETERMINATION OF CONTRIBUTION SUFFICIENCY/(DEFICIENCY)

(Dollars in Thousands)

The annual required contribution (ARC) is the sum of normal cost, a supplemental contribution to amortize the UAAL, and an allowance for expenses.

	<u>Percent of Payroll</u>	<u>Dollar Amount</u>
A. Statutory contributions - Chapter 354		
1. Employee contributions	7.50%	\$ 364,408
2. Employer contributions*	7.70%	374,140
3. Supplemental contributions**		
a. 1993 Legislation	0.10%	5,000
b. 1996 Legislation	0.07%	3,256
c. 1997 Legislation	0.27%	12,954
d. 2014 Legislation	0.30%	14,377
	<hr/>	<hr/>
4. Total	15.94%	\$ 774,135
B. Required contributions - Chapter 356		
1. Normal cost		
a. Retirement benefits	7.27%	\$ 353,245
b. Disability benefits	0.21%	10,204
c. Survivor benefits	0.08%	3,888
d. Deferred retirement benefits	0.91%	44,216
e. Refunds	0.32%	15,548
f. Total	<hr/>	<hr/>
	8.79%	\$ 427,101
2. Supplemental contribution for the amortization of the Unfunded Actuarial Accrued Liability by June 30, 2039	9.70%	471,284
3. Allowance for expenses	<hr/>	<hr/>
	0.23%	\$ 11,175
4. Total annual contribution for fiscal year ending June 30, 2017***	18.72%	\$ 909,560
C. Contribution Sufficiency / (Deficiency) (A.4. - B.4.)***	(2.78%)	\$ (135,425)

Note: Projected annual payroll for fiscal year beginning on the valuation date: \$4,858,593

* Employer contribution rate is blended to reflect rates of 15.14% of pay for Basic members, 7.50% of pay for Coordinated members not employed by Special School District #1, and 11.14% of pay for Coordinated members who are employed by Special School District #1.

** Includes contributions from School District #1, the City of Minneapolis, matching state contributions.

*** On a market value of assets basis, the total required contribution is 19.87% of payroll and the contribution deficiency is 3.93% of payroll.



SECTION IV - CONTRIBUTIONS

TABLE 10

STATUTORY AND REQUIRED CONTRIBUTION AMOUNTS

(Dollars in Thousands)

Basic Members

	Percent of Payroll		Dollar Amount
A. Statutory contributions - Chapter 354			
1. Employee contributions	11.00%	\$	42
2. Employer contributions*	15.14%		58
3. Supplemental contributions**			
a. 1993 Legislation	0.10%		0
b. 1996 Legislation	0.07%		0
c. 1997 Legislation	0.27%		1
d. 2014 Legislation	0.30%		1
	<hr/>		<hr/>
4. Total	26.88%	\$	102
B. Required contributions - Chapter 356			
1. Normal cost			
a. Retirement benefits	13.79%	\$	53
b. Disability benefits	0.65%		2
c. Survivor benefits	0.31%		1
d. Deferred retirement benefits	1.56%		6
e. Refunds	0.55%		2
f. Total	<hr/>		<hr/>
	16.86%	\$	64

Note: Projected annual payroll for fiscal year beginning on the valuation date: \$382 for 4 members.

* All Basic active members are teachers employed by Special School District #1; employer contribution rate of 15.14% of payroll applies.

** Includes contributions from School District #1, the City of Minneapolis, matching state contributions.



SECTION IV - CONTRIBUTIONS

TABLE 11

STATUTORY AND REQUIRED CONTRIBUTION AMOUNTS

(Dollars in Thousands)

Coordinated Members

	Percent of Payroll		Dollar Amount
A. Statutory contributions - Chapter 354			
1. Employee contributions	7.50%	\$	364,366
2. Employer contributions*	7.70%		374,082
3. Supplemental contributions**			
a. 1993 Legislation	0.10%		5,000
b. 1996 Legislation	0.07%		3,256
c. 1997 Legislation	0.27%		12,953
d. 2014 Legislation	0.30%		14,376
	<hr/>		<hr/>
4. Total	15.94%	\$	774,033
B. Required contributions - Chapter 356			
1. Normal cost			
a. Retirement benefits	7.27%	\$	353,192
b. Disability benefits	0.21%		10,202
c. Survivor benefits	0.08%		3,887
d. Deferred retirement benefits	0.91%		44,210
e. Refunds	0.32%		15,546
f. Total	<hr/>	\$	<hr/>
	8.79%		427,037

Note: Projected annual payroll for fiscal year beginning on the valuation date: \$4,858,211. This includes \$4,585,347 for 75,766 Coordinated members who are not employed by Special School District #1 and \$272,864 for 4,760 members who are employed by Special School District #1.

* *Employer contribution rate is blended to reflect rates of 7.50% of pay for Coordinated members not employed by Special School District #1, and 11.14% of pay for Coordinated members who are employed by Special School District #1.*

** *Includes contributions from School District #1, the City of Minneapolis, matching state contributions.*



SECTION V
ADDITIONAL INFORMATION



SECTION V – ADDITIONAL INFORMATION

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SECTION V – ADDITIONAL INFORMATION

This section contains information that may be helpful in understanding the Systems' historical funding as well as current information regarding membership information and expected benefit payments. Some of the historical information was required under prior GASB accounting standards, but continues to provide useful information. Current financial reporting information required under Governmental Accounting Standards Board Statement No. 67 is provided in a separate report.



SECTION V – ADDITIONAL INFORMATION

TABLE 12
SUMMARY OF MEMBERSHIP DATA

	<u>July 1, 2016</u>	<u>July 1, 2015</u>
Active members:		
Vested	63,674	62,804
Non-vested	<u>16,856</u>	<u>16,602</u>
Total	80,530	79,406
Pensioners and Beneficiaries	63,503	61,986
Terminated vested members entitled to, but not yet receiving, benefits:	13,680	13,314
Other terminated, non-vested members entitled to a refund of contributions	<u>31,850</u>	<u>31,026</u>
Total	189,563	185,732



