Minnesota State Retirement System

State Patrol Retirement Fund

Actuarial Valuation Report as of July 1, 2020

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December 1, 2020

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

Dear Board of Directors:

The results of the July 1, 2020 annual actuarial valuation of the State Patrol Retirement Fund are presented in this report. This report was prepared at the request of the Board and is intended for use by the Board and staff and those designated or approved by the Board. This report may be provided to parties other than the Board and staff only in its entirety. GRS is not responsible for the consequences of any unauthorized use of this report by persons other than intended users as described above.

The purpose of the valuation is to measure the Fund's funding progress and to determine the required contribution rate for the fiscal year beginning July 1, 2020 based on the prescribed assumptions. Note that the impact of GASB Statements No. 67 and No. 68 is provided in a separate report.

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

In a 2019 analysis of long-term rate of investment return and inflation assumptions, GRS determined that an investment return assumption of 7.50% was reasonable. Please see our experience study report for the State Employees Retirement Fund dated June 27, 2019 for additional information. This report also concluded that the probability of exceeding the current 7.50% assumption over 10 years is 44%. If capital market assumptions decline from present levels, the 7.50% return assumption might not comply with actuarial standards for the July 1, 2021 valuation. For informational purposes, results based on a 6.5% discount rate are shown on page 3.

The valuation assumed the continuing ability of the plan sponsor to make the contributions necessary to fund this plan. A determination regarding whether or not the plan sponsor is actually able to do so is outside our scope of expertise. Therefore, we did not make such a determination.

The contribution rate in this report is determined using the actuarial assumptions and methods disclosed in the Actuarial Basis section of this report. This report includes risk metrics on pages 4-7, but does not include a more robust assessment of the risks of future experience differing materially from the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment. We encourage a review and assessment of investment and other significant risks that may have a material effect on the plan's financial condition.

The findings in this report are based on data and other information through June 30, 2020. The valuation was based upon information furnished by the Minnesota State Retirement System (MSRS), concerning benefits, financial transactions, plan provisions and active members, terminated members, retirees and beneficiaries. We checked for internal and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the information provided by MSRS.

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

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

This report does not fully reflect the recent and still developing impact of COVID-19, which is likely to influence demographic and investment experience, at least in the short term. We will continue to monitor these developments and their impact on the plan.

This report was prepared using our proprietary valuation model and related software which in our professional judgment has the capability to provide results that are consistent with the purposes of the valuation. We performed tests to ensure that the model reasonably represents that which is intended to be modeled.

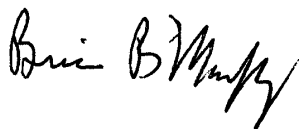
The signing actuaries are independent of the plan sponsor. We are not aware of any relationship that would impair the objectivity of our work.

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

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

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

Respectfully submitted,



Brian B. Murphy, FSA, EA, FCA, MAAA, PhD

Bonita J. Wurst, ASA, EA, FCA, MAAA

BBM/BJW:rmn

Other Observations

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

Given the plan's contribution allocation procedure, if there are no changes in benefits or contributions and all actuarial assumptions are met (including the statutory assumption of the plan earning 7.50%), it is expected that:

(1) The normal cost of the plan is expected to remain approximately level as a percent of pay,
(2) The funded status of the plan is expected to gradually improve and is expected to be 100% funded within the next 28 years, and
(3) The unfunded liability will grow initially as a dollar amount before beginning to decline.

Limitations of Funded Status Measurements

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

(1) The measurement is inappropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations; in other words, of transferring the obligations to an unrelated third party in an arm's length market value type transaction.

(2) The measurement is dependent upon the actuarial cost method which, in combination with the plan's amortization policy, affects the timing and amounts of future contributions. The amounts of future contributions will most certainly differ from those assumed in this report due to future actual experience differing from assumed experience based upon the actuarial assumptions. A funded status measurement in this report of 100% is not synonymous with no required future contributions. If the funded status were 100%, the plan would still require future normal cost contributions (i.e., contributions to cover the cost of the active membership accruing an additional year of service credit).

(3) The measurement would produce a different result if the market value of assets were used instead of the actuarial value of assets.

