



Cavanaugh Macdonald
CONSULTING, LLC

The experience and dedication you deserve



Teachers Retirement Association of Minnesota

**Actuarial Valuation Report
For Funding Purposes
As of July 1, 2020**



This page is intentionally left blank



Cavanaugh Macdonald

CONSULTING, LLC

The experience and dedication you deserve

December 1, 2020

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, 2020. The major findings of the actuarial valuation are contained in this report, which reflects the benefit provisions in place on July 1, 2020.

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 and others identified in this report, are prescribed by Minnesota Statutes Section 356.215, the Legislative Commission on Pensions and Retirement (LCPR), and the Board of Trustees. Collectively, 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. An experience study was performed in 2019, with only a few minor changes recommended. The proposed assumption changes had not been approved by the LCPR when the 2019 actuarial valuation was performed but have since been approved and are reflected in the current valuation.

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.



We note that as we prepare this report, the world is in the midst of a pandemic. We have considered available information, but do not believe there is sufficient data yet to warrant the modification of any of our assumptions. We will continue to monitor the situation and advise the Board in the future of any adjustment we believe would be appropriate.

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 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 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. Risk Assessment	
• Overview	35
• Investment Risk	36
• Sensitivity Measures	37
• Mortality Risk	37
• Contribution Risk	38
• Covered Payroll Risk	39
VI. Additional Information	
• Summary of Membership Data	44
• Schedule of Funding Progress	45
• Schedule of Contributions from the Employer and Other Contributing Entities	46
• Projected Benefit Payments	47
 <u>Appendices</u>	
A. Membership Data	
• Reconciliation of Members	51
• Distribution of Active Members	52
• Distribution of Service Retirements	53
• Distribution of Survivors	56
• Distribution of Disability Retirements	59
B. Summary of Plan Provisions	61
C. Actuarial Methods and Assumptions	
• Actuarial Cost Method	77
• Amortization Method	77
• Asset Valuation Method	78
• Supplemental Contributions	78
• Summary of Actuarial Assumptions	80
Glossary	87



This page is intentionally left blank



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 certain college faculty. This report presents the results of the July 1, 2020 actuarial funding valuation of the System. The primary purposes of performing the actuarial funding valuation are to:

- disclose asset and liability measures as of the valuation date;
- 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 actuarial experience of the System since the last valuation date;
- assess and disclose the key risks associated with funding the System; and
- analyze and report on trends in System contributions, assets, and liabilities over the past several years.

There have been no changes to the plan provisions or actuarial methods since the last valuation. However, there have been a few minor changes to the actuarial assumptions. An experience study, based on the four-year period from July 1, 2014 through June 30, 2018, was completed in June 2019. The recommended assumption changes were adopted by the TRA Board and approved by the Legislative Commission on Pensions and Retirement. The changes include:

- Mortality tables used for active members have been adjusted to reflect higher rates of death for males and lower rates for females, to better match actual experience.
- Termination rates in the first five years of employment have been adjusted to better reflect observed experience.
- The probability that new female retirees will elect to receive their benefit as a 100% joint and survivor annuity has been refined to more closely reflect recent experience.

The adoption of this new set of assumptions resulted in a \$6.7 million decrease in the unfunded actuarial accrued liability, an increase of 0.03% in the normal cost rate. The increase in the total Required Contribution Rate was 0.03%.

The July 1, 2020 valuation also reflects a change in the method for determining which benefit formula should be applied to each active participant. Historically, the member's hire date, as provided by the System, was used to determine the appropriate benefit formula. In recent years, TRA staff has developed a reliable indicator that identifies these members more accurately. After discussions with the TRA staff we believe using the tier codes provided in the data is now a better approach. As a result, about 3,800 active members previously valued as if they were hired on or after July 1, 1989 are now valued as if they were hired prior to July 1, 1989. With this data adjustment, the actuarial accrued liability as of July 1, 2020 increased by about \$216 million and the total required contribution rate increased by 0.34%.

The actuarial valuation results provide a “snapshot” view of the System's financial condition on July 1, 2020. The results reflect net unfavorable experience for the past plan year as demonstrated by an UAAL that was higher than expected. The UAAL on July 1, 2020 is \$7.192 billion as compared to an expected UAAL of \$6.910. The unfavorable experience of \$282 million was the combined result of an experience loss of \$121 million on the actuarial value of assets and an experience loss of \$161 million on the System liabilities.

A summary of the key valuation results from the July 1, 2020 actuarial valuation, compared to the July 1, 2019 valuation, is shown in the following table. Further detail on the valuation results can be found in the following sections of this Executive Summary.



SECTION 1 – EXECUTIVE SUMMARY

	July 1, 2020	July 1, 2019
Total Required Contribution Rate (Chapter 356)	17.65%	17.18%
Employer Contributions	8.32%	8.11%
Employee Contributions	7.50%	7.50%
Direct Aids (Chapters 354 and 423A)	<u>0.64%</u>	<u>0.66%</u>
Sufficiency/(Deficiency)	(1.19%)	(0.91%)
Unfunded Actuarial Accrued Liability (\$M)	\$7,192	\$6,779
Funded Ratio (Actuarial Assets)	76.13%	76.82%

The contribution deficiency increased from 0.91% of payroll in last year’s valuation to 1.19% of payroll in the 2020 valuation despite the scheduled increase in the employer contribution rate. The increase in the deficiency was primarily the result of unfavorable experience on the Plan’s assets and liabilities during the year ended June 30, 2020.

EXPERIENCE FOR THE LAST PLAN YEAR

Numerous factors contributed to the change in the System’s assets, liabilities and Required Contribution Rate (actuarial contribution rate) between July 1, 2019 and July 1, 2020. The components are examined in the following discussion.

ASSETS

As of June 30, 2020, TRA had net assets of \$22.7 billion, as measured on a market value basis. This was a decrease of approximately \$131 million from the prior year.

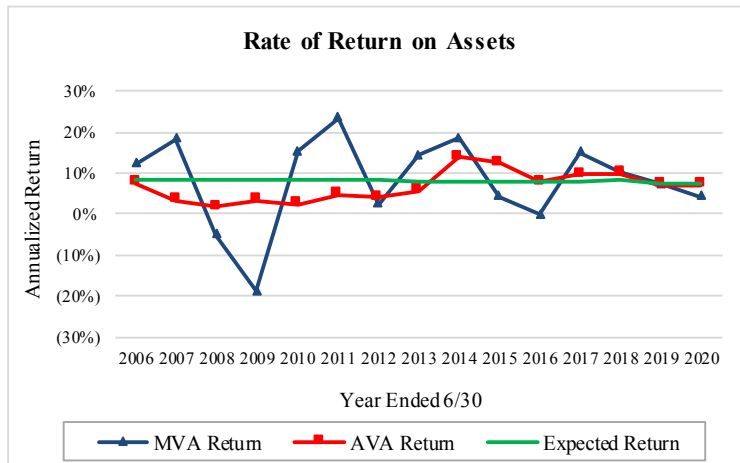
The market value of assets is not used directly in the calculation of the unfunded actuarial accrued liability and the Required Contribution Rate. An asset valuation method, which smoothes the effect of market fluctuations, is used to determine the value of assets used in the valuation, called the “actuarial value of assets”. In this year’s valuation, the actuarial value of assets as of June 30, 2020 was \$22.9 billion, an increase of approximately \$470 million 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, 2019	\$22,467	\$22,872
- Employer and Member Contributions and State Aid	857	857
- Benefit Payments and Administrative Expenses	(1,930)	(1,930)
- Investment Income	<u>1,543</u>	<u>942</u>
Net Assets, June 30, 2020	\$22,937	\$22,741
Rate of Return	7.0%	4.2%



SECTION 1 – EXECUTIVE SUMMARY

The Minnesota State Board of Investment (SBI) reported a rate of return of 4.2% on the market value of assets for fiscal year 2020. Due to the application of the asset smoothing method, including the scheduled recognition of the deferred investment experience from prior years, the rate of return on the actuarial value of assets was 7.0%. Because this rate of return was lower than the assumed rate of return of 7.5%, an actuarial loss of \$121 million occurred. 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 the difference in the actual and expected investment returns 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.

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 as of July 1, 2020 is shown in the following table:

	Actuarial Value of Assets	Market Value of Assets
<i>(\$Millions)</i>		
Actuarial Accrued Liability	\$30,129	\$30,129
Value of Assets	22,937	22,741
Unfunded Actuarial Accrued Liability*	7,192	7,388
Funded Ratio	76.13%	75.48%

*Numbers may not add due to rounding

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



SECTION 1 – EXECUTIVE SUMMARY

Changes in the UAAL occur for various reasons. The net increase in the UAAL from July 1, 2019 to July 1, 2020 was \$413 million. The components of this net change are shown in the following table (in millions):

Unfunded Actuarial Accrued Liability, July 1, 2019 (\$M)		\$6,779
• Expected increase from amortization method	\$78	
• Expected increase from contributions below Required Rate	50	
• Investment experience on actuarial assets	121	
• Liability experience	(55)	
• Assumption changes	(7)	
• Data refinement	216	
• Other experience	10	
• Total		413
Unfunded Actuarial Accrued Liability, July 1, 2020		\$7,192

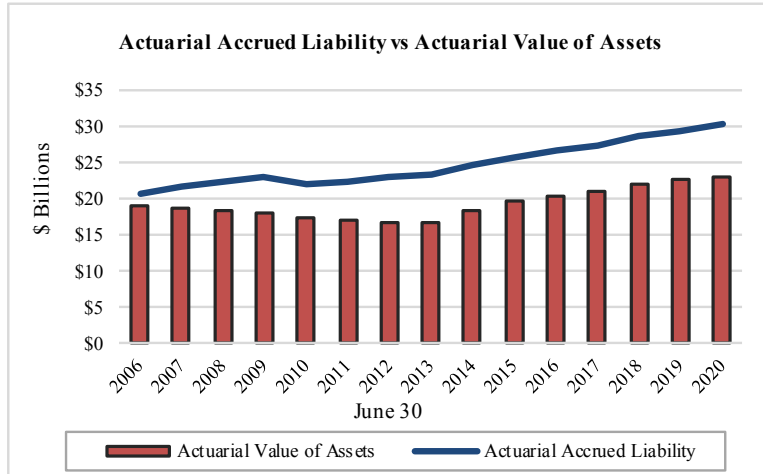
As shown above, various types of experience impacted the UAAL from July 1, 2019 to July 1, 2020. The UAAL is financed as a level percentage of payroll so the dollar amount of the UAAL payments increase each year in the future with assumed payroll increases. As a result of the payment schedule, contributions in the first part of the amortization period are less than the interest on the UAAL and the dollar amount of the UAAL is expected to increase as demonstrated by the \$78 million increase shown in the table above.