SECTION V – ADDITIONAL INFORMATION

TABLE 13

SCHEDULE OF FUNDING PROGRESS*

(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)
07/01/91	\$ 5,614,924	\$ 7,213,720	\$ 1,598,796	77.84%	\$ 1,943,375	82.27%
07/01/92	6,324,733	7,662,522	1,337,789	82.54%	1,989,624	67.24%
07/01/93	7,045,937	8,266,059	1,220,122	85.24%	2,065,881	59.06%
07/01/94	7,611,936	9,115,266	1,503,330	83.51%	2,150,300	69.91%
07/01/95	8,348,124	9,717,623	1,369,499	85.91%	2,204,693	62.12%
07/01/96	9,541,221	10,366,168	824,947	92.04%	2,268,390	36.37%
07/01/97	11,103,759	10,963,637	(140,122)	101.28%	2,359,011	(5.94%)
07/01/98	12,727,546	12,046,312	(681,234)	105.66%	2,422,957	(28.12%)
07/01/99	14,011,247	13,259,569	(751,678)	105.67%	2,625,254	(28.63%)
07/01/00	15,573,151	14,802,441	(770,710)	105.21%	2,704,575	(28.50%)
07/01/01	16,834,024	15,903,984	(930,040)	105.85%	2,812,000	(33.07%)
07/01/02	17,378,994	16,503,099	(875,895)	105.31%	2,873,771	(30.48%)
07/01/03	17,384,179	16,856,379	(527,800)	103.13%	2,952,887	(17.87%)
07/01/04	17,519,909	17,518,784	(1,125)	100.01%	3,032,483	(0.04%)
07/01/05	17,752,917	18,021,410	268,493	98.51%	3,121,571	8.60%
07/01/06	19,035,612	20,679,111	1,643,499	92.05%	3,430,645	47.91%
07/01/07	18,794,389	21,470,314	2,675,925	87.54%	3,532,159	75.76%
07/01/08	18,226,985	22,230,841	4,003,856	81.99%	3,645,230	109.84%
07/01/09	17,882,408	23,114,802	5,232,394	77.36%	3,761,484	139.10%
07/01/10	17,323,146	22,081,634	4,758,488	78.45%	3,787,757	125.63%
07/01/11	17,132,383	22,171,493	5,039,110	77.27%	3,838,111	131.29%
07/01/12	16,805,077	23,024,505	6,219,428	72.99%	3,871,809	160.63%
07/01/13	16,774,626	23,418,629	6,644,003	71.63%	3,917,310	169.61%
07/01/14	18,181,932	24,528,506	6,346,574	74.13%	4,056,482	156.46%
07/01/15	19,696,893	25,562,155	5,865,262	77.05%	4,306,426	136.20%
07/01/16	20,194,279	26,716,216	6,521,937	75.59%	4,515,699	144.43%

* Information prior to 2004 provided by Milliman; from 2004 to 2008 provided by The Segal Company; and 2009 to 2010 by Mercer.



SECTION V – ADDITIONAL INFORMATION

TABLE 14

SCHEDULE OF CONTRIBUTIONS FROM THE EMPLOYER AND OTHER CONTRIBUTING ENTITIES

(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)*(b)] - (c)	Actual Employer Contributions¹	Percentage Contributed
2000	8.36%	\$ 2,704,575	\$ 138,696	\$ 87,406	\$ 134,419	153.79%
2001 ²	7.92%	2,812,000	145,075	77,635	139,799	180.07%
2002	7.85%	2,873,771	152,331	73,260	142,222	194.13%
2003 ³	7.57%	2,952,887	155,577	67,957	149,481	219.96%
2004	8.37%	3,032,483	159,140	94,679	151,029	159.52%
2005	8.46%	3,121,571	160,982	103,103	157,693	152.95%
2006 ⁴	9.05%	3,430,645	177,085	133,389	200,286	150.15%
2007 ⁵	12.16%	3,532,159	199,869	229,642	209,219	91.11%
2008 ⁶	13.44%	3,645,230	209,592	280,327	231,562	82.60%
2009 ⁷	15.08%	3,761,484	212,043	355,189	240,718	67.72%
2010 ⁸	16.81%	3,787,757	214,909	421,813	242,088	57.39%
2011 ⁹	15.71%	3,838,111	218,024	384,943	244,233	63.45%
2012 ¹⁰	16.57%	3,871,809	239,834	401,725	266,661	66.38%
2013 ¹¹	18.75%	3,917,310	270,708	463,788	290,662	62.67%
2014 ¹²	19.41%	4,056,482	294,632	492,731	320,301	65.01%
2015 ¹³	19.15%	4,261,626	331,905	484,196	358,367	74.01%
2016 ¹⁴	17.87%	4,515,699	347,256	459,699	390,548	84.96%
2017 ¹⁵	18.72%					

Note: Information prior to 2004 provided by Milliman USA; 2004 to 2008 information provided by The Segal Company; 2009 and 2010 information provided by Mercer.

- ¹ Includes contributions from other sources (if applicable)
- ² Actuarially Required Contribution Rate prior to change in Actuarial Assumptions and Asset Valuation Method is 7.31%.
- ³ Actuarially Required Contribution Rate prior to change in Actuarial Assumptions is 8.11%.
- ⁴ Actuarially Required Contribution Rate shown is the contribution rate stated in the TRA July 1, 2005 actuarial valuation.
- ⁵ Actuarially Required Contributions calculated according to parameters of GASB 25 (30-year amortization period), and post-merger of the Minneapolis Teachers' Retirement Fund Association.
- ⁶ Actuarially Required Contribution Rate prior to change in Asset Valuation Method is 11.58%.
- ⁷ Actuarially Required Contribution Rate prior to change in Actuarial Assumptions is 15.36%.
- ⁸ Actuarially Required Contribution Rate prior to change in Asset Valuation Method is 19.98%.
- ⁹ Actuarially Required Contribution Rate prior to change in Actuarial Assumptions and Plan Provisions is 18.91%.
- ¹⁰ Actuarially Required Contribution Rate prior to change in Actuarial Assumptions is 16.91%.
- ¹¹ Actuarially Required Contribution Rate prior to change in Actuarial Assumptions is 18.15%.
- ¹² Actuarially Required Contribution Rate prior to change in Plan Provisions is 19.66%.
- ¹³ Actuarially Required Contribution Rate prior to change in Actuarial Assumptions is 17.95%. Actual Covered Payroll excludes DTRFA payroll of \$44.8 million.
- ¹⁴ Actuarially Required Contribution Rate prior to DTRFA merger is 17.70%.
- ¹⁵ Actuarially Required Contribution Rate prior to change in Actuarial Assumptions is 17.44%.



SECTION V – ADDITIONAL INFORMATION

TABLE 15

PROJECTED BENEFIT PAYMENTS

(Dollars in Thousands)

The table below shows estimated benefits expected to be paid over the next twenty-five years, based on the assumptions used in the valuation. The “Actives” column shows benefits expected to be paid to members currently active on July 1, 2016. The “Retirees” column shows benefits expected to be paid to all other members. This includes those who, as of July 1, 2016, are receiving benefit payments or who terminated employment and are entitled to a deferred benefit.