Limitations of Project Scope

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

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Summary of Valuation Results

Contributions

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

	Actuarial Valuation as of	
Total Contributions	**July 1, 2020**	**July 1, 2019**
Statutory Contributions - Chapter 352B (% of Payroll)	44.63%	42.17%
Required Contributions - Chapter 356 (% of Payroll)	40.53%	40.43%
Sufficiency / (Deficiency)	4.10%	1.74%

Statutory contributions are defined in statute as a fixed percentage of payroll and represent the amount that is actually contributed to the fund. Required contributions are defined in statute and the LCPR Standards for Actuarial Work, and represent the amount needed to fully fund the plan by June 30, 2048 (normal cost, expenses, and a payment to amortize the unfunded liability).

The contribution sufficiency improved from 1.74% of payroll to 4.10% of payroll. The primary reason for the change in contribution sufficiency was the increase in member and employer contributions effective July 1, 2020. On a market value of assets basis, contributions are sufficient by 3.74% of payroll.

The contribution sufficiency referenced above is based on a current snapshot of statutory contributions for the fiscal year ending June 30, 2021. Additional contribution increases will be phased in over the next year, ultimately increasing the statutory contribution rate (and the contribution sufficiency) by an additional 2.00% of payroll, if there are no significant gains or losses.

Based on the actuarial value of assets, statutory contribution rates (including the increases described above), and actuarial assumptions described in this report, statutory contributions are expected to bring the plan to full funding within the 28-year amortization period.

The Plan Assets section provides detail on the plan assets used for the valuation including a development of the Actuarial Value of Assets (AVA). The Market Value of Assets (MVA) earned approximately 4.2% for the plan year ending June 30, 2020. The AVA earned approximately 7.1% for the plan year ending June 30, 2020 as compared to the assumed rate of 7.50%. The assumed rate is a prescribed assumption mandated by Minnesota Statutes.

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

Accounting and financial reporting information prepared according to GASB Statements No. 67 and No. 68 has been provided in a separate report dated November 30, 2020.

Summary of Valuation Results

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

	Actuarial Valuation as of	
	July 1, 2020	**July 1, 2019**
Total Contributions (*% of Payroll*)		
Statutory - Chapter 352B	44.63%	42.17%
Required - Chapter 356	40.53%	40.43%
Sufficiency / (Deficiency)	4.10%	1.74%
Funding Ratios (*dollars in thousands*)		
Assets		
- Current assets (AVA)	$ 762,865	$ 737,700
- Current assets (MVA)	$ 757,590	$ 753,144
Accrued Benefit Funding Ratio		
- Current benefit obligations	$ 966,732	$ 938,813
- Funding ratio (AVA)	78.91%	78.58%
- Funding ratio (MVA)	78.37%	80.22%
Accrued Liability Funding Ratio		
- Actuarial accrued liability	$ 989,045	$ 959,964
- Funding ratio (AVA)	77.13%	76.85%
- Funding ratio (MVA)	76.60%	78.46%
Projected Benefit Funding Ratio		
- Current and expected future assets*	$ 1,263,409	$ 1,189,877
- Current and expected future benefit obligations	$ 1,203,759	$ 1,164,831
- Projected benefit funding ratio (AVA)*	104.96%	102.15%
Participant Data		
Active members		
- Number	937	943
- Actual covered payroll [GASB] *(000s)*	$ 84,530	$ 80,792
- Annual valuation earnings *(000s)*	$ 83,647	$ 81,089
- Projected annual earnings *(000s)*	$ 88,238	$ 85,543
- Average projected annual earnings	$ 94,171	$ 90,714
- Average age	40.7	40.7
- Average service	11.1	11.2
Service retirements	891	863
Survivors	152	155
Disability retirements	64	60
Deferred retirements	63	56
Terminated other non-vested	30	31
Total	**2,137**	**2,108**

** Per the LCPR Standards for Actuarial Work, calculated assuming the current percent of pay contribution toward the unfunded liability continues for the entire amortization period. Includes $1,000,000 state contribution and excludes future statutory contribution increases.*

Summary of Valuation Results

Effects of Changes

There were no changes in plan provisions, actuarial assumptions, or methods since the previous valuation.