To the extent the Statutory Contribution Rate is less than the Required Contribution Rate, the full amount of the scheduled UAAL payment is not paid to the system. As a result, the expected reduction in the UAAL does not occur. In fiscal year 2020, the contribution deficiency increased the UAAL by \$50 million.

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. These 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 an actuarial loss of \$282 million which may be explained by considering the separate experience of assets and liabilities. As noted earlier, there was a \$121 million loss on the actuarial value of assets and a \$161 million loss on liabilities.



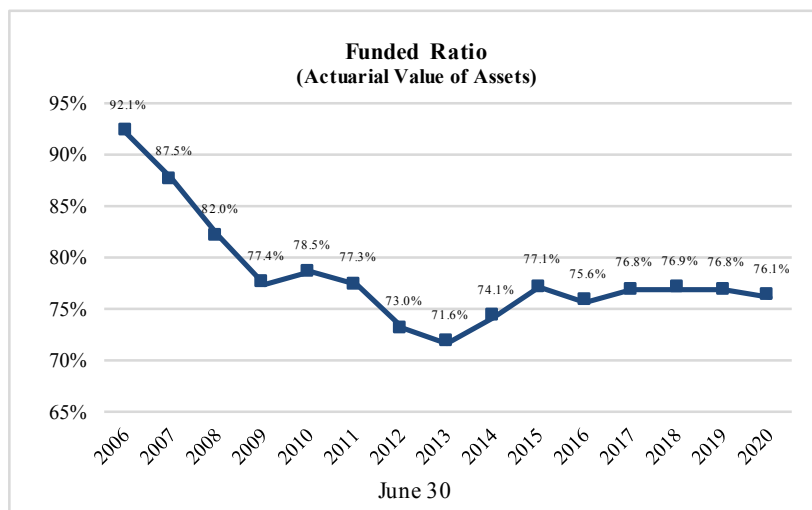
SECTION 1 – EXECUTIVE SUMMARY



The actuarial accrued liability has exceeded the actuarial value of assets during this period. Investment experience below the assumed rate of return, coupled with contributions below the actuarial contribution rate, over this period has 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 was 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 in the following table (in millions).

	7/1/16	7/1/17	7/1/18	7/1/19	7/1/20
Funded Ratio	75.6%	76.8%	76.9%	76.8%	76.1%
Unfunded Actuarial Accrued Liability (\$M)	\$6,522	\$6,365	\$6,620	\$6,779	\$7,192



The funded ratio has decreased over this period largely due to investment experience lower than the assumed rate of return. Assumption changes also decreased the ratio. The benefit reductions passed by the 2010 and 2018 legislatures and the strong investment returns since FY10 have resulted in the funded ratio improving 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. These calculations are based on the actuarial value of assets. Note that if the future scheduled contribution increases were reflected, the contribution deficiency would be significantly reduced, but not entirely eliminated.

Contribution Rates	July 1, 2020	July 1, 2019
1. Normal Cost Rate	9.23%	9.11%
2. UAAL Contribution Rate	8.12%	7.77%
3. Expenses	<u>0.30%</u>	<u>0.30%</u>
4. Total Required Contribution Rate	17.65%	17.18%
5. Statutory Contribution Rate	<u>16.46%</u>	<u>16.27%</u>
6. Contribution (Deficiency)/Sufficiency (5) - (4)	(1.19%)	(0.91%)
7. Contribution (Deficiency)/Sufficiency Reflecting Future Scheduled Contribution Increases	(0.32%)	0.17%

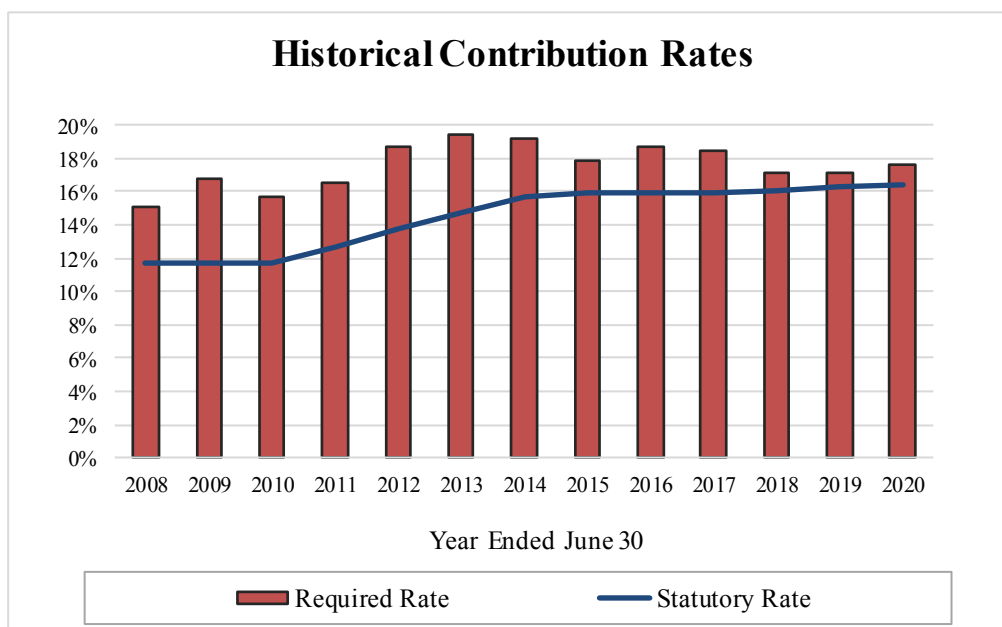
The impact of the various factors discussed earlier on the Required Contribution Rate are shown in the following table.

Total Actuarial Required Contribution Rate, July 1, 2019	17.18%
- Change in normal cost rate	0.12%
- Contributions below the Actuarial Required Contribution	0.06%
- Investment experience	0.14%
- Liability experience	0.18%
- Payroll increase greater than expected	(0.03%)
- Other experience	<u>0.00%</u>
Total Actuarial Required Contribution Rate, July 1, 2020	17.65%



SECTION 1 – EXECUTIVE SUMMARY

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



When a system is funded with fixed contribution rates (Statutory Contribution Rate), it is expected that the fixed contribution rate may be either above or below the actuarial contribution rate (Required Contribution Rate for TRA), as determined in the actuarial valuation each year. However, when the Statutory Contribution Rate is consistently lower than the Required Contribution Rate for a long period, it can significantly impact the funding progress of the system and result in an increasing UAAL and declining funded ratio. For TRA, the Statutory Contribution Rate was significantly below the Required Contribution Rate from 2008 to 2017. Over that time, the funded status of the system declined from 92% to 76%. Actual investment experience over that time period also had a significant impact on the decline in the system's funding.

The benefit and contribution changes enacted by the 2018 legislature had a significantly positive impact on the projected long-term funding of TRA. While the funded ratio, as of July 1, 2020, is 76% and the Contribution Deficiency is 1.19%, future scheduled increases to the Statutory Contribution Rate would reduce the Contribution Deficiency to 0.32%. This deficiency means that, if all assumptions are exactly met in the future, the UAAL will not be fully amortized by June 30, 2048, as scheduled. However, if the contribution deficiency remains relatively small, the UAAL will be significantly reduced even if it is not eliminated. We will need to closely monitor the contribution deficiency and projected full funding date in future valuations to ensure the current funding policy will meet the System's goals.

The actuarial contribution rate (Required Contribution Rate) is determined based on the snapshot of the System taken on the valuation date, July 1, 2020. 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.



SECTION 1 – EXECUTIVE SUMMARY

SUMMARY

The investment return on the market value of assets for FY 2020 was 4.2%, as reported by SBI. However, due to the application of the asset smoothing method, the return on the actuarial value of assets was 7.0%. Since this return was below the assumed rate of return of 7.5% for the fiscal year ending 2020, there was an actuarial loss on the actuarial value of assets. Coupled with demographic experience for the year, the funded ratio dropped from 76.82% in last year’s valuation to 76.13% 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 \$196 million represents about 0.9% of the market value of assets.

The key valuation results from the July 1, 2020 actuarial valuation are shown in the following table, using both actuarial and market value of assets.

	Actuarial Value	Market Value
Statutory Rate	16.46%	16.46%
Required Contribution		
Normal Cost	9.23%	9.23%
UAAL Contribution	8.12%	8.34%
Expenses	<u>0.30%</u>	<u>0.30%</u>
Total Required Contribution	17.65%	17.87%
(Deficiency)/Sufficiency	(1.19%)	(1.41%)
UAAL (\$M)	\$7,192	\$7,388
Funded Ratio	76.13%	75.48%

Note: does not reflect future scheduled increases in the employer and employee contribution rates.

As shown in the table, if the Required Contribution Rate is calculated, based on the UAAL, using the market value of assets, it increases to 17.87% and the resulting Contribution Deficiency for FY 2021, reflecting the current contribution rates, is 1.41%. If future scheduled increases in the contribution rates for both employers and members are considered, the contribution deficiency would be 0.54%.

The long-term financial health of this 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 2018 Legislature to strengthen the funding of TRA and enhance its long-term sustainability. Contributions were increased by a total of 1.5%, phased-in over six years beginning July 1, 2018, and benefit reductions were implemented. These changes are expected to lead to improvement in the long-term funding of the System. Of course, actual experience over time will unfold differently from that assumed, so additional adjustments may be necessary in the future. It is especially important to note that it is the actual investment returns, not



SECTION 1 – EXECUTIVE SUMMARY

the assumed investment return, that will ultimately determine the cost of providing the promised benefits.

A typical retirement plan faces many different risks. The term “risk” is most commonly associated with an outcome with undesirable results. However, in the actuarial world risk can be translated as uncertainty. The actuarial valuation process uses many actuarial assumptions to project how future contributions and investment returns will meet the cash flow needs for future benefit payments. Of course, we know that actual experience will not unfold exactly as anticipated by the assumptions each year and that uncertainty, whether favorable or unfavorable, creates risk. Actuarial Standard of Practice Number 51 defines risk as the potential of actual future measurements to deviate from expected results due to actual experience that is different than the actuarial assumptions. Risk evaluation is an important part of managing any defined benefit plan. A discussion of certain key risks for TRA is included in Section V of this report.

We note that as we are preparing this report, the world is in the midst of a pandemic. We have considered available information, but do not believe that there is yet sufficient data to warrant the modification of any of our assumptions. We will continue to monitor the situation and advise the Board in the future of any adjustments that we believe would be appropriate.