Year Ending			
June 30	Actives	Retirees	Total
2017	\$ 36,128	\$ 1,735,784	\$ 1,771,912
2018	89,023	1,715,616	1,804,639
2019	141,497	1,703,540	1,845,037
2020	199,409	1,691,724	1,891,133
2021	260,926	1,680,079	1,941,006
2022	323,898	1,668,289	1,992,187
2023	387,780	1,655,638	2,043,418
2024	451,332	1,641,846	2,093,178
2025	515,099	1,626,543	2,141,643
2026	581,481	1,608,810	2,190,291
2027	652,439	1,589,487	2,241,925
2028	729,470	1,567,328	2,296,798
2029	814,342	1,542,707	2,357,049
2030	908,258	1,514,335	2,422,593
2031	1,012,540	1,482,966	2,495,506
2032	1,127,561	1,448,928	2,576,489
2033	1,253,413	1,411,792	2,665,205
2034	1,388,799	1,371,570	2,760,370
2035	1,532,763	1,329,520	2,862,283
2036	1,684,765	1,284,186	2,968,951
2037	1,844,745	1,236,310	3,081,055
2038	2,010,539	1,185,400	3,195,939
2039	2,181,069	1,130,774	3,311,843
2040	2,358,066	1,074,368	3,432,433
2041	2,541,841	1,015,740	3,557,580

Note: Numbers may not add due to rounding

Cash flows are the expected future non-discounted payments to current members. These numbers exclude refund payouts to current nonvested inactive and assume future retirees and future terminated members make benefit elections according to valuation assumptions.



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APPENDIX A

**SUMMARY STATISTICS
ON MEMBERSHIP DATA**



APPENDIX A – MEMBERSHIP DATA

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APPENDIX A – MEMBERSHIP DATA

TABLE 16

RECONCILIATION OF MEMBERS*

	Active Members**	Former Members***	Benefit Recipients****			Total
			Service Retirements	Disability Retirements	Survivors	
Members on 7/1/2015	79,406	44,340	56,589	571	4,826	185,732
New hires	5,457	-	-	-	-	5,457
Return from inactive	1,683	(1,683)	-	-	-	0
Return from zero balance	516	-	-	-	-	516
Transfer to inactive	(4,226)	4,226	-	-	-	0
Refunded	(222)	(949)	-	-	-	(1,171)
Restored write-off	-	151	-	-	-	151
Repay refunds	-	26	-	-	-	26
Transfer from non-status	-	21	-	-	-	21
Retirements	(2,001)	(573)	2,580	(83)	-	(77)
Benefits began	-	-	-	62	527	589
Benefits ended	-	-	-	(5)	(54)	(59)
Deaths	(51)	(43)	(1,249)	(23)	(208)	(1,574)
Adjustments for Disabilitants	34	-	-	-	-	34
Adjustments (Other)	(66)	14	(2)	-	(1)	(55)
Adjustments due to DTRFA merger	-	-	(27)	(1)	1	(27)
Net changes	1,124	1,190	1,302	(50)	265	3,831
Members on 7/1/2016	80,530	45,530	57,891	521	5,091	189,563

* All figures in this chart were provided by the Teachers Retirement Association. Recipient counts include all pensions in force, including double counting of multiple benefit types. Service Retirements include Supplemental and Variable optional joint annuitants. We have found these results to be reasonable.

** Active members include 4 Basic and 80,526 Coordinated members.

*** Former members include 24 Basic and 45,506 Coordinated members.

**** Benefit recipients include 4,064 Basic members and 59,439 Coordinated members.

Former Member Statistics	Vested	Non-vested	Total
Number	13,680	31,850	45,530
Average Age	48.0	45.7	46.4
Average Service (years)	7.5	0.9	2.9
Average annual benefits, with augmentation to Normal Retirement Date and Combined Service Annuity load	\$10,536	N/A	N/A
Average refund value, with Combined Service Annuity load	\$31,526	\$2,424	\$11,168



APPENDIX A – MEMBERSHIP DATA

TABLE 17

DISTRIBUTION OF ACTIVE MEMBERS*

Age	Years of Service as of July 1, 2016										Total	
	<3**	3-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 +		
<25	2,449	57										2,506
Avg. Earnings	28,610	43,335										28,945
25-29	4,545	3,042	1,492	1								9,080
Avg. Earnings	32,508	43,989	48,790	69,102								39,034
30-34	2,370	1,800	5,037	1,393								10,600
Avg. Earnings	32,385	44,912	52,374	62,442								47,960
35-39	1,857	994	2,643	4,748	1,367							11,609
Avg. Earnings	29,484	47,432	53,193	64,978	73,654							56,137
40-44	1,463	680	1,436	2,096	4,398	817						10,890
Avg. Earnings	25,878	46,910	53,400	63,740	73,809	79,048						61,454
45-49	1,254	616	1,291	1,521	2,591	3,638	648					11,559
Avg. Earnings	23,899	43,295	51,681	62,112	72,128	77,723	80,427					63,984
50-54	941	434	960	1,112	1,511	1,965	2,399	626	1			9,949
Avg. Earnings	21,451	43,328	48,340	61,777	69,997	75,760	79,446	81,008	59,409			65,342
55-59	791	287	711	876	1,177	1,225	1,544	1,452	267			8,330
Avg. Earnings	20,456	35,699	45,257	59,547	67,996	74,055	77,632	80,073	81,017			64,739
60-64	620	156	380	408	713	708	686	326	389	82		4,468
Avg. Earnings	12,161	32,790	39,721	56,810	66,553	72,706	77,474	82,319	82,448	76,890		60,031
65-69	378	74	107	125	128	114	96	50	43	75		1,190
Avg. Earnings	6,449	16,939	25,709	57,964	59,040	76,652	81,372	80,627	98,437	89,093		44,320
70 +	188	23	34	15	16	13	17	13	7	23		349
Avg. Earnings	5,929	12,448	14,462	49,457	60,059	91,572	71,023	99,153	71,428	90,597		28,269
Total	16,856	8,163	14,091	12,295	11,901	8,480	5,390	2,467	707	180		80,530
Avg. Earnings	27,563	43,924	50,920	63,088	71,754	76,454	78,801	80,719	82,738	83,726		56,079

* Active members include 4 Basic and 80,526 Coordinated members.

** This exhibit does not reflect service earned in 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 the amount of average annual earnings. Earnings shown in this exhibit are actual salaries earned during the fiscal year ending June 30, 2016 as reported by the Teachers Retirement Association of Minnesota.



APPENDIX A – MEMBERSHIP DATA

TABLE 18
DISTRIBUTION OF SERVICE RETIREMENTS

Age	Years Since Retirement as of July 1, 2016							Total
	<1	1-4	5-9	10-14	15-19	20-24	25 +	
<55	6	1						7
Avg. Benefit	27,772	23,936						27,224
55-59	486	1,135	6					1,627
Avg. Benefit	34,790	31,597	34,544					32,562
60-64	874	4,460	2,484	30			1*	7,849
Avg. Benefit	29,467	31,480	28,337	32,404			1,625	30,261
65-69	614	4,383	6,253	4,416	353	2	4*	16,025
Avg. Benefit	21,560	22,525	25,982	23,958	34,011	23,411	3,008	24,480
70-74	46	610	2,723	4,162	4,860	100	4*	12,505
Avg. Benefit	18,137	18,481	22,066	23,814	25,159	33,267	6,039	23,745
75-79	3	76	367	1,484	4,644	2,134	65	8,773
Avg. Benefit	10,052	18,563	18,454	20,302	28,473	30,937	20,465	27,120
80-84		13	50	165	1,455	3,021	1,084	5,788
Avg. Benefit		13,707	15,608	16,860	29,180	37,350	31,605	33,396
85-89		7	9	37	117	1,061	2,274	3,505
Avg. Benefit		17,001	23,587	19,626	29,744	35,352	34,530	34,398
90 +			2	9	11	76	1,714	1,812
Avg. Benefit			60,528	14,563	19,165	36,264	32,811	32,813
Total	2,029	10,685	11,894	10,303	11,440	6,394	5,146	57,891
Avg. Benefit	28,059	26,953	25,310	23,260	27,330	34,797	33,110	27,485

* Pertaining to the accounts of former participants in the Minnesota Variable Annuity Fund, abolished by law in 1989.