Sensitivity Tests

During the 2017 legislative session, the Legislative Commission on Pensions and Retirement (LCPR) enacted a new sensitivity disclosure requirement for MSRS' valuations. Per the LCPR's requirement, we have calculated the liabilities associated with the following scenarios:

1) 6.5% interest rate assumption
2) 8.5% interest rate assumption

In each case, all other assumptions were unchanged from those used to develop the final valuation results in this report. Note that we believe the 8.5% interest rate would not comply with Actuarial Standards of Practice.

$ in millions	Final Valuation Assumptions	Final Valuation Assumptions with 6.5% interest	Final Valuation Assumptions with 8.5% interest
Normal Cost Rate, % of Pay	24.70%	31.28%	19.71%
Amortization of Unfunded Accrued Liability, Level % of Pay to 2048	15.57%	21.38%	9.67%
Expenses (% of Pay)	0.26%	0.26%	0.26%
Total Required Contribution, % of Pay	40.53%	52.92%	29.64%
Contribution Sufficiency/(Deficiency), % of Pay	4.10 %	(8.29)%	14.99 %
Accrued Liability Funding Ratio	77.1%	68.8%	85.8%
Present Value of Projected Benefits	$ 1,203.8	$ 1,404.3	$ 1,048.2
Present Value of Future Normal Costs	$ 214.8	$ 295.0	$ 158.7
Actuarial Accrued Liability	$ 989.0	$ 1,109.3	$ 889.5
Unfunded Accrued Liability	$ 226.2	$ 346.4	$ 126.6

Summary of Valuation Results

Risks Associated with Measuring the Accrued Liability and Actuarially Determined Contribution

The determination of the accrued liability and the actuarially determined contribution requires the use of assumptions regarding future economic and demographic experience. Risk measures, as illustrated in this report, are intended to aid in the understanding of the effects of future experience differing from the assumptions used in the course of the actuarial valuation. Risk measures may also help with illustrating the potential volatility in the accrued liability and the actuarially determined contribution that result from the differences between actual experience and the actuarial assumptions.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions due to changing conditions; 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. The scope of an actuarial valuation does not include an analysis of the potential range of such future measurements.

Examples of risk that may reasonably be anticipated to significantly affect the plan's future financial condition include:

1. **Investment Risk** – actual investment returns may differ from the expected returns;
2. **Asset/Liability Mismatch** – changes in asset values may not match changes in liabilities, thereby altering the gap between the accrued liability and assets and consequently altering the funded status and contribution requirements;
3. **Contribution Risk** – actual contributions may differ from expected future contributions. For example, actual contributions may not be made in accordance with the plan's funding policy or material changes may occur in the anticipated number of covered employees, covered payroll, or other relevant contribution base;
4. **Salary and Payroll Risk** – actual salaries and total payroll may differ from expected, resulting in actual future accrued liability and contributions differing from expected;
5. **Longevity Risk** – members may live longer or shorter than expected and receive pensions for a period of time other than assumed; and
6. **Other Demographic Risks** – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future accrued liability and contributions differing from expected.

The effects of certain trends in experience can generally be anticipated. For example, if the investment return since the most recent actuarial valuation is less (or more) than the assumed rate, the cost of the plan can be expected to increase (or decrease). Likewise if longevity is improving (or worsening), increases (or decreases) in cost can be anticipated.

Summary of Valuation Results

The Required Contribution rate shown on page 1 may be considered as a minimum contribution rate that complies with Minnesota Statutes and the requirements of the Standards for Actuarial Work published by the LCPR. The timely receipt of the actuarially determined contributions is critical to support the financial health of the plan. Users of this report should be aware that contributions made at the actuarially determined rate do not necessarily guarantee benefit security.

Plan Maturity Measures

Risks facing a pension plan evolve over time. A young plan with virtually no investments and paying few benefits may experience little investment risk. An older plan with a large number of members in pay status and a significant trust may be much more exposed to investment risk. Generally accepted plan maturity measures and values for the State Patrol Retirement Fund for the last two years include the following. Additional maturity measures are shown on the following pages.

	2020	2019
Ratio of market value of assets to total payroll	8.96	9.32
Ratio of actuarial accrued liability to total payroll	11.70	11.88
Ratio of actives to retirees and beneficiaries	0.85	0.87
Ratio of net cash flow to market value of assets	-3.5%	-3.8%
Approximate modified duration* of:		
▪ Total projected benefits:	14.79	14.69
▪ Actuarial accrued liability:	11.11	11.07
▪ Retiree liability:	8.75	8.72

* *Based on 7.5% interest.*

Ratio of Market Value of Assets to Payroll

The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. For example, if the market value of assets is 5.0 times the payroll, a return on assets 5% different than assumed would equal 25% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in plan sponsor contributions as a percentage of payroll.