We conclude this executive summary by presenting comparative statistics and actuarial information on both the July 1, 2020 and July 1, 2019 valuations.



SECTION 1 – 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, 2020	July 1, 2019
1. PARTICIPANT DATA		
A. Active members		
1. Number	83,149	82,965
2. Projected annual earnings for fiscal year (000s)	5,521,463	5,340,671
3. Average projected annual earnings for fiscal year 2021	66,404	64,373
4. Average age	43.3	43.2
5. Average service	12.1	12.0
B. Service retirements	61,748	61,073
C. Survivors	5,937	5,727
D. Disability retirements	469	485
E. Deferred retirements	16,203	15,517
F. Non-vested terminated members	37,177	35,919
G. Total	204,683	201,686
2. LIABILITIES AND FUNDING RATIOS (<i>dollars in thousands</i>)		
A. Accrued Benefit Funding Ratio		
1. Current assets (AVA)	\$ 22,936,908	\$ 22,466,848
2. Current benefit obligations	28,650,444	27,893,008
3. Funding ratio	80.06%	80.55%
B. Actuarial Accrued Liability Funding Ratio		
1. Current assets (AVA)	\$ 22,936,908	\$ 22,466,848
2. Market value of assets (MVA)	22,741,046	22,872,153
3. Actuarial accrued liability	30,129,180	29,246,174
4. Unfunded actuarial accrued liability (B.3. - B.1.)	7,192,272	6,779,326
5. Funding ratio (AVA) (B.1. / B.3.)	76.13%	76.82%
6. Funding ratio (MVA) (B.2. / B.3.)	75.48%	78.21%
C. Projected Benefit Funding Ratio		
1. Current and expected future assets	\$ 34,469,708	\$ 33,586,725
2. Current and expected future benefit obligations	35,524,154	34,382,729
3. Funding ratio (AVA)	97.03%	97.68%
3. CONTRIBUTIONS (<i>% of Payroll</i>)		
A. Normal Cost Rate	9.23%	9.11%
B. UAAL Amortization Payment	8.12%	7.77%
C. Expenses	0.30%	0.30%
D. Total Required Contribution (Chapter 356)	17.65%	17.18%
E. Statutory Contribution (Chapter 354)	16.46%	16.27%
F. Contribution (Deficiency)/Sufficiency (3.E. - 3.D.)	(1.19%)	(0.91%)



SECTION II
PLAN ASSETS



SECTION II - PLAN ASSETS

This page is intentionally left blank



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, 2020	June 30, 2019
	<u>Amount</u>	<u>Amount</u>
Cash and short-term investments		
Cash	\$ 11,169	\$ 11,076
Building account cash	167	47
Short term investments	1,057,847	654,048
Total cash and short term investments	\$ 1,069,183	\$ 665,171
Accounts Receivable	22,822	22,324
Investments (at fair value)		
Bond pool	\$ 4,609,781	\$ 4,630,885
Alternative investments pool	3,539,370	3,311,887
Domestic stock pool	9,079,338	9,561,812
Broad International Stock Fund	4,419,260	4,678,182
Total investments	\$ 21,647,749	\$ 22,182,766
Securities lending collateral	\$ 1,591,273	\$ 1,692,432
Building		
Land	\$ 171	\$ 171
Building & equipment net of depreciation	5,442	5,710
Total building	\$ 5,613	\$ 5,881
Capital assets net of depreciation	11,505	13,262
Total Assets	\$ 24,348,145	\$ 24,581,836

**SECTION II - PLAN ASSETS**

TABLE 1 (continued)

STATEMENT OF FIDUCIARY NET POSITION
(Dollars in Thousands)

	June 30, 2020	June 30, 2019
Liabilities	<u>Amount</u>	<u>Amount</u>
Current		
Accounts payable	\$ 7,685	\$ 8,551
Accrued compensated absences	86	87
Accrued expenses - building	54	30
Bonds payable	661	643
Bonds interest payable	4	5
Securities lending collateral	1,591,273	1,692,432
Total current liabilities	\$ 1,599,763	\$ 1,701,748
Long term		
Accrued compensated absences	\$ 838	\$ 776
Bonds payable	2,548	3,256
Total long term liabilities	\$ 3,386	\$ 4,032
Total Liabilities	\$ 1,603,149	\$ 1,705,780
Net position restricted for pensions	\$ 22,744,996	\$ 22,876,056
Earnings Limitation Savings Account (ELSA) accounts payable	(3,950)	(3,903)
Net position restricted for pensions, after adjustment for ELSA accounts	\$ 22,741,046	\$ 22,872,153

**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, 2020 and 2019.

	For Year Ended	
	June 30, 2020	June 30, 2019
Additions		
Contributions		
Employee	\$ 396,679	\$ 386,669
Employer	425,223	403,300
Direct aid (state/city/district)	35,587	35,587
Earnings Limitation Savings Account (ELSA)	1,842	1,931
Total contributions	<u>\$ 859,331</u>	<u>\$ 827,487</u>
Investment Income		
Investment appreciation in fair value	\$ 953,036	\$ 1,590,124
Less investment expenses	<u>(20,927)</u>	<u>(21,853)</u>
Net Investment Income	<u>\$ 932,109</u>	<u>\$ 1,568,271</u>
Securities Lending activities		
Securities lending income	\$ 28,289	\$ 57,918
Securities lending expenses:		
Borrowing rebates	(18,973)	(44,713)
Management fees	<u>(1,677)</u>	<u>(2,377)</u>
Total securities lending expenses	<u>(20,650)</u>	<u>(47,090)</u>
Net income from securities lending	<u>7,639</u>	<u>10,828</u>
Total Net Investment Income	<u>\$ 939,748</u>	<u>\$ 1,579,099</u>
Other Income	<u>1,560</u>	<u>2,306</u>
Total Additions	\$ 1,800,639	\$ 2,408,892
Deductions		
Benefits Paid		
Retirement benefits	\$ (1,900,650)	\$ (1,863,762)
Refunds of contributions to members	<u>(13,815)</u>	<u>(14,074)</u>
Total benefits paid	<u>\$ (1,914,465)</u>	<u>\$ (1,877,836)</u>
Administrative Expenses	<u>(15,392)</u>	<u>(15,156)</u>
Total Deductions	\$ (1,929,857)	\$ (1,892,992)
Increase/(Decrease) in ELSA Account Value	(1,889)	(1,317)
Net Increase (Decrease)	(131,107)	514,583
Net Position Restricted for Pensions		
Beginning of Year	\$ 22,872,153	\$ 22,357,570
End of Year	\$ 22,741,046	\$ 22,872,153

**SECTION II - PLAN ASSETS**

TABLE 3

ACTUARIAL VALUE OF ASSETS AS OF JUNE 30, 2020*(Dollars in Thousands)*

1. Market value of assets available for benefits				\$ 22,741,046
2. Determination of average balance				
a. Assets available at July 1, 2019*			\$	22,876,056
b. Assets available at June 30, 2020*				22,744,996
c. Net investment income for fiscal year ending June 30, 2020				939,748
d. Average balance $(a. + b. - c.) / 2$			\$	22,340,652
3. Expected return $(7.5\% * 2.d.)$				1,675,549
4. Actual return				939,748
5. Current year unrecognized asset return $(4. - 3.)$				(735,801)
6. Unrecognized asset returns				
		Original	% Not	
		<u>Amount</u>	<u>Recognized</u>	
a. Year ended June 30, 2020	\$	(735,801)	80%	\$ (588,641)
b. Year ended June 30, 2019		(58,115)	60%	(34,869)
c. Year ended June 30, 2018		398,058	40%	159,223
d. Year ended June 30, 2017		1,342,126	20%	268,425
e. Total return not yet recognized				\$ (195,862)
7. Actuarial value of assets at June 30, 2020 (1. - 6.e.)				\$ 22,936,908

* Before recognition of ELSA accounts payable.



SECTION II - PLAN ASSETS

This page is intentionally left blank



SECTION III
PLAN LIABILITIES



SECTION III - PLAN LIABILITIES

This page is intentionally left blank



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, 2020. 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 demographic actuarial assumptions used to determine liabilities are based on the results of the 2014-2018 Experience Study. The economic actuarial assumptions used to determine liabilities are based on the results of an economic experience study performed in 2017. This set of assumptions is shown in Appendix C. The June 2019 experience study again reviewed the current set of economic assumptions and did not recommend any changes to the assumptions passed by the 2018 Legislature.

The liabilities reflect the benefit structure in place as of July 1, 2020.

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, 2020

(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	\$ 22,936,908
B. Expected Future Assets	
1. Present value of expected future statutory supplemental contributions*	\$ 6,137,826
2. Present value of expected future normal cost contributions	5,394,974
3. Total expected future assets (1. + 2.)	\$ 11,532,800
C. Total Current and Expected Future Assets**	\$ 34,469,708

	<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	\$ 17,674,854	\$ 17,674,854
b. Disability	0	140,114	140,114
c. Survivors	0	1,224,623	1,224,623
2. Deferred retirements with applicable future augmentation	0	678,027	678,027
3. Former members without vested rights***	100,348	0	100,348
4. Active members	67,438	8,765,040	8,832,478
5. Total Current Benefit Obligations	\$ 167,786	\$ 28,482,658	\$ 28,650,444
E. Expected Future Benefit Obligations			6,873,710
F. Total Current and Expected Future Benefit Obligations			35,524,154
G. Unfunded Current Benefit Obligations (D.5. - A.)			5,713,536
H. Unfunded Current and Future Benefit Obligations (F. - C.)			1,054,446

* Under LCPR guidelines, this amount does not include supplemental payments which could occur after the expiration of the remaining 28 year amortization period.

** Does not reflect deferred investment experience in the asset smoothing method. Total expected future assets on a market value basis is \$ 34,273,846.

*** 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, 2020
(Dollars in Thousands)

	<u>Actuarial Present Value of Projected Benefits</u>	<u>Actuarial Present Value of Future Normal Costs</u>	<u>Actuarial Accrued Liability</u>
1. Active Members			
a. Retirement annuities	\$ 14,822,475	\$ (4,514,906)	\$ 10,307,569
b. Disability Benefits	347,522	(146,717)	200,805
c. Survivor benefits	105,496	(39,677)	65,819
d. Deferred retirements	416,981	(513,042)	(96,061)
e. Refunds	13,714	(180,632)	(166,918)
f. Total	<u>\$ 15,706,188</u>	<u>\$ (5,394,974)</u>	<u>\$ 10,311,214</u>
2. Deferred Retirements with Applicable Future Augmentation	678,027	0	678,027
3. Former Members Without Vested Rights	100,348	0	100,348
4. Benefit Recipients	<u>19,039,591</u>	<u>0</u>	<u>19,039,591</u>
5. Total Actuarial Accrued Liability	\$ 35,524,154	\$ (5,394,974)	\$ 30,129,180
6. Actuarial Value of Assets			\$ 22,936,908
7. Unfunded Actuarial Accrued Liability (UAAL)			\$ 7,192,272

* On a market value of assets basis, the unfunded actuarial accrued liability is \$7,388,134.