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.



APPENDIX A – MEMBERSHIP DATA

TABLE 19
DISTRIBUTION OF SURVIVORS

Age	Years Since Death as of July 1, 2016							Total
	<1	1-4	5-9	10-14	15-19	20-24	25 +	
<45	15	40	43	18	6	1		123
Avg. Benefit	14,926	20,110	15,296	13,564	12,367	31,354		16,551
45-49	7	40	20	8	8	2		85
Avg. Benefit	17,547	11,468	15,462	15,240	15,095	35,822		14,178
50-54	8	34	20	9	5	1	3	80
Avg. Benefit	16,774	14,035	16,288	12,497	28,077	41,026	28,184	16,445
55-59	15	51	43	18	7	3	2	139
Avg. Benefit	22,428	20,915	15,163	11,981	16,147	3,126	17,315	17,466
60-64	35	96	66	36	12	5	1	251
Avg. Benefit	19,704	23,311	19,215	17,524	17,603	20,749	7,639	20,515
65-69	44	205	150	91	35	17	3	545
Avg. Benefit	22,313	22,783	20,739	20,394	18,116	17,273	9,009	21,236
70-74	75	271	190	129	63	23	13	764
Avg. Benefit	25,055	23,656	22,144	22,800	19,003	22,378	17,091	22,739
75-79	73	251	220	151	90	69	33	887
Avg. Benefit	25,633	26,876	28,269	28,664	27,201	29,231	18,724	27,336
80-84	71	301	222	144	111	73	67	989
Avg. Benefit	35,864	32,559	35,538	32,420	36,404	31,664	29,898	33,630
85-89	47	208	190	135	89	59	92	820
Avg. Benefit	32,721	39,718	35,898	35,350	33,379	35,131	31,731	35,799
90 +	21	78	105	74	51	31	48	408
Avg. Benefit	34,760	35,623	34,231	34,226	31,760	39,799	37,177	34,984
Total	411	1,575	1,269	813	477	284	262	5,091
Avg. Benefit	26,894	27,754	27,624	27,581	28,449	30,635	29,392	27,935

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



APPENDIX A – MEMBERSHIP DATA

TABLE 20

DISTRIBUTION OF DISABILITY RETIREMENTS

Age	Years Disabled as of July 1, 2016							Total
	<1	1-4	5-9	10-14	15-19	20-24	25 +	
<45	1	13	5					19
Avg. Benefit	5,430	11,408	8,025					10,203
45-49	3	18	10	10			1	42
Avg. Benefit	21,072	17,040	9,051	6,062		4,863		12,522
50-54	4	38	15	10	4	1		72
Avg. Benefit	12,802	21,606	16,610	11,280	7,796	2,846		17,614
55-59	4	67	35	13	6	3		128
Avg. Benefit	30,384	23,353	20,593	15,687	11,695	14,337		21,281
60-64	7	75	70	44	21	11	2	230
Avg. Benefit	28,482	29,450	22,831	20,114	15,837	18,426	8,126	23,665
65 +	1	25	4					30
Avg. Benefit	21,061	23,123	15,601					22,052
Total	20	236	139	77	31	16	2	521
Avg. Benefit	23,091	23,846	19,864	16,395	13,997	15,838	8,126	20,761

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



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APPENDIX B

**SUMMARY OF
PLAN PROVISIONS**



APPENDIX B - SUMMARY OF PLAN PROVISIONS

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APPENDIX B - SUMMARY OF PLAN PROVISIONS

BASIC MEMBERS

This summary of provisions reflects our interpretation of applicable Statutes for purposes of preparing this valuation. This interpretation is not intended to provide a basis for administering the Plan.

<i>Plan year</i>	July 1 through June 30		
<i>Eligibility</i>	Teachers first hired prior to July 1, 1978 employed by the Board of Education of Special School District No. 1, other than a charter school, and not covered by the Social Security Act. Certain part-time licensed employees of Special School District No. 1 are also covered. These members were transferred to TRA as part of the merger of the Minneapolis Teachers Retirement Fund Association (MTRFA) effective June 30, 2006.		
<i>Contributions</i>	Shown as a percent of Salary:		
	<u>Member</u>		<u>Employer</u>
	11.00%		15.14%
	After June 30, 2015, the member and employer contribution rates may be adjusted if there is a sufficiency of at least 1.00% or a deficiency of at least 0.50%. The Board has discretion to adjust this rate based on discussion with the actuary and consideration of various metrics. The resulting rate may not go below the normal cost plus administrative expenses.		
	Potential contribution increases after June 30, 2016 are not reflected in this valuation report.		
	Employee contributions are "picked up" according to the provisions of Internal Revenue Code 414(h).		
<i>Teaching service</i>	A year is earned during a calendar year if the member is employed in a covered position and employee contributions are deducted. Certain part-time service and military service is also included.		



APPENDIX B - SUMMARY OF PLAN PROVISIONS

BASIC MEMBERS

Salary Periodic compensation used for contribution purposes excluding lump sum annual or sick leave payments, severance payments, any payments made in lieu of employer paid fringe benefits or expenses, and employer contributions to a Section 457 deferred compensation plan.

Average salary Average of the five highest successive years of Salary.

Retirement

Normal retirement

Age/Service requirements Age 60, or any age with 30 years of Teaching Service

Amount 2.50% of Average Salary for each year of Teaching Service.

Early retirement

Age/Service requirements Age 55 with less than 30 years of Teaching Service.

Amount

The greater of (a) or (b):

- (a) 2.25% of Average Salary for each year of Teaching Service with reduction of 0.25% for each month before the Member would first be eligible for a normal retirement benefit.
- (b) 2.50% of Average Salary for each year of Teaching Service assuming augmentation to the age of first eligibility for a normal retirement benefit at 3.00% per year and actuarial reduction for each month before the member would be first eligible for a normal retirement benefit.

An alternative benefit is available to members who are at least age 50 and have seven years of Teaching Service. The benefit is based on the accumulation of the 6.50% "city deposits" to the Retirement Fund. Other benefits are also provided under this alternative depending on the member's age and Teaching Service.