Ratio of Actuarial Accrued Liability to Payroll

The relationship between actuarial accrued liability and payroll is a useful indicator of the potential volatility of contributions for a fully funded plan. A funding policy that targets a funded ratio of 100% is expected to result in the ratio of assets to payroll and the ratio of liability to payroll converging over time.

The ratio of liability to payroll may also be used as a measure of sensitivity of the contribution rates to liability gains and losses. For example, if the actuarial accrued liability is 5.0 times the payroll, a change in liability 2% other than assumed would equal 10% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in liability (and also plan sponsor contributions) as a percentage of payroll.

Summary of Valuation Results

Ratio of Actives to Retirees and Beneficiaries

A young plan with many active members and few retirees will have a high ratio of actives to retirees. A mature open plan may have close to the same number of actives as retirees resulting in a ratio near 1.0. A super-mature or closed plan may have significantly more retirees than actives resulting in a ratio below 1.0.

Ratio of Net Cash Flow to Market Value of Assets

A positive net cash flow means contributions exceed benefits and expenses. A negative cash flow means benefits and expenses exceed contributions and existing funds may be used to make payments. A certain amount of negative net cash flow is generally expected to occur when benefits are prefunded through a qualified trust. Large negative net cash flows as a percent of assets may indicate a super-mature plan or a need for additional contributions.

Duration of Actuarial Liability

The duration may be used to approximate the sensitivity of the liability to a small change in the assumed rate of return. For example, a duration of 10 indicates that the liability would change by approximately 10% if the assumed rate of return were changed by 1% (i.e., from 7.5% to 6.5%).

Additional Risk Assessment

Additional risk assessment is outside the scope of the annual actuarial valuation but could aid stakeholders in an understanding of the risks to which the System is exposed. Additional assessment may include scenario tests, sensitivity tests, stochastic modeling, stress tests, and a comparison of the present value of accrued benefits at low-risk discount rates with the actuarial accrued liability.

Summary of Valuation Results

Risk Measures (Dollars in Thousands)

Valuation Date (July 1)	(1) Accrued Liabilities (AAL)	(2) Market Value of Assets	(3) Market Value Unfunded AAL (1) - (2)	(4) Actual Covered Payroll	(5) Market Value Funded Ratio (2) / (1)	(6) Retiree Liabilities	(7) RetLiab/ AAL (6) / (1)	(8) AAL/ Payroll (1) / (4)	(9) Assets/ Payroll (2) / (4)
2011	$700,898	$568,279	$132,619	$63,250	81.1%	$454,811	64.9%	1108.1%	898.5%
2012	$760,955	$549,956	$210,999	$62,524	72.3%	$513,106	67.4%	1217.1%	879.6%
2013	$741,850	$593,201	$148,649	$62,121	80.0%	$507,005	68.3%	1194.2%	954.9%
2014	$800,421	$667,340	$133,081	$63,952	83.4%	$537,866	67.2%	1251.6%	1043.5%
2015	$833,033	$664,530	$168,503	$68,463	79.8%	$570,541	68.5%	1216.8%	970.6%
2016	$833,886	$629,992	$203,894	$69,343	75.6%	$581,343	69.7%	1202.6%	908.5%
2017	$880,846	$691,599	$189,247	$73,056	78.5%	$611,782	69.5%	1205.7%	946.7%
2018	$930,408	$729,799	$200,609	$74,007	78.4%	$647,308	69.6%	1257.2%	986.1%
2019	$959,964	$753,144	$206,820	$80,792	78.5%	$654,242	68.2%	1188.2%	932.2%
2020	$989,045	$757,590	$231,455	$84,530	76.6%	$676,416	68.4%	1170.1%	896.2%