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	\$ 6,779,326
B. Changes due to interest requirements and current rate of funding*	
1. Normal cost and actual administrative expenses	\$ 501,934
2. Contributions	(859,331)
3. Interest on A., B.1., and B.2. at 7.5%	495,289
4. Total (B.1. + B.2. + B.3.)	\$ 137,892
C. Expected unfunded actuarial accrued liability at end of year (A. + B.4.)	\$ 6,917,218
D. Increase (decrease) due to actuarial losses (gains) because of experience deviations from expected	
1. Salary increases	\$ (103,034)
2. Investment return (actuarial assets)	120,967
3. Mortality of active members	292
4. Mortality of benefit recipients	(49,068)
5. Retirement from active service	84,257
6. Data Refinement	215,928
7. Other items	12,385
8. Total	\$ 281,727
E. Unfunded actuarial accrued liability at end of year before plan amendments and changes in actuarial assumptions (C. + D.7.)	\$ 7,198,945
F. Change in unfunded actuarial accrued liability due to change in plan amendments	\$ 0
G. Change in unfunded actuarial accrued liability due to change in assumptions	\$ (6,673)
H. Unfunded actuarial accrued liability at end of year (E. + F. + G.)	\$ 7,192,272

* *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 – CONTRIBUTIONS

This page is intentionally left blank



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, 2048). Contributions to fund the UAAL are determined as a level percentage of payroll assuming payroll increases 3.00% each year.



SECTION IV – CONTRIBUTIONS

TABLE 7

NORMAL COST AT JULY 1, 2020
(Dollars in Thousands)

	<u>Percent of Pay</u>	<u>Dollar Amount</u>
1. Normal Cost Rate		
a. Retirement benefits	7.78%	\$ 429,578
b. Disability benefits	0.24%	13,252
c. Survivor benefits	0.07%	3,865
d. Deferred retirement benefits*	0.83%	45,828
e. Refunds	0.31%	17,116
f. Total	<u>9.23%</u>	<u>\$ 509,639</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	\$ 30,129,180
2. Actuarial value of assets	<u>22,936,908</u>
3. Unfunded actuarial accrued liability	\$ 7,192,272
B. Determination of Supplemental Contribution Rate*	
1. Present value of future payrolls through the amortization date of June 30, 2048	\$ 88,568,911
2. Supplemental contribution rate (A.3. / B.1.)**	8.12%

* *On a market value of assets basis, the unfunded actuarial accrued liability is \$7,388,134 and the supplemental contribution rate is 8.34% of payroll.*

** *The amortization factor as of July 1, 2020 is 16.0408.*



SECTION IV – CONTRIBUTIONS

TABLE 9

DETERMINATION OF CONTRIBUTION SUFFICIENCY/(DEFICIENCY)
(Dollars in Thousands)

The actuarial contribution rate is the sum of normal cost, a supplemental contribution to amortize the UAAL, and an allowance for expenses.

	Percent of Payroll		Dollar Amount
A. Statutory contributions - Chapter 354			
1. Employee contributions	7.50%	\$	414,113
2. Employer contributions*	8.32%		459,393
3. Supplemental contributions**			
a. 1993 Legislation	0.09%		5,000
b. 1996 Legislation	0.06%		3,256
c. 1997 Legislation	0.23%		12,954
d. 2014 Legislation	0.26%		14,377
			<hr/>
4. Total	16.46%	\$	909,093
B. Required contributions - Chapter 356			
1. Normal cost			
a. Retirement benefits	7.78%	\$	429,578
b. Disability benefits	0.24%		13,252
c. Survivor benefits	0.07%		3,865
d. Deferred retirement benefits	0.83%		45,828
e. Refunds	0.31%		17,116
f. Total	9.23%	\$	509,639
			<hr/>
2. Supplemental contribution for the amortization of the Unfunded Actuarial Accrued Liability by June 30, 2048	8.12%		448,343
3. Allowance for expenses	0.30%	\$	16,564
			<hr/>
4. Total actuarial contribution for fiscal year ending June 30, 2021***	17.65%	\$	974,546
C. Contribution Sufficiency / (Deficiency) (A.4. - B.4.)***	(1.19%)	\$	(65,453)

Note: Projected annual payroll for fiscal year beginning on the valuation date: \$5,521,463

* Employer contribution rate is blended to reflect rates of 15.77% of pay for Basic members, 8.13% of pay for Coordinated members not employed by Special School District #1, and 11.77% 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 17.87% of payroll and the contribution deficiency is 1.41% 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%	\$	11
2. Employer contributions*	15.77%		15
3. Supplemental contributions**			
a. 1993 Legislation	0.09%		0
b. 1996 Legislation	0.06%		0
c. 1997 Legislation	0.23%		0
d. 2014 Legislation	0.26%		0
	27.41%		0
4. Total	27.41%	\$	26
B. Required contributions - Chapter 356			
1. Normal cost			
a. Retirement benefits	15.93%	\$	16
b. Disability benefits	0.84%		1
c. Survivor benefits	0.33%		0
d. Deferred retirement benefits	0.93%		1
e. Refunds	0.33%		0
f. Total	18.36%	\$	18

Note: Projected annual payroll for fiscal year beginning on the valuation date: \$98 for 1 member.

* Basic active member is a teacher employed by Special School District #1; employer contribution rate of 15.77% 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%	\$ 414,102
2. Employer contributions*	8.32%	459,378
3. Supplemental contributions**		
a. 1993 Legislation	0.09%	5,000
b. 1996 Legislation	0.06%	3,256
c. 1997 Legislation	0.23%	12,954
d. 2014 Legislation	0.26%	14,377
	16.46%	\$ 909,067
4. Total		
B. Required contributions - Chapter 356		
1. Normal cost		
a. Retirement benefits	7.78%	\$ 429,562
b. Disability benefits	0.24%	13,251
c. Survivor benefits	0.07%	3,865
d. Deferred retirement benefits	0.83%	45,827
e. Refunds	0.31%	17,116
f. Total	9.23%	\$ 509,621

Note: Projected annual payroll for fiscal year beginning on the valuation date: \$5,521,365

* Employer contribution rate is blended to reflect rates of 8.13% of pay for Coordinated members not employed by Special School District #1, and 11.77% of pay for Coordinated members who are employed by Special School District #1. The rate was blended using the prior year's actual covered payroll of \$5,166,241, which includes \$4,901,004 for Coordinated members who are not employed by Special School District #1 and \$265,237 for members who are employed by Special School District #1.

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



SECTION V
RISK ASSESSMENT



SECTION V – RISK ASSESSMENT

This page is intentionally left blank



SECTION V – RISK ASSESSMENT

OVERVIEW

Actuarial Standards of Practice (ASOP) No. 51, issued by the Actuarial Standards Board, provides guidance on assessing and disclosing risks related to pension plan funding. This guidance is binding on all credentialed actuaries practicing in the United States.

The term “risk” frequently has a negative connotation, but from an actuarial perspective, it may be thought of as simply the fact that what actually happens in the real world will not always match what was expected, based on actuarial assumptions. Of course, when actual experience is better than expected, the favorable risk is easily absorbed. The risk of unfavorable experience will likely be unpleasant, and so there is an understandable focus on the aspects of risk that are negative.

Risk usually can be reduced or eliminated at some cost. Consumers, for example, buy auto and home insurance to reduce the risk of accidents or catastrophes. Another way to express this concept, however, is that there is generally some reward for assuming risk. Thus, retirement plans invest not just in US Treasury bonds which have almost no risk, but also in equities which are considerably riskier – because they have an expected reward of a higher return that justifies the risk.

Under ASOP 51, the actuary is called on to identify the significant risks to the pension plan and provide information to help those sponsoring and administering the plan understand the implications of these risks. In this section, we identify some of the key risks for TRA and provide information to help interested parties better understand these risks.



SECTION V – RISK ASSESSMENT

INVESTMENT RISK

The investment return on assets is the most significant risk to funding a pension plan. To illustrate the magnitude of this risk, please review the following chart showing the Asset Volatility Ratio (AVR), defined as the market value of assets divided by covered payroll (dollars in thousands).

<u>Valuation</u>	<u>Market Value of Assets</u>	<u>Covered Payroll</u>	<u>Asset Volatility Ratio</u>
2001	15,902,336	2,812,000	5.66
2002	13,997,762	2,873,771	4.87
2003	13,061,606	2,952,887	4.42
2004	15,095,804	3,032,483	4.98
2005	15,928,604	3,121,571	5.10
2006	17,764,526	3,430,645	5.18
2007	19,938,882	3,532,159	5.64
2008	18,106,966	3,645,230	4.97
2009	13,833,826	3,761,484	3.68
2010	14,939,540	3,787,757	3.94
2011	17,303,576	3,838,111	4.51
2012	16,689,941	3,871,809	4.31
2013	18,019,319	3,917,310	4.60
2014	20,293,684	4,056,482	5.00
2015	20,446,091	4,261,626	4.80
2016	19,424,431	4,515,699	4.30
2017	21,258,090	4,688,875	4.53
2018	22,357,570	4,832,917	4.63
2019	22,872,153	5,000,930	4.57
2020	22,741,046	5,166,241	4.40

The asset volatility ratio is especially useful to compare across plans or through time. It is also frequently useful to consider how the AVR translates into changes in the Required Contribution Rate (actuarial contribution rate). For example, the following table demonstrates that with an AVR of 4.00, if the market value return in one year is 10% below assumed, or -2.50%, there will be an increase in the Required Contribution Rate of 0.46% in the first year. Without asset smoothing or without returns above the expected return in the next four years, the impact on the Required Contribution Rate would be 2.32%. A higher AVR produces more volatility in the Required Contribution Rate.