Form of payment

Life annuity. Actuarially equivalent options are:

- (a) 10 or 15 year Certain and Life
- (b) 50%, 75% or 100% Joint and Survivor with bounce back feature (option is canceled if member is predeceased by beneficiary).

Benefit increases

Under current law, the annual post-retirement increase on January 1 is 2.0 percent. When the funded ratio reaches 90 percent (on a market value of assets basis) for two consecutive years, the annual increase will rise to 2.5 percent. A benefit recipient who has been receiving a benefit for at least 12 full months as of the June 30 preceding the increase date will receive a full increase. Members receiving benefits for at least one full month but less than 12 full months as of the June 30 preceding the increase date will receive a prorated increase.



APPENDIX B - SUMMARY OF PLAN PROVISIONS

BASIC MEMBERS

Disability

<i>Age/service requirement</i>	Total and permanent disability with three years of Teaching Service
<i>Amount</i>	An annuity actuarially equivalent to the continued accumulation of member and city contributions at the current rate for a period of 15 years (but not beyond age 65) plus an additional benefit equal to the smaller of 100% of the annuity provided by city contributions only or \$150 per month. A member with 20 years of Teaching Service also receives an additional \$7.50 per month. Payments stop earlier if disability ceases or death occurs. Benefits may be reduced on resumption of partial employment.
<i>Form of payment</i>	Same as for retirement.
<i>Benefit increases</i>	Same as for retirement.

Death

Benefit A

<i>Age/Service requirements</i>	Choice of Benefit A, Benefit B or Benefit C Death before retirement.
<i>Amount</i>	The accumulation of member and city contributions plus 6.00% interest. Paid as a life annuity, 15-year Certain and Life, or lump sum. If an annuity is chosen the beneficiary also receives additional benefits.

Benefit B

<i>Age/Service requirements</i>	An active member with seven years of Teaching Service. A former member age 60 with seven years of Teaching Service who dies before retirement or disability benefits begin.
<i>Amount</i>	The actuarial equivalent of any benefits the member could have received if resignation occurred on the date of death.

Benefit C

<i>Age/Service requirements</i>	As an active member who dies and leaves surviving children.
<i>Amount</i>	A monthly benefit of \$248.30 to the surviving widow while caring for a child and an additional \$248.30 per month for each surviving dependent child. The maximum family benefit is \$579.30 per month. Benefits to the widow cease upon death or when no longer caring for an eligible child. Benefits for dependent children cease upon marriage or age 18 (age 22 if a full time student).
<i>Benefit Increases</i>	Same as for retirement.



APPENDIX B - SUMMARY OF PLAN PROVISIONS

BASIC MEMBERS

Withdrawal

Refund of contribution

Age/Service requirements

Termination of Teaching Service.

Amount

Member's contributions earn 4.00% interest compounded annually. For vested members, a deferred annuity may be elected in lieu of a refund.

Deferred annuity

Age/Service Requirements

Seven years of Teaching Service

Amount

The benefit is computed under law in effect at termination and increased by the following percentage compounded annually:

- (a) 3.00% therefore until the earlier of January 1 of the year following attainment of age 55 and June 30, 2012;
- (b) 5.00% thereafter until the earlier of June 30, 2012 and when the annuity begins; and
- (c) 2.00% beginning July 1, 2012.

In addition, the interest earned on the member and city contributions between termination and age 60 can be applied to provide an additional annuity.



APPENDIX B - SUMMARY OF PLAN PROVISIONS

COORDINATED MEMBERS

This summary of provisions reflects our interpretation of applicable Statutes for purposes of preparing this valuation. This interpretation is not intended to provide a basis for administering the Plan.

Plan year

July 1 through June 30

Eligibility

A public school or MNSCU teacher who is covered by the Social Security Act, except for teachers employed by St. Paul public schools or by the University of Minnesota. Charter school teachers employed statewide are covered by TRA.

No MNSCU teacher will become a new Member unless that person elects coverage as defined by Minnesota Statutes under Chapter 354B.

Contributions

Shown as a percent of Salary:

<u>Member</u>	<u>Employer</u>
7.50%	7.50%

Employer also contributes Supplemental amount equal to 3.64% of Salary (members employed by Special School District #1 only).

After June 30, 2015, the member and employer contribution rates may be adjusted if there is a sufficiency of at least 1.00% or a deficiency of at least 0.50%. The Board has discretion to adjust this rate based on discussion with the actuary and consideration of various metrics. The resulting rate may not go below the normal cost plus administrative expenses.

Potential contribution increases after June 30, 2016 are not reflected in this valuation report.

Employee contributions are "picked up" according to the provisions of Internal Revenue Code 414(h).

Teaching service

A year is earned during a calendar year if the member is employed in a covered position and employee contributions are deducted. Certain part-time service and military service is also included.



APPENDIX B - SUMMARY OF PLAN PROVISIONS

COORDINATED MEMBERS

Salary

Periodic compensation used for contribution purposes excluding lump sum annual or sick leave payments, severance payments, any payments made in lieu of employer paid fringe benefits or expenses, and employer contributions to a Section 457 deferred compensation plan.

Average salary

Average of the five highest successive years of Salary. Average salary is based on all Allowable Service if less than five years.

Retirement

Normal retirement

Age/Service requirements

First hired before July 1, 1989:

- (a) Age 65 and three years of Allowable Service; or
- (b) Age 62 and 30 years of Allowable Service.

Proportionate Retirement Annuity is available at age 65 and one year of Allowable Service.

First hired after June 30, 1989:

The age when first eligible for full Social Security retirement benefits (but not to exceed age 66) and three years of Allowable Service.

Proportionate Retirement Annuity is available at normal retirement age and one year of Allowable Service.

Early retirement

Age/Service requirements

First hired before July 1, 1989:

- (a) Age 55 and three years of Allowable Service; or
- (b) Any age and 30 years of Allowable Service; or
- (c) Rule of 90: Age plus Allowable Service totals 90.

First hired after June 30, 1989:

- (a) Age 55 with three years of Allowable Service.



APPENDIX B - SUMMARY OF PLAN PROVISIONS

COORDINATED MEMBERS

Retirement(continued)

Amount

First hired before July 1, 1989:

The greater of (a), (b) or (c):

- (a) 1.20% of Average Salary for each of the first ten years of Allowable Service.
1.70% of Average Salary for each year of Allowable Service in excess of 10 prior to July 1, 2006, and
1.90% of Average Salary for years of Allowable Service after July 1, 2006.
No actuarial reduction if age plus years of service totals 90. Otherwise reduction of 0.25% for each month the member is under age 65 (or 62 if 30 years of Allowable Service) at time of retirement.
- (b) 1.70% of Average Salary for each year of Allowable Service prior to July 1, 2006 and 1.90% for each year of Allowable Service beginning July 1, 2006, assuming augmentation to normal retirement age at 3.00% per year (2.50% per year for members hired after June 30, 2006) and actuarial reduction for each month the member is under the full Social Security benefit retirement age (not to exceed age 66). Beginning July 1, 2015, new early retirement reduction factors will apply, including special factors for members retiring at age 62 or later with at least 30 years of service.
- (c) For eligible members: the monthly benefit that is actuarially equivalent to 2.2 times the members' accumulated deductions plus interest thereon.