Valuation Date (July 1)	(10) Portfolio StdDev	(11) Std Dev % of Pay (9) x (10)	(12) Unfunded / Payroll (3) / (4)	(13) Non-Investment Cash Flow (NICF)	(14) NICF/ Assets (13) / (2)	(15) SBI Market Rate of Return	(16) SBI 5-Year Average	(17) SBI 10-Year Trailing Average
2011			209.7%	$(31,499)	-5.5%	23.3%	5.3%	N/A
2012			337.5%	$(31,067)	-5.6%	2.4%	2.3%	N/A
2013			239.3%	$(33,070)	-5.6%	14.2%	6.2%	N/A
2014			208.1%	$(33,048)	-5.0%	18.6%	14.5%	N/A
2015	0	1	246.1%	$(31,713)	-4.8%	4.4%	12.3%	N/A
2016	14.1%	128.1%	294.0%	$(33,764)	-5.4%	-0.1%	7.7%	N/A
2017	14.1%	133.5%	259.0%	$(31,470)	-4.6%	15.1%	10.2%	6.2%
2018	14.1%	139.0%	271.1%	$(32,274)	-4.4%	10.3%	9.4%	7.8%
2019	14.3%	133.3%	256.0%	$(28,478)	-3.8%	7.3%	7.3%	10.9%
2020	14.3%	128.2%	273.8%	$(26,627)	-3.5%	4.2%	7.2%	9.7%

Notes pertaining to numbered columns:

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

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

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

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

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

(13) and (14). The ratio of non-investment cash flow to assets is an important measure of sustainability. Negative ratios are common and expected for a maturing system. In the longer term, this ratio should be on the order of approximately -4%. A ratio that is significantly more negative than that for an extended period could be a leading indicator of potential exhaustion of assets.

(15) (16) and (17). Investment return is probably the largest single risk that most systems face. The year by year return and the 5-year and 10-year geometric average give an indicator of past performance. Of course, past performance is not a guarantee of future results, may not ever be reflective of potential future results, and historical averages are very sensitive to the time period chosen. The performance data for the Combined Funds (pooled investments of major Minnesota Public Retirement Systems) is presented in these columns. The source of this data is the Minnesota State Board of Investment.

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

Supplemental Information

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

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

Plan Assets

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

Assets	Market Value June 30, 2020	Market Value June 30, 2019
Cash, equivalents, short term securities	$ 34,673	$ 23,416
Fixed income	153,586	76,521
Equity	567,663	651,897
Other*	53,017	55,780
Total cash, investments, and other assets	**$ 808,939**	**$ 807,614**
Amounts receivable	$ 2,034	$ 1,653
Total Assets	**$ 810,973**	**$ 809,267**
Amounts payable*	$ (53,383)	$ (56,123)
Net Position Restricted for Pensions	**$ 757,590**	**$ 753,144**

** Includes $53,017 in Securities Lending Collateral as of June 30, 2020 and $55,780 as of June 30, 2019.*

Plan Assets

Reconciliation of Plan Assets *(Dollars in Thousands)*

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

Change in Assets	**Market Value**	
Year Ending	**June 30, 2020**	**June 30, 2019**
1. Fund balance at market value at beginning of year	**$ 753,144**	**$ 729,799**
2. Contributions		
a. Member	12,595	12,038
b. Employer	21,975	19,479
c. Other sources - Supplemental State Aid	1,000	1,000
d. Total contributions	$ 35,570	$ 32,517
3. Investment income		
a. Investment income/(loss)	$ 31,769	$ 52,541
b. Investment expenses	(696)	(718)
c. Net investment income/(loss)	$ 31,073	$ 51,823
4. Other	$ -	$ -
5. Total income: *(2.d.) + (3.c.) + (4.)*	**$ 66,643**	**$ 84,340**
6. Benefits Paid		
a. Annuity benefits	(61,859)	(60,375)
b. Refunds	(112)	(428)
c. Total benefits paid	$ (61,971)	$ (60,803)
7. Expenses		
a. Other	(2)	(1)
b. Administrative	(224)	(191)
c. Total expenses	$ (226)	$ (192)
8. Total disbursements: *(6.c.) + (7.c.)*	**$ (62,197)**	**$ (60,995)**
9. Fund balance at market value at end of year: *(1.) + (5.) + (8.)*	**$ 757,590**	**$ 753,144**
10. State Board of Investment calculated investment return	4.2%	7.3%