Impact of One-Year Return 10% Below Expected (Percent of Payroll)			
	<u>Asset</u>	<u>Unsmoothed</u>	<u>Smoothed</u>
<u>AVR</u>	<u>Value</u>	<u>Amortization</u>	<u>Amortization</u>
4.00	40%	2.32%	0.46%
5.00	50%	2.90%	0.58%
6.00	60%	3.48%	0.70%



SECTION V – RISK ASSESSMENT

SENSITIVITY MEASURES

Valuations are generally performed with a single set of assumptions that reflects the best estimate of future conditions, in the opinion of the actuary and typically the governing board. Note that under Actuarial Standards of Practice, the set of economic assumptions used for funding must be consistent. To enhance the understanding of the importance of an assumption, a sensitivity test can be performed where the valuation results are recalculated using a different assumption or set of assumptions. The Minnesota Legislative Commission on Pensions and Retirement requires that TRA (and Minnesota retirement systems) disclose the sensitivity of valuation results relative to the investment return assumption.

The following table contains the key measures for TRA under the valuation assumption for investment return of 7.5%, along with the results if the assumption were 6.5% or 8.5%. In this analysis, only the investment return assumption is changed. Consequently, there may be inconsistencies between the investment return and other economic assumptions such as inflation or payroll increases. In addition, it should not be assumed that Cavanaugh Macdonald Consulting believes that either assumption (6.5% or 8.5%) would comply with applicable Actuarial Standards of Practice.

	Investment Return Assumption		
	6.50%	7.50%	8.50%
Normal Cost Rate	11.96%	9.23%	7.24%
Amortization of UAAL	11.27%	8.12%	4.95%
Expenses	0.30%	0.30%	0.30%
Total Required Contribution	23.53%	17.65%	12.49%
Contribution Sufficiency/(Deficiency)	(7.07%)	(1.19%)	3.97%
Actuarial Accrued Liability Funding Ratio	67.36%	76.13%	85.28%
Actuarial Accrued Liability (\$B)	\$34.1	\$30.1	\$26.9
Unfunded Actuarial Accrued Liability (\$B)	\$11.1	\$7.2	\$4.0

Note: All calculations are based on the actuarial value of assets.

MORTALITY RISK

The mortality assumption is a significant assumption for valuation results, second only to the investment assumption in most situations. The TRA mortality assumption utilizes a mortality table (with separate rates for males and females, as well as different rates by status) and an improvement scale for how the mortality rates are expected to improve through time. This approach is the current state of the art in retirement actuarial practice, made possible by the increase in computational power over the past 20 years.

The future, however, is not known, and actual mortality improvements may occur at a faster rate than expected, or at a slower rate than expected (or even decline). Although changes in mortality will affect the benefits paid, this assumption is carefully studied during the regular experience studies that TRA conducts so that incremental changes can be made to smoothly reflect unfolding experience.

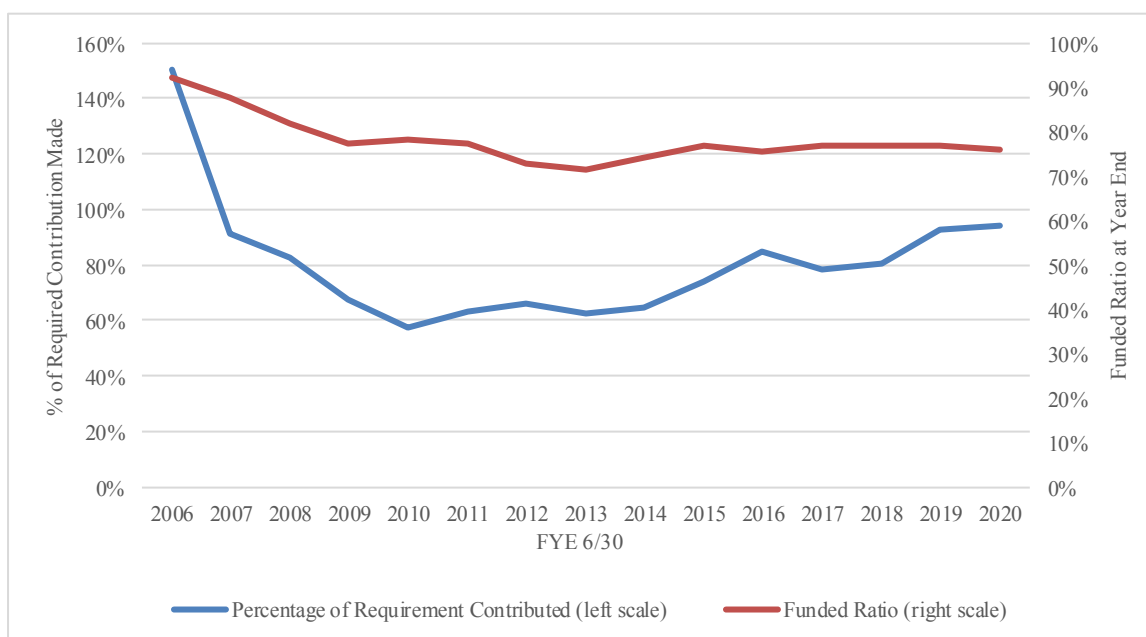


SECTION V – RISK ASSESSMENT

CONTRIBUTION RISK

TRA is primarily funded by member and employer contributions to the trust fund, together with the earnings on those accumulated contributions. The contribution rates are set by state statute and intended to provide the needed amounts to fund the system over time. Each year in the valuation, the Required Contribution Rate is determined, based on TRA’s funding policy (also in statute). This rate is the sum of the rates for the normal cost for the plan, the amortization of the UAAL, and the administrative expenses. The difference between this Required Contribution Rate and the Statutory Contribution Rate is determined, resulting in a contribution sufficiency (the Statutory Rate exceeds the Required Contribution Rate) or a deficiency (the Statutory Rate is smaller).

A key risk factor to TRA’s funding is that over time, the Statutory Contribution Rate will be insufficient to accumulate enough funds, with investment income, to fund the promised benefits. The following graph shows two lines: the blue line shows the proportion of the Required Contribution Rate actually made each year for the past 20 years. As can be seen by looking at the scale on the left, through 2007 the Statutory Rate was at least 100% of the Required Contribution Rate, and so more than 100% of the Required Contribution Rate was contributed. Since 2007, the ratio has been significantly less than 100%, indicating the Statutory Rate has been less than the Required Contribution Rate. Also on the graph (with the scale on the right axis) is the funded ratio of the System. While there have been certain events (large financial market drops, the merger of the Minneapolis and Duluth systems into TRA, etc.) that have had an effect on the funded ratio, there is also a noteworthy decline in the funded ratio during the period the Statutory Contribution Rate has been less than the Required Contribution Rate.



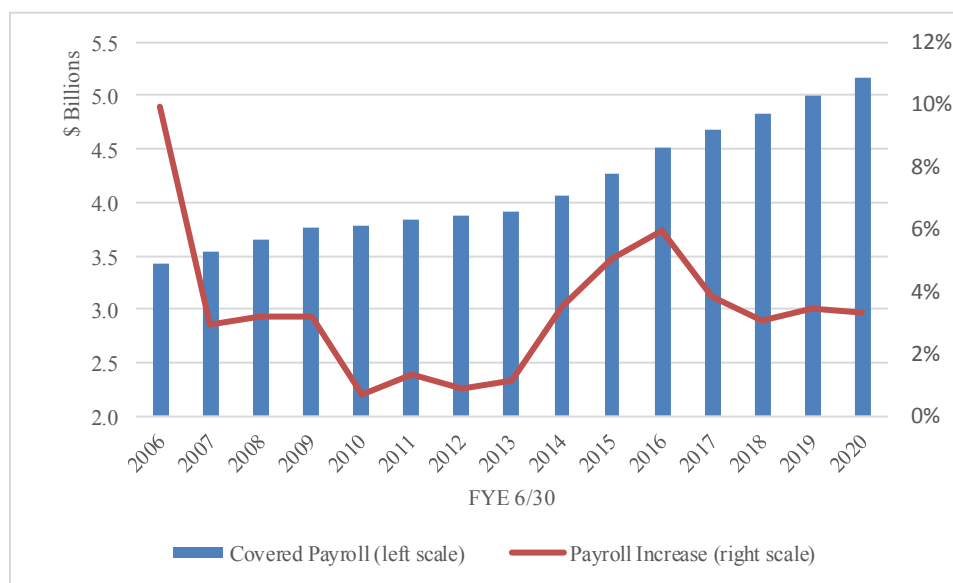
The presence of this risk does not mean that there is an insurmountable problem. For example, benefit and contribution adjustments were made by both the 2010 and the 2018 Legislatures as a way to bring the System’s funding into long-term balance and improve its sustainability. The challenge for TRA is that adjustments to address long-term funding require legislative action and the time period to enact such change is outside the control of the Board.



SECTION V – RISK ASSESSMENT

COVERED PAYROLL RISK

The Required Contribution Rate for TRA is calculated under the assumption that total covered payroll will increase over time at a certain rate (currently 3.0% per year). We know that this assumption will not be met exactly every year, because there are many factors that affect the actual pay increases granted by each employer and there are many different employers participating in TRA. The following graph shows actual payroll growth since 2000.



Visually, it is clear that there are years when covered payroll has increased significantly and years when there is little to no change. Sometimes this is a function of external events such as the merger of another school district into TRA (leading to large increases), or a national financial crisis (leading to small increases).

The volatility of covered payroll increases affects the plan's funding in multiple ways. First, lower increases in covered payroll mean that less contribution dollars will be collected, which works against the financial health of the plan. At the same time, if lower covered payroll is the result of lower individual pay increases for active members (rather than a decrease in active membership) this results in an actuarial gain on liabilities since the expected future benefits are lower. The trade-off between these two factors is complex, and so it is not always clear if lower than expected covered payroll helps or hurts the plan's funding. What is important to understand, however, is that actual versus expected covered payroll growth is a source of risk to funding the plan. If actuarial assumptions accurately reflect the average increases over time, then the net consequences should be manageable.