First hired after June 30, 1989:

1.70% of Average Salary for each year of Allowable Service prior to July 1, 2006 and 1.90% for each year of Allowable Service beginning July 1, 2006, assuming augmentation to normal retirement age at 3.00% per year (2.50% per year for members hired after June 30, 2006) and actuarial reduction for each month the member is under the full Social Security benefit retirement age (not to exceed age 66). Beginning July 1, 2015, new early retirement reduction factors will apply, including special factors for members retiring at age 62 or later with at least 30 years of service.



APPENDIX B - SUMMARY OF PLAN PROVISIONS

Early Retirement Reduction Factors

Age	Hired before 7/1/89	Hired from 7/1/89 to 6/30/06	Hired after 6/30/06
55	43.56%	51.55%	54.08%
58	33.59%	40.46%	42.74%
60	24.65%	30.75%	32.74%
62	13.68%	18.96%	20.53%
65	0.00%	4.21%	4.68%
66	0.00%	0.00%	0.00%

Members who are age 62 with 30 years of service are eligible for a special set of reduction factors:

Age	Hired before 7/1/89	Hired from 7/1/89 to 6/30/06	Hired after 6/30/06
62	10.40%	14.46%	16.11%
63	6.64%	10.40%	11.70%
64	3.18%	6.64%	7.55%
65	0.00%	3.18%	3.65%
66	0.00%	0.00%	0.00%

All of the early retirement reduction factors shown are the ultimate factors. These are being phased in from the prior factors over a five-year period beginning July 1, 2015.

Form of Payment

Life annuity. Actuarially equivalent options are:

- (a) 50%, 75% or 100% Joint and Survivor with bounce back feature (option is canceled if member is predeceased by beneficiary).
- (b) 15 year Certain and Life
- (c) Guaranteed Refund.



APPENDIX B - SUMMARY OF PLAN PROVISIONS

COORDINATED MEMBERS

Retirement(continued)

Benefit increases

Under current law, the annual post-retirement increase on January 1 is 2.0 percent. When the funded ratio reaches 90 percent (on a market value of assets basis) for two consecutive years, the annual increase will rise to 2.5 percent. A benefit recipient who has been receiving a benefit for at least 12 full months as of the June 30 preceding the increase date will receive a full increase. Members receiving benefits for at least one full month but less than 12 full months as of the June 30 preceding the increase date will receive a prorated increase.

Disability

Age/service requirement

Total and permanent disability before Normal Retirement Age with three years of Allowable Service.

Amount

Normal Retirement Benefit based on Allowable Service and Average Salary at disability without reduction for commencement before Normal Retirement Age unless an optional annuity plan is selected.

Payments stop at Normal Retirement Age or the five 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 reduced on resumption of partial employment.

Form of payment

Same as for retirement.

Benefit increases

Same as for retirement.

Retirement after disability

Age/service requirement

Normal Retirement Age or the five year anniversary of the effective date of the disability benefit, whichever is later.

Amount

Any optional annuity continues. Otherwise, the larger of the disability benefit paid before Normal Retirement Age or the normal retirement benefit available at Normal Retirement Age, or an actuarially equivalent optional annuity.

Benefit increases

Same as for retirement.



APPENDIX B - SUMMARY OF PLAN PROVISIONS

COORDINATED MEMBERS

Death

Surviving spouse optional annuity

Age/Service requirements

Member or former member with three years of Allowable Service who dies before retirement or disability benefits commence.

Amount

Survivor's payment of the 100% Joint and Survivor benefit or an actuarial equivalent term certain annuity. If commencement is prior to age 65 (age 62 if 30 years of service), the benefit is reduced for early retirement with half the applicable reduction factor used from age 55 to actual commencement age. If no surviving spouse, then an actuarial equivalent dependent child benefit is paid to age 20 or for five years if longer.

Benefit increase

Same as for retirement.

Withdrawal

Refund of contributions

Age/Service requirements

Thirty days following termination of teaching service.

Amount

Member's contributions earn 4.00% interest compounded annually. For vested members, a deferred annuity may be elected in lieu of a refund.

Deferred annuity

Age/Service requirements

Vested at date of termination. Current requirement is three years of Allowable Service.



APPENDIX B - SUMMARY OF PLAN PROVISIONS

COORDINATED MEMBERS

Withdrawal (continued)

Amount

For members first hired prior to July 1, 2006, the benefit is computed under law in effect at termination and increased by the following percentage compounded annually:

- (a) 3.00% therefore until the earlier of January 1 of the year following attainment of age 55 and June 30, 2012;
- (b) 5.00% thereafter until the earlier of June 30, 2012 and when the annuity begins; and
- (c) 2.00% from July 1, 2012 forward.

Amount is payable as a normal or early retirement.

A member who terminated service before July 1, 1997 whose benefit does not commence until after June 30, 1997 shall receive an actuarially equivalent increase to reflect the change from 5.00% to 6.00% in the post-retirement interest assumption; or

For eligible members; the monthly benefit that is actuarially equivalent to 2.2 times the members' accumulated deductions plus interest thereon.

For members first hired July 1, 2006 and after, the benefit computed under law in effect at termination is increased by 2.50% compounded annually until June 30, 2012 and increased by 2.00% from July 1, 2012 forward until the annuity begins.



APPENDIX B - SUMMARY OF PLAN PROVISIONS

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APPENDIX C

**ACTUARIAL METHODS
AND ASSUMPTIONS**



APPENDIX C – ACTUARIAL METHODS AND ASSUMPTIONS

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APPENDIX C – ACTUARIAL METHODS AND ASSUMPTIONS

Actuarial Cost Method

Liabilities and contributions in this report are computed using the Individual Entry Age Normal Cost Method. This method is prescribed by Minnesota Statutes.

The objective under this method is to fund each member's benefits under the Plan as payments which are level as a percentage of salary, starting at original participation date (or employment date), and continuing until the assumed date of retirement termination, disability or death. For valuation purposes, entry age for each member is determined as the age at valuation minus years of service as of the valuation date.

At any given date, a liability is calculated equal to the contributions which would have been accumulated if this method of funding had always been used, the current plan provisions had always been in place, and all assumptions had been met. The difference between this liability and the assets (if any) which are held in the fund is the unfunded actuarial accrued liability. The unfunded actuarial accrued liability is typically funded over a chosen period in accordance with the amortization schedule.

A detailed description of the calculation follows: The normal cost for each active member under the assumed retirement age is determined by applying to earnings the level percentage of salary which, if contributed each year from date of entry into the Plan until the assumed retirement (termination, disability or death) date, is sufficient to provide the full value of the benefits expected to be payable.