SECTION V – RISK ASSESSMENT

This page is intentionally left blank



SECTION VI
ADDITIONAL INFORMATION



SECTION VI – ADDITIONAL INFORMATION

This page is intentionally left blank



SECTION VI – 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 VI – ADDITIONAL INFORMATION

TABLE 12
SUMMARY OF MEMBERSHIP DATA

	<u>July 1, 2020</u>	<u>July 1, 2019</u>
Active members:		
Vested	67,529	66,660
Non-vested	<u>15,620</u>	<u>16,305</u>
Total	83,149	82,965
Pensioners and Beneficiaries	68,154	67,285
Terminated vested members entitled to, but not yet receiving, benefits:	16,203	15,517
Other terminated, non-vested members entitled to a refund of contributions	<u>37,177</u>	<u>35,919</u>
Total	204,683	201,686

**SECTION VI – 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%
07/01/17	21,062,789	27,427,702	6,364,913	76.79%	4,688,875	135.74%
07/01/18	22,022,842	28,643,023	6,620,181	76.89%	4,832,917	136.98%
07/01/19	22,466,848	29,246,174	6,779,326	76.82%	5,000,930	135.56%
07/01/20	22,936,908	30,129,180	7,192,272	76.13%	5,166,241	139.22%

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



SECTION VI – ADDITIONAL INFORMATION

TABLE 14

SCHEDULE OF CONTRIBUTIONS FROM THE EMPLOYER AND OTHER CONTRIBUTING ENTITIES (Dollars in Thousands)

Table with 7 columns: Plan Year Ended, Actuarially Required Contribution Rate (a), Actual Covered Payroll (b), Actual Member Contributions (c), Annual Required Contributions [(a)*(b)] - (c), Actual Employer Contributions 1, and Percentage Contributed. Rows range from 2000 to 2021.

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%.
16 Actuarially Required Contribution Rate prior to change in Actuarial Assumptions is 18.71%.
17 Actuarially Required Contribution Rate prior to change in Actuarial Assumptions and Plan Provisions is 18.25%.
18 Actuarially Required Contribution Rate prior to change in Actuarial Assumptions is 17.62%.



SECTION VI – 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, 2020. The “Retirees” column shows benefits expected to be paid to all other members. This includes those who, as of July 1, 2020, are receiving benefit payments or who terminated employment and are entitled to a deferred benefit.

Year Ending	Actives	Retirees	Total
June 30			
2021	\$ 71,181	\$ 1,911,979	\$ 1,983,160
2022	128,724	1,874,630	2,003,354
2023	182,689	1,843,524	2,026,213
2024	235,870	1,810,957	2,046,827
2025	287,263	1,780,055	2,067,318
2026	337,577	1,751,051	2,088,628
2027	388,639	1,722,475	2,111,114
2028	442,604	1,693,707	2,136,311
2029	501,850	1,665,621	2,167,471
2030	567,939	1,635,119	2,203,058
2031	642,704	1,603,895	2,246,599
2032	726,918	1,569,821	2,296,739
2033	821,475	1,532,893	2,354,368
2034	925,087	1,493,273	2,418,360
2035	1,036,827	1,452,020	2,488,847
2036	1,156,146	1,408,262	2,564,408
2037	1,283,300	1,362,013	2,645,313
2038	1,416,794	1,312,537	2,729,331
2039	1,556,024	1,259,738	2,815,762
2040	1,701,719	1,204,752	2,906,471
2041	1,853,769	1,147,707	3,001,476
2042	2,011,433	1,088,806	3,100,239
2043	2,173,520	1,028,228	3,201,748
2044	2,338,821	966,734	3,305,555
2045	2,507,463	904,132	3,411,595

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



SECTION VI – ADDITIONAL INFORMATION

This page is intentionally left blank



APPENDIX A

SUMMARY STATISTICS
ON MEMBERSHIP DATA



APPENDIX A – MEMBERSHIP DATA

This page is intentionally left blank



APPENDIX A – MEMBERSHIP DATA

**TABLE 16
RECONCILIATION OF MEMBERS***

	Active Members**	Former Members***	Benefit Recipients****			Total
			Service Retirements	Disability Retirements	Survivors	
Members on 6/30/2019	82,965	51,436	61,073	485	5,727	201,686
New hires	5,069	-	-	-	-	5,069
Transfer from active to inactive	(4,688)	4,688	-	-	-	0
Transfer from inactive to active	1,494	(1,494)	-	-	-	0
Return from zero balance	359	10	-	-	-	369
Return from disability	5	2	-	-	-	7
Refunded	(295)	(729)	-	-	-	(1,024)
Refunded (non-repayable)	(14)	(98)	-	-	-	(112)
Retirements	(1,737)	(518)	2,255	(41)	-	(41)
Benefits began	-	-	-	47	568	615
Benefits ended	-	-	-	(4)	(53)	(57)
Deaths	(26)	(83)	(1,582)	(16)	(307)	(2,014)
Adjustments	17	166	2	(2)	2	185
Net changes	184	1,944	675	(16)	210	2,997
Members on 6/30/2020	83,149	53,380	61,748	469	5,937	204,683

* 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 1 Basic and 83,148 Coordinated members.

*** Former members include 17 Basic and 53,363 Coordinated members.

**** Benefit recipients include 3,121 Basic members and 65,033 Coordinated members.

Former Member Statistics

	Vested	Non-vested	Total
Number	16,203	37,177	53,380
Average Age	48.4	47.2	47.5
Average Service (years)	7.7	0.8	2.9
Average annual benefits, with applicable future augmentation and Combined Service Annuity load	\$8,072	N/A	N/A
Average refund value, with Combined Service Annuity load	\$36,367	\$2,699	\$12,919

Former Member Statistics (Basic)

	Vested	Non-vested	Total
Number	4	13	17
Average Age	72.3	78.5	76.6
Average Service (years)	17.6	0.8	4.8
Average annual benefits, with applicable future augmentation and Combined Service Annuity load	\$42,629	N/A	N/A
Average refund value, with Combined Service Annuity load	\$204,034	\$23,443	\$65,935

Former Member Statistics (Coordinated)

	Vested	Non-vested	Total
Number	16,199	37,164	53,363
Average Age	48.4	47.2	47.5
Average Service (years)	7.7	0.8	2.9
Average annual benefits, with applicable future augmentation and Combined Service Annuity load	\$8,064	N/A	N/A
Average refund value, with Combined Service Annuity load	\$36,326	\$2,692	\$12,902



APPENDIX A – MEMBERSHIP DATA

TABLE 17
DISTRIBUTION OF ACTIVE MEMBERS*

Age	Years of Service as of July 1, 2020										Total	
	<3**	3-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 +		
<25	2,531	79	2									2,612
Avg. Earnings	33,648	45,935	48,405									34,031
25-29	3,826	3,134	2,083									9,043
Avg. Earnings	36,454	48,364	53,693									44,552
30-34	2,028	1,729	5,677	1,182	1							10,617
Avg. Earnings	36,403	50,298	57,451	66,336	77,765							53,257
35-39	1,704	1,117	3,243	4,531	1,300							11,895
Avg. Earnings	33,553	53,470	60,680	71,140	79,429							62,150
40-44	1,577	855	2,005	2,297	4,196	1,341						12,271
Avg. Earnings	29,094	52,595	60,301	70,554	80,326	86,210						67,351
45-49	1,127	596	1,446	1,424	2,003	4,196	811					11,603
Avg. Earnings	27,483	49,836	60,875	70,211	77,887	84,944	89,426					71,847
50-54	950	457	1,067	1,059	1,347	2,334	3,226	606				11,046
Avg. Earnings	24,121	50,876	58,022	67,205	75,194	82,511	87,383	88,301				73,196
55-59	689	295	708	746	974	1,263	1,678	1,714	201			8,268
Avg. Earnings	21,977	46,326	53,212	64,354	74,386	80,134	85,337	88,081	86,153			72,525
60-64	544	195	432	453	558	641	615	422	247	57		4,164
Avg. Earnings	15,228	41,391	48,924	61,551	71,153	79,742	82,831	88,040	87,565	87,372		65,056
65-69	377	77	139	112	118	116	87	58	28	59		1,171
Avg. Earnings	7,406	23,635	35,531	63,020	72,602	77,016	78,498	86,978	89,385	93,670		46,126
70 +	267	28	36	30	23	10	19	12	9	25		459
Avg. Earnings	6,431	11,930	22,095	31,818	89,639	81,471	77,610	99,879	103,371	94,502		27,546
Total	15,620	8,562	16,838	11,834	10,520	9,901	6,436	2,812	485	141		83,149
Avg. Earnings	30,944	49,487	57,623	69,111	77,990	83,495	86,523	88,150	87,378	91,271		62,566

* Active members include 1 Basic and 83,148 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, 2020 as reported by the Teachers Retirement Association of Minnesota.



APPENDIX A – MEMBERSHIP DATA

TABLE 18
DISTRIBUTION OF SERVICE RETIREMENTS
(TOTAL)

Age	Years Since Retirement as of July 1, 2020							Total
	<1	1-4	5-9	10-14	15-19	20-24	25 +	
<55	1	3						4
Avg. Benefit	57,321	28,797						35,928
55-59	589	985	5					1,579
Avg. Benefit	42,432	35,003	29,470					37,757
60-64	781	3,481	1,840	6				6,108
Avg. Benefit	34,398	34,616	29,321	19,047				32,977
65-69	553	4,038	5,817	2,746	48		1*	13,203
Avg. Benefit	22,723	24,199	27,040	26,187	33,600		1,725	25,835
70-74	59	868	4,641	5,694	4,262	442	5*	15,971
Avg. Benefit	17,291	19,920	23,547	27,161	25,704	32,397	8,996	25,431
75-79	11	86	640	2,348	4,015	4,110	82	11,292
Avg. Benefit	14,182	24,217	19,812	23,385	25,152	27,443	36,637	25,381
80-84	2	13	72	282	1,318	3,716	1,783	7,186
Avg. Benefit	40,799	18,127	15,003	19,370	22,692	31,931	34,470	30,181
85-89		3	10	26	123	1,042	2,921	4,125
Avg. Benefit		3,582	18,782	15,901	19,026	33,062	37,799	35,834
90 +			5	7	25	74	2,169	2,280
Avg. Benefit			18,900	27,900	16,183	33,231	36,828	36,418
Total	1,996	9,477	13,030	11,109	9,791	9,384	6,961	61,748
Avg. Benefit	32,935	28,743	25,688	25,894	25,003	30,123	36,604	28,224

* 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 18A
DISTRIBUTION OF SERVICE RETIREMENTS
(BASIC)

Age	Years Since Retirement as of July 1, 2020							Total
	<1	1-4	5-9	10-14	15-19	20-24	25 +	
<55								
Avg. Benefit								
55-59								
Avg. Benefit								
60-64			1					1
Avg. Benefit			73,072					73,072
65-69	1	5	12	25	8			51
Avg. Benefit	9,209	53,798	47,727	60,756	59,477			55,797
70-74		7	39	66	144	100		356
Avg. Benefit		31,131	28,768	50,552	57,956	51,529		51,053
75-79	1	1	6	37	100	172	37	354
Avg. Benefit	29,234	92,149	33,358	41,485	55,762	58,850	53,375	55,169
80-84		1		9	37	134	255	436
Avg. Benefit		79,667		68,863	52,472	54,287	76,149	67,278
85-89				3	13	82	536	634
Avg. Benefit				30,421	44,019	54,369	68,133	65,680
90 +				1	3	10	574	588
Avg. Benefit				2,230	33,885	45,683	57,032	56,628
Total	2	14	58	141	305	498	1,402	2,420
Avg. Benefit	19,222	47,052	33,929	50,379	55,781	55,150	64,657	59,874