- The present value of future normal costs is the total of the discounted values of all active members' normal cost, assuming these to be paid in each case from the valuation date until retirement (termination, disability or death) date.
- The present value of projected benefits is calculated as the value of all benefit payments expected to be paid to the Plan's current members, including active and retired members, beneficiaries, and terminated members with vested rights.
- The actuarial accrued liability is the excess of the present value of projected benefits over the present value of future normal costs.
- The unfunded actuarial accrued liability is the excess of the actuarial accrued liability over the assets of the fund, and represents that part of the actuarial accrued liability which has not been funded by accumulated past contributions.

Amortization Method

The unfunded actuarial accrued liability is amortized as a level percentage of payroll each year to the statutory amortization date of June 30, 2039, assuming payroll increases of 3.50% per year (effective with the 2016 valuation). If the unfunded actuarial accrued liability is negative, the surplus amount is amortized over 30 years as a level percentage of payroll. If there is an increase in the unfunded actuarial accrued liability due to a change in the actuarial assumptions, plan provisions, or actuarial cost method, a new amortization period is determined. This new amortization period is determined by blending the period needed to amortize the prior unfunded actuarial accrued liability over the prior amortization period and the increase in unfunded actuarial accrued liability amortized over 30 years. If there is a decrease in the unfunded actuarial accrued liability, no change is made to the amortization period.



APPENDIX C – ACTUARIAL METHODS AND ASSUMPTIONS

Asset Valuation Method

As prescribed in the Minnesota Statutes Section 356.215, Subdivision 1, Paragraph (f), 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;
- The asset value is the sum of the market value plus the scheduled recognition of investment gains or (losses) during the current and the preceding four fiscal years.

Supplemental Contributions

The City of Minneapolis, the Minneapolis School District, and the State of Minnesota are scheduled to make the following supplemental contributions to the Fund in FY15:

<i>1993 Legislation:</i>	Supplemental contributions of \$5,000,000 annually are assumed to be made until full actuarial funding is achieved. Amount is fixed in statute.
<i>1996 Legislation:</i>	Supplemental contributions of \$3,256,410 annually are assumed to be made until the amortization date of June 30, 2039 or full actuarial funding is achieved, whichever is earlier. Amount is variable as described in Minnesota Statutes, Chapter 423A.02. Assumed amount is based on actual amount received in most recent fiscal year, and information provided by the Teachers Retirement Association.
<i>1997 Legislation:</i>	Supplemental contributions of \$12,954,000 annually are assumed to be made until full actuarial funding is achieved or the stabilizer may be used to decrease contribution rates. Amount is fixed in statute.
<i>2014 Legislation:</i>	Supplemental contributions of \$14,377,000 annually are assumed to be made until full actuarial funding is achieved or the stabilizer may be used to decrease contribution rates. Amount is fixed in statute.



APPENDIX C – ACTUARIAL METHODS AND ASSUMPTIONS

Entry Age Calculation

As required by the LCPR Standards for Actuarial Work, a member's Entry Age is calculated as the age at the valuation date less years of service. Age on the valuation date is calculated as age nearest birthday. The years of service for each member are provided by TRA.

Decrement Timing

All decrements are assumed to occur in the middle of the plan year. This is the preferred decrement timing in the LCPR Standards for Actuarial Work.

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.

Benefits included or excluded

To the best of our knowledge, all material benefits have been included in the liability.

IRC Section 415(b): The limitations of Internal Revenue Code Section 415(b) have been incorporated into our calculations. Annual benefits may not exceed the limits in IRC Section 415. This limit is indexed annually. For 2016, the limit is \$210,000.

IRC Section 401(a)(17): The limitations of Internal Revenue Code Section 401(a)(17) have been incorporated into our calculations. Compensation for any 12-month period used to determine accrued benefits may not exceed the limits in IRC Section 401(a)(17) for the calendar year in which the 12-month period begins. This limit is indexed annually. For 2016, the limit is \$265,000. Certain members first hired before July 1, 1995 may have a higher limit.



APPENDIX C – ACTUARIAL METHODS AND ASSUMPTIONS

Summary of Actuarial Assumptions

The following assumptions were used in valuing the liabilities and benefits under the plan. All assumptions are prescribed by Statutes, the LCPR, or the Board of Trustees. The assumptions prescribed are based on the experience study dated June 10, 2015.

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

<i>Investment Return</i>	8.47% compounded annually to reflect an 8.00% assumption for one (1) year and 8.50% thereafter.
<i>Future post-retirement adjustments</i>	2.00% per year. Once the funded ratio reaches 90% on a market value basis for two consecutive years, the COLA is scheduled by statute to revert back from 2.00% to 2.50%. Future assets and liabilities were projected using the 2016 valuation results as a starting point and assuming all actuarial assumptions are met in future years. These assumptions include a rate of return on the market value of assets of 8.0% for the next year and 8.5% thereafter. Further, there is an assumption that the stabilizer provisions will not be utilized by the Board. Based on this methodology, as of July 1, 2016, the increased COLA is not expected to be implemented during the next 40 years, and so we assume it will not occur. For the July 1, 2015 valuation, the COLA was expected to increase with the July 1, 2037 valuation.
<i>Salary Increases</i>	Reported salary for prior fiscal year, with new hires annualized, is increased according to the salary increase table shown in the rate table for current fiscal year and annually for each future year. See table of sample rates.
<i>Payroll Growth</i>	3.50% per year
<i>Future Service</i>	Members are assumed to earn future service at a full-time rate.
<i>Mortality: Pre-retirement</i>	RP 2014 white collar employee table, male rates set back 6 years and female rates set back 5 years. Generational projection uses the MP-2015 scale.
<i>Post-retirement</i>	RP 2014 white collar annuitant table, male rates set back 3 years and female rates set back 3 years, with further adjustments of the rates. Generational projection uses the MP-2015 scale.
<i>Post-disability</i>	RP 2014 disabled retiree mortality, without adjustment
<i>Disability</i>	Age-related rates based on experience; see table of sample rates.



APPENDIX C – ACTUARIAL METHODS AND ASSUMPTIONS

Summary of Actuarial Assumptions *(continued)*

<i>Withdrawal</i>	Rates vary by service based on actual plan experience, as shown in the rate table.
<i>Expenses</i>	Prior year administrative expenses expressed as percentage of prior year payroll.
<i>Retirement Age</i>	Graded rates beginning at age 55 as shown in rate table. Members who have attained the highest assumed retirement age will retire in one year.
<i>Percentage Married</i>	85% of male members and 65% of female members are assumed to be married. Members are assumed to have no children.
<i>Age Difference</i>	Females two years younger than males.
<i>Allowance for Combined Service Annuity</i>	Liabilities for active members are increased by 1.40% and liabilities for former members are increased by 4.00% to account for the effect of some Participants being eligible for a Combined Service Annuity.
<i>Refund of Contributions</i>	All employees withdrawing after becoming eligible for a deferred benefit are assumed to take the larger of their contributions accumulated with interest or the value of their deferred benefit.
<i>Interest on member contributions</i>	Members and former members who are eligible for the money purchase annuity are assumed to receive interest credits equal to the Pre-Retirement interest rate. All other members and former members receive the interest crediting rate as specified in statutes.
<i>Commencement of deferred benefits</i>	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at unreduced retirement age.
<i>Form of payment</i>	Members are assumed to elect subsidized joint and survivor form of annuity as follows: Males: 10.0% elect 50% J&S option 10.0% elect 75% J&S option 60.0% elect 100% J&S option 20.0% elect Straight Life option Females: 13.5% elect 50% J&S option 6.5% elect 75% J&S option 35.0% elect 100% J&S option 45.0% elect Straight Life option Members eligible for deferred annuities (including current terminated deferred members) and future disability benefits are assumed to elect a life annuity.