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 18B
DISTRIBUTION OF SERVICE RETIREMENTS
(COORDINATED)

Age	Years Since Retirement as of July 1, 2020							Total
	<1	1-4	5-9	10-14	15-19	20-24	25 +	
<55	1	3						4
Avg. Benefit	57,321	28,797						35,928
55-59	589	985	5					1,579
Avg. Benefit	42,432	35,003	29,470					37,757
60-64	781	3,481	1,839	6				6,107
Avg. Benefit	34,398	34,616	29,297	19,047				32,971
65-69	552	4,033	5,805	2,721	40		1*	13,152
Avg. Benefit	22,748	24,162	26,997	25,870	28,424		1,725	25,718
70-74	59	861	4,602	5,628	4,118	342	5*	15,615
Avg. Benefit	17,291	19,829	23,503	26,887	24,576	26,802	8,996	24,847
75-79	10	85	634	2,311	3,915	3,938	45	10,938
Avg. Benefit	12,677	23,418	19,684	23,095	24,370	26,072	22,874	24,417
80-84	2	12	72	273	1,281	3,582	1,528	6,750
Avg. Benefit	40,799	12,998	15,003	17,738	21,832	31,095	27,514	27,785
85-89		3	10	23	110	960	2,385	3,491
Avg. Benefit		3,582	18,782	14,007	16,073	31,242	30,982	30,413
90 +			5	6	22	64	1,595	1,692
Avg. Benefit			18,900	32,178	13,769	31,286	29,557	29,395
Total	1,994	9,463	12,972	10,968	9,486	8,886	5,559	59,328
Avg. Benefit	32,948	28,716	25,651	25,579	24,013	28,721	29,529	26,933

* 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
(TOTAL)**

Age	Years Since Death as of July 1, 2020							Total
	<1	1-4	5-9	10-14	15-19	20-24	25 +	
<45	18	62	36	14	5	2		137
Avg. Benefit	25,857	18,677	11,631	19,826	6,342	10,364		17,315
45-49	6	18	19	11	6	5	1	66
Avg. Benefit	24,399	16,230	21,062	8,424	5,121	21,830	34,499	16,754
50-54	2	44	30	13	2	6	2	99
Avg. Benefit	12,263	19,994	11,369	17,780	20,686	27,485	25,864	17,520
55-59	9	62	37	17	8	2	3	138
Avg. Benefit	18,444	23,220	14,360	12,308	16,133	29,920	27,829	18,975
60-64	20	97	63	42	16	8	7	253
Avg. Benefit	28,246	21,961	19,510	15,810	14,246	18,518	11,046	19,928
65-69	38	168	110	65	24	11	7	423
Avg. Benefit	21,334	20,699	24,160	20,403	19,337	13,311	22,257	21,367
70-74	82	286	231	133	82	27	16	857
Avg. Benefit	25,084	23,486	23,190	22,676	21,372	20,136	15,666	22,980
75-79	83	342	274	175	107	54	45	1,080
Avg. Benefit	25,928	26,538	26,267	25,490	24,494	23,590	22,774	25,746
80-84	102	360	276	179	131	65	75	1,188
Avg. Benefit	28,446	29,945	31,405	33,595	30,005	31,291	27,324	30,620
85-89	64	268	274	149	92	65	100	1,012
Avg. Benefit	34,452	36,708	36,978	35,815	37,855	39,830	31,968	36,343
90 +	24	139	152	135	83	67	84	684
Avg. Benefit	41,202	37,263	43,054	41,386	38,256	35,909	37,024	39,460
Total	448	1,846	1,502	933	556	312	340	5,937
Avg. Benefit	27,862	27,610	28,945	29,169	28,573	30,434	29,513	28,559

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 19A

**DISTRIBUTION OF SURVIVORS
(BASIC)**

Age	Years Since Death as of July 1, 2020							Total
	<1	1-4	5-9	10-14	15-19	20-24	25 +	
<45	2		2			1		5
Avg. Benefit	38,232		6,744			1,184		18,227
45-49						1		1
Avg. Benefit						19,354		19,354
50-54					1	2	2	5
Avg. Benefit					26,034	33,676	25,864	29,023
55-59		1					1	2
Avg. Benefit		73,072					38,007	55,539
60-64	2	1	1		1	2	1	8
Avg. Benefit	34,384	62,231	2,622		47,865	22,107	27,348	31,631
65-69	1	2	2		3	1	2	11
Avg. Benefit	4,814	23,554	23,253		29,506	8,454	20,007	21,401
70-74		10	8	1	2	1		22
Avg. Benefit		44,736	36,008	46,027	36,303	49,549		41,073
75-79	2	22	16	6	7	1	5	59
Avg. Benefit	63,240	51,008	65,801	43,049	39,315	76,187	53,952	53,914
80-84	4	32	26	23	14	10	14	123
Avg. Benefit	53,162	56,333	59,437	56,398	68,117	56,484	42,108	56,633
85-89	10	67	64	33	29	17	32	252
Avg. Benefit	73,136	60,771	53,552	56,023	56,664	64,088	51,124	57,333
90 +	7	36	45	39	32	24	30	213
Avg. Benefit	59,301	52,439	58,878	63,251	54,823	49,936	43,706	54,851
Total	28	171	164	102	89	60	87	701
Avg. Benefit	58,416	55,638	55,035	58,010	54,623	51,985	45,557	54,260

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 19B

**DISTRIBUTION OF SURVIVORS
(COORDINATED)**

Age	Years Since Death as of July 1, 2020							Total
	<1	1-4	5-9	10-14	15-19	20-24	25 +	
<45	16	62	34	14	5	1		132
Avg. Benefit	24,310	18,677	11,919	19,826	6,342	19,544		17,280
45-49	6	18	19	11	6	4	1	65
Avg. Benefit	24,399	16,230	21,062	8,424	5,121	22,449	34,499	16,714
50-54	2	44	30	13	1	4		94
Avg. Benefit	12,263	19,994	11,369	17,780	15,337	24,389		16,908
55-59	9	61	37	17	8	2	2	136
Avg. Benefit	18,444	22,403	14,360	12,308	16,133	29,920	22,740	18,438
60-64	18	96	62	42	15	6	6	245
Avg. Benefit	27,564	21,542	19,783	15,810	12,005	17,321	8,329	19,546
65-69	37	166	108	65	21	10	5	412
Avg. Benefit	21,781	20,665	24,176	20,403	17,885	13,796	23,158	21,366
70-74	82	276	223	132	80	26	16	835
Avg. Benefit	25,084	22,716	22,730	22,500	20,998	19,005	15,666	22,503
75-79	81	320	258	169	100	53	40	1,021
Avg. Benefit	25,007	24,856	23,815	24,866	23,456	22,598	18,877	24,118
80-84	98	328	250	156	117	55	61	1,065
Avg. Benefit	27,437	27,371	28,490	30,233	25,445	26,711	23,931	27,616
85-89	54	201	210	116	63	48	68	760
Avg. Benefit	27,289	28,687	31,927	30,066	29,197	31,239	22,954	29,384
90 +	17	103	107	96	51	43	54	471
Avg. Benefit	33,750	31,959	36,399	32,503	27,861	28,080	33,312	32,500
Total	420	1,675	1,338	831	467	252	253	5,236
Avg. Benefit	25,825	24,749	25,748	25,629	23,609	25,303	23,996	25,119

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, 2020							Total
	<1	1-4	5-9	10-14	15-19	20-24	25 +	
<45	1	11	6	2				20
Avg. Benefit	5,388	11,545	10,851	6,106				10,485
45-49	1	18	12	3	1			35
Avg. Benefit	37,788	21,284	13,755	8,115	2,171			17,499
50-54	6	33	17	8	6	2		72
Avg. Benefit	25,992	23,784	17,288	9,043	7,244	4,469		18,881
55-59	5	42	47	17	8	3	1	123
Avg. Benefit	35,154	28,463	22,663	15,502	11,542	6,607	3,020	22,887
60-64	4	60	75	28	11	9	5	192
Avg. Benefit	27,749	23,551	26,200	19,100	16,666	16,004	14,156	23,031
65 +	1	13	9	2	2			27
Avg. Benefit	22,857	33,093	19,925	24,850	10,360			26,030
Total	18	177	166	60	28	14	6	469
Avg. Benefit	28,264	24,484	22,491	15,949	12,215	12,343	12,300	21,581

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.



APPENDIX A – MEMBERSHIP DATA

This page is intentionally left blank



APPENDIX B

**SUMMARY OF
PLAN PROVISIONS**



APPENDIX B - SUMMARY OF PLAN PROVISIONS

This page is intentionally left blank



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: <table> <tr> <td></td> <td style="text-align: center;"><u>Member</u></td> <td style="text-align: center;"><u>Employer</u></td> </tr> <tr> <td></td> <td style="text-align: center;">11.00%</td> <td style="text-align: center;">15.77%</td> </tr> </table> <p>Employer rates will increase by 0.21% per year until they reach 16.39% beginning July 1, 2023. Member rates will increase to 11.25% effective July 1, 2023.</p> <p>Employee contributions are "picked up" according to the provisions of Internal Revenue Code 414(h).</p>		<u>Member</u>	<u>Employer</u>		11.00%	15.77%
	<u>Member</u>	<u>Employer</u>					
	11.00%	15.77%					
<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.						
<i>Salary</i>	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.						
<i>Average salary</i>	Average of the five highest successive years of Salary.						
<i>Retirement</i>							
<i><u>Normal retirement</u></i>							
<i>Age/Service requirements</i>	Age 60, or any age with 30 years of Teaching Service						
<i>Amount</i>	2.50% of Average Salary for each year of Teaching Service.						



APPENDIX B - SUMMARY OF PLAN PROVISIONS

BASIC MEMBERS

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 1.0 percent for January, 2019 through January, 2023. Beginning January 1, 2024, this amount will increase in 0.1% step increments until the COLA reaches 1.5%. 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.

Beginning July 1, 2024, eligibility for receipt of first COLA will be changed to Normal Retirement Age. Members who retire under rule of 90 or are least age 62 with 30 years of service are exempt from this delay in COLA.