APPENDIX C – ACTUARIAL METHODS AND ASSUMPTIONS

Summary of Actuarial Assumptions *(continued)*

Missing data for members

Membership data was supplied by TRA as of the valuation date. This information has not been audited by CMC. We have reviewed the information for internal consistency and we have no reason to doubt its substantial accuracy. In the small number of cases where submitted data was missing or incomplete and could not be recovered from prior years, the following assumptions were applied, if needed:

Data for active members:

Salary, Service, and Date of Birth	Based on current active demographics.
Gender	Female

Data for terminated members:

Date of birth	July 1, 1970
Average salary	\$38,000
Date of termination	Derived from date of birth, original entry age, and service

Data for in-pay members:

Beneficiary date of birth	Wife two years younger than husband
Gender	Based on first name
Form of payment	Life annuity for retirees and beneficiaries, 100% J&S option for disabled retirees.

Termination Rates

Service	Males	Females
Less than 1	32.00%	29.00%
1	15.00%	13.00%
2	11.00%	11.00%
3	8.50%	9.00%
4	6.25%	7.00%
5	5.25%	5.50%
6	4.60%	4.00%
7	4.10%	3.50%
8	2.80%	3.00%
9	2.30%	2.50%
10	2.00%	2.10%
15	1.10%	1.10%
20	0.60%	0.60%
25 or more	0.50%	0.50%



APPENDIX C – ACTUARIAL METHODS AND ASSUMPTIONS

Age	Rate (%)			
	Pre-retirement Mortality*		Disability	
	Male	Female	Male	Female
20	0.023	0.013	0.00	0.00
25	0.026	0.014	0.00	0.00
30	0.036	0.014	0.00	0.00
35	0.031	0.018	0.01	0.01
40	0.035	0.024	0.03	0.03
45	0.041	0.033	0.05	0.05
50	0.061	0.055	0.10	0.10
55	0.105	0.092	0.16	0.16
60	0.175	0.140	0.25	0.25
65	0.292	0.204	0.00	0.00

*Rates shown are for 2014, the base year of the tables.

Age	Annuitant Mortality Rates (%)			
	Retirement *		Disability	
	Male	Female	Male	Female
55	0.267	0.196	2.337	1.448
60	0.353	0.267	2.660	1.700
65	0.486	0.430	3.169	2.086
70	0.945	0.706	4.035	2.820
75	2.015	1.352	5.429	4.105
80	4.126	2.682	7.662	6.104
85	7.358	5.456	11.330	9.042
90	13.560	9.947	17.301	13.265
95	24.351	18.062	24.717	19.588
100	38.292	29.731	32.672	27.819

* Rates shown are for 2014, the base year of the tables.



APPENDIX C – ACTUARIAL METHODS AND ASSUMPTIONS

Summary of Actuarial Assumptions *(continued)*

Salary Scale	
Service	Salary Increase
1	9.50%
2	7.75%
3	7.25%
4	7.00%
5	7.00%
6	6.85%
7	6.70%
8	6.55%
9	6.40%
10	6.25%
11	6.00%
12	5.75%
13	5.50%
14	5.25%
15	5.00%
16	4.75%
17	4.50%
18	4.30%
19	4.20%
20	4.10%
21	4.00%
22	3.90%
23	3.80%
24	3.70%
25	3.60%
26 or more	3.50%



APPENDIX C – ACTUARIAL METHODS AND ASSUMPTIONS

<u>Age</u>	Retirement Rate (%)					
	Coordinated Members				Basic Members	
	Tier 1	Tier 1	Tier 2	Tier 2	Eligible for	Not Eligible for
	Early	Unreduced	Early	Unreduced	30 and Out	30 and Out
					Provision	Provision
55	5	35	5		40	5
56	10	35	5		40	5
57	10	35	5		40	5
58	10	35	5		40	5
59	14	35	5		40	5
60	17	35	6		25	25
61	20	35	15		25	25
62	25	35	15		25	25
63	25	35	15		25	25
64	25	35	20		25	25
65		40	30		40	40
66		35		35	40	40
67		30		30	40	40
68		30		25	40	40
69		30		25	40	40
70		35		35	60	60
71-74		100		100	60	60
75-79		100		100	60	100
80 & Over		100		100	100	100

Coordinated Tier 2 Members age 62 or older with 30 or more years of service have 5% added to their early retirement rates.

Changes in actuarial assumptions and methods since the previous valuation

Mortality, retirement, termination and optional forms of payment assumptions were updated. In addition, price inflation was lowered to 2.75%, general wage growth and payroll growth were lowered to 3.50% and total salary increases were changed.



GLOSSARY

Actuarial Asset Value. The value of assets used in calculating the required contributions. The actuarial asset value may be equal to the fair market value of assets, or it may spread the recognition of certain investment gains or losses over a period of years in accordance with an asset valuation method. The goal of an asset valuation method is to produce a relatively stable asset value thereby reducing year-to-year volatility in contribution requirements.

Actuarial Accrued Liability. The portion of the present value of all benefits attributable to service already rendered.

Actuarial Cost Method. Sometimes called "funding method," a particular technique used by actuaries to establish the amount and incidence of the annual actuarial cost of pension plan benefits, or normal cost, and the related unfunded actuarial accrued liability. Ordinarily, the annual contribution to the plan comprises the normal cost and an amount for amortization of the unfunded actuarial accrued liability.

ASA. Associate of the Society of Actuaries.

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

EA. Enrolled Actuary.

FSA. Fellow of the Society of Actuaries.

MAAA. Member of the American Academy of Actuaries.

Normal Cost. The annual cost assigned to the current year, under the actuarial cost method in use.

Present Value. Sometimes called "actuarial present value," the current worth (on the valuation date) of an amount or series of amounts payable or receivable in the future. The present value is determined by discounting the future payments at a predetermined rate of interest, taking into account the probability of payment.

Statement No. 67 of the Governmental Accounting Standards Board (GASB 67). The accounting standard governing the financial reporting for defined benefit pension plans and note disclosures for defined benefit plans.

Statement No. 68 of the Governmental Accounting Standards Board (GASB 68). The accounting standard governing a state or local governmental employer's accounting for pensions.