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 3.00% 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;
- (c) 2.00% beginning July 1, 2012 until the earlier of June 30, 2019 and when the annuity begins; and
- (d) 0.00% beginning July 1, 2019.

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.

<i>Plan year</i>	July 1 through June 30				
<i>Eligibility</i>	A public school or Minnesota State 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 Minnesota State teacher will become a new Member unless that person elects coverage as defined by Minnesota Statutes under Chapter 354B.				
<i>Contributions</i>	Shown as a percent of Salary: <table> <tr> <td><u>Member</u></td> <td><u>Employer</u></td> </tr> <tr> <td>7.50%</td> <td>8.13%</td> </tr> </table> <p>Employer also contributes Supplemental amount equal to 3.64% of Salary (members employed by Special School District #1 only). Employer rates will increase by 0.21% per year until they reach 8.75% on July 1, 2023. Member rates will increase to 7.75% effective July 1, 2023.</p> <p>Employee contributions are "picked up" according to the provisions of Internal Revenue Code 414(h).</p>	<u>Member</u>	<u>Employer</u>	7.50%	8.13%
<u>Member</u>	<u>Employer</u>				
7.50%	8.13%				
<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.				
<i>Salary</i>	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.				
<i>Average salary</i>	Average of the five highest successive years of Salary. Average salary is based on all Allowable Service if less than five years.				



APPENDIX B - SUMMARY OF PLAN PROVISIONS

COORDINATED MEMBERS

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 65). 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, 2019, 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. Beginning July 1, 2019, the augmentation adjustment will be phased out.



APPENDIX B - SUMMARY OF PLAN PROVISIONS

COORDINATED MEMBERS

Retirement(continued)

Early Retirement Reduction Factors

First hired before July 1, 1989:

Benefit reductions for retiring prior to meeting normal retirement definitions apply. Members who reach age 62 with 30 years of service are eligible for a more favorable set of reduction factors than members who do not reach age 62 and 30 years of service. An extract of the reduction table is presented below:

Age 62	10.40%
Age 63	6.64%
Age 64	3.18%
Age 65	0.00%

Members who do not reach age 62 with 30 years of service credit are eligible for a different set of factors. When fully implemented on July 1, 2024, the following reduction factors will be applied to an eligible person with the normal retirement age of 65:

Age 55	58.0%	Age 61	28.0%
Age 56	54.0%	Age 62	21.0%
Age 57	50.0%	Age 63	14.0%
Age 58	46.0%	Age 64	7.0%
Age 59	42.0%	Age 65	0.0%
Age 60	35.0%		

First hired after June 30, 1989:

Reduction factors for members of the normal retirement age of 66 first hired from July 1, 1989 through June 30, 2006 and who reach age 62 with 30 years of service credit:

Age 62	14.46%
Age 63	10.40%
Age 64	6.64%
Age 65	3.18%
Age 66	0.00%



APPENDIX B - SUMMARY OF PLAN PROVISIONS

COORDINATED MEMBERS

Retirement(continued)

When fully implemented on July 1, 2024, the following reduction factors will be applied to an eligible person with the normal retirement age of 66 first hired from July 1, 1989 through June 30, 2006 and who do not reach age 62 with 30 years of service credit:

Age 55	65.0%	Age 61	35.0%
Age 56	61.0%	Age 62	28.0%
Age 57	57.0%	Age 63	21.0%
Age 58	53.0%	Age 64	14.0%
Age 59	49.0%	Age 65	7.0%
Age 60	42.0%	Age 66	0.0%

Reduction factors for members of the normal retirement age of 66 first hired on or after July 1, 2006 and who reach age 62 with 30 years of service credit:

Age 62	16.11%
Age 63	11.70%
Age 64	7.55%
Age 65	3.65%
Age 66	0.00%

When fully implemented on July 1, 2024, the following reduction factors will be applied to an eligible person with the normal retirement age of 66 first hired after June 30, 2006 and who do not reach age 62 with 30 years of service credit:

Age 55	65.0%	Age 61	35.0%
Age 56	61.0%	Age 62	28.0%
Age 57	57.0%	Age 63	21.0%
Age 58	53.0%	Age 64	14.0%
Age 59	49.0%	Age 65	7.0%
Age 60	42.0%	Age 66	0.0%

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 1.0 percent for January, 2019 through January, 2023. Beginning January 1, 2024, this amount will increase in 0.1% step increments until the COLA reaches 1.5%. 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.

Beginning July 1, 2024, eligibility for receipt of first COLA will be changed to Normal Retirement Age. Members who retire under rule of 90 or are least age 62 with 30 years of service are exempt from this delay in COLA.

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 3.00% 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;
- (c) 2.00% from July 1, 2012 forward until the earlier of June 30, 2019 and when the annuity begins; and
- (d) 0.00% from July 1, 2019 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, increased by 2.00% from July 1, 2012 to July 1, 2019 and no increase going forward until the annuity begins.



APPENDIX C

**ACTUARIAL METHODS
AND ASSUMPTIONS**



APPENDIX C – ACTUARIAL METHODS AND ASSUMPTIONS

This page is intentionally left blank



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, 2048, assuming payroll increases of 3.00% per year (effective with the 2018 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 FY21:

1993 Legislation: Supplemental contributions from the City of Minneapolis in the amount of \$1,250,000, from Minneapolis Schools in the amount of \$1,250,000 and from the State in the amount of \$2,500,000 (\$5,000,000 total) annually are assumed to be made until the amortization date of June 30, 2048 or full actuarial funding is achieved, whichever is earlier. Amount is fixed in statute.

1996 Legislation: Supplemental contributions from the State in the amount of \$3,256,410 annually are assumed to be made until the amortization date of June 30, 2048 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.

1997 Legislation: Supplemental contributions from the State in the amount of \$12,954,000 annually are assumed to be made until the amortization date of June 30, 2048 or full actuarial funding is achieved, whichever is earlier. Amount is fixed in statute.

2014 Legislation: Supplemental contributions from the State in the amount of \$14,377,000 annually are assumed to be made until the amortization date of June 30, 2048 or full actuarial funding is achieved, whichever is earlier. 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 2020, the limit is \$230,000.

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 2020, the limit is \$285,000. 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 full experience study dated June 28, 2019 and the study of economic assumptions presented to the Board in November 2017 and approved by the LCPR on February 19, 2018.

The Allowance for Combined Service Annuity was based on the recommendation of Deloitte Consulting LLP, the actuary for the Legislative Commission on Pensions and Retirement (LCPR). We are unable to judge the reasonableness of this assumption without performing a substantial amount of additional work beyond the scope of this assignment, so we have relied on Deloitte’s findings.

<i>Investment Return</i>	7.50% compounded annually.
<i>Future post-retirement adjustments</i>	1.0% for January, 2019 through January, 2023, then increasing by 0.1% each year up to 1.5% annually.
<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>	3.00% 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 5 years and female rates set back 7 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 vested former members are increased by 7.00% and liabilities for non-vested former members are increased by 9.00% 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>	<p>Married members are assumed to elect subsidized joint and survivor form of annuity as follows:</p> <table> <tr> <td>Males:</td> <td>10.0% elect 50% J&S option</td> </tr> <tr> <td></td> <td>10.0% elect 75% J&S option</td> </tr> <tr> <td></td> <td>60.0% elect 100% J&S option</td> </tr> <tr> <td></td> <td>20.0% elect Straight Life option</td> </tr> <tr> <td>Females:</td> <td>13.5% elect 50% J&S option</td> </tr> <tr> <td></td> <td>6.5% elect 75% J&S option</td> </tr> <tr> <td></td> <td>38.0% elect 100% J&S option</td> </tr> <tr> <td></td> <td>42.0% elect Straight Life option</td> </tr> </table> <p>Members eligible for deferred annuities (including current terminated deferred members) and future disability benefits are assumed to elect a life annuity.</p>	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		38.0% elect 100% J&S option		42.0% elect Straight Life option
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																
	38.0% elect 100% J&S option																
	42.0% elect Straight Life option																



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, 1972
Average salary	\$40,000
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	14.00%	12.00%
2	10.00%	10.00%
3	7.50%	8.00%
4	5.75%	6.50%
5	5.00%	5.25%
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	0.50%	0.50%
30	0.50%	0.50%
Over 30	0.00%	0.00%



APPENDIX C – ACTUARIAL METHODS AND ASSUMPTIONS

Age	Rate (%)			
	Pre-retirement Mortality*		Disability	
	Male	Female	Male	Female
20	0.022	0.013	0.00	0.00
25	0.029	0.013	0.00	0.00
30	0.034	0.014	0.00	0.00
35	0.032	0.017	0.01	0.01
40	0.037	0.022	0.03	0.03
45	0.044	0.029	0.05	0.05
50	0.068	0.045	0.10	0.10
55	0.118	0.076	0.16	0.16
60	0.196	0.121	0.25	0.25
65	0.329	0.177	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)*

Service	Salary Scale	
	Select Salary Increase Before July 1, 2028	Ultimate Salary Increase After June 30, 2028
1	8.85%	9.25%
2	7.10%	7.50%
3	6.60%	7.00%
4	6.35%	6.75%
5	6.35%	6.75%
6	6.20%	6.60%
7	6.05%	6.45%
8	5.90%	6.30%
9	5.75%	6.15%
10	5.60%	6.00%
11	5.35%	5.75%
12	5.10%	5.50%
13	4.85%	5.25%
14	4.60%	5.00%
15	4.35%	4.75%
16	4.10%	4.50%
17	3.85%	4.25%
18	3.65%	4.05%
19	3.55%	3.95%
20	3.45%	3.85%
21	3.35%	3.75%
22	3.25%	3.65%
23	3.15%	3.55%
24	3.05%	3.45%
25	2.95%	3.35%
26 or more	2.85%	3.25%



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
	<u>Early</u>	<u>Unreduced</u>	<u>Early</u>	<u>Unreduced</u>	<u>30 and Out Provision</u>	<u>30 and Out Provision</u>
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.



APPENDIX C – ACTUARIAL METHODS AND ASSUMPTIONS

Changes in actuarial assumptions and methods since the previous valuation

An experience study, based on the four-year period from July 1, 2014 to June 30, 2018, was completed in June 2019 and the Legislative Committee on Pensions and Retirement has adopted the following changes:

- Mortality tables used for active members have been adjusted to reflect higher rates of death for males and lower rates for females, to better match actual experience.
- Termination rates in the first five years of employment have been adjusted to better reflect observed experience.
- The probability that new female retirees will elect to receive their benefit as a 100% joint and survivor annuity has been refined to reflect observed experience.



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.