Plan Assets

Actuarial Asset Value *(Dollars in Thousands)*

	June 30, 2020	June 30, 2019
1. Market value of assets available for benefits	**$ 757,590**	**$ 753,144**
2. Determination of average balance		
a. Total assets available at beginning of year	753,144	729,799
b. Total assets available at end of year	757,590	753,144
c. Net investment income for fiscal year	31,073	51,823
d. Average balance *[a. + b. - c.] / 2*	739,831	715,560
3. Expected return *[7.5% x 2.d.]*	55,487	53,667
4. Actual return	31,073	51,823
5. Current year asset gain/(loss) *[4. - 3.]*	(24,414)	(1,844)
6. Unrecognized asset returns		

	Original Amount	Unrecognized Amount %	Unrecognized Amount $	Unrecognized Amount %	Unrecognized Amount $
a. Year ended June 30, 2020	$ (24,414)	80%	$ (19,531)	N/A	N/A
b. Year ended June 30, 2019	(1,844)	60%	(1,106)	80%	$ (1,475)
c. Year ended June 30, 2018	16,437	40%	6,575	60%	9,862
d. Year ended June 30, 2017	43,936	20%	8,787	40%	17,574
e. Year ended June 30, 2016	(52,586)		N/A	20%	(10,517)
f. Unrecognized return adjustment			**$ (5,275)**		**$ 15,444**

7. **Actuarial value at end of year** *(1. - 6.f.)*	**$ 762,865**	**$ 737,700**
8. Approximate return on actuarial value of assets during fiscal year	7.1%	7.1%
9. Ratio of actuarial value of assets to market value of assets	1.01	0.98

Membership Data

Distribution of Active Members

	Years of Service as of June 30, 2020									
Age	**<3***	**3 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25 - 29**	**30 - 34**	**35+**	**Total**
< 25	19									**19**
Avg. Earnings	$ 66,786									**$ 66,786**
25 - 29	49	38	18							**105**
Avg. Earnings	$ 62,534	$ 77,676	$ 83,423							**$ 71,595**
30 - 34	39	29	65	10						**143**
Avg. Earnings	$ 65,964	$ 72,214	$ 88,079	$ 92,681						**$ 79,152**
35 - 39	29	23	49	35	12					**148**
Avg. Earnings	$ 74,495	$ 84,511	$ 88,994	$ 92,086	$ 96,549					**$ 86,800**
40 - 44	16	14	26	27	58	15				**156**
Avg. Earnings	$ 84,352	$ 81,832	$ 90,031	$ 92,986	$104,380	$104,971				**$ 95,996**
45 - 49	11	8	17	36	45	63	3			**183**
Avg. Earnings	$ 80,531	$ 92,667	$ 85,213	$ 94,189	$ 99,022	$ 98,931	$100,688			**$ 95,395**
50 - 54	3	3	9	20	21	62	23	11		**152**
Avg. Earnings	$ 68,023	$101,579	$ 93,260	$ 95,181	$ 97,202	$101,674	$102,277	$108,569		**$ 99,628**
55 - 59	1		6	2	5	8	3	2		**27**
Avg. Earnings	$ 89,672		$ 98,734	$101,738	$ 97,383	$102,398	$ 98,826	$109,682		**$100,277**
60 - 64			1	1		2				**4**
Avg. Earnings			$119,474	$ 96,453		$ 97,953				**$102,958**
65 - 69										
Avg. Earnings										
70+										
Avg. Earnings										
Total	**167**	**115**	**191**	**131**	**141**	**150**	**29**	**13**		**937**
Avg. Earnings	**$ 69,433**	**$ 79,838**	**$ 88,629**	**$ 93,548**	**$100,686**	**$100,841**	**$101,755**	**$108,740**		**$ 89,271**

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

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

Membership Data

Distribution of Service Retirements

	Years Retired as of June 30, 2020							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<50								
Avg. Benefit								
50 - 54	5	10						**15**
Avg. Benefit	$ 20,540	$ 27,304						**$ 25,049**
55 - 59	33	77	30	1				**141**
Avg. Benefit	$ 60,015	$ 56,504	$ 50,462	$ 55,741				**$ 56,035**
60 - 64	8	38	120	24				**190**
Avg. Benefit	$ 47,893	$ 55,747	$ 61,979	$ 44,612				**$ 57,946**
65 - 69		3	41	91	20			**155**
Avg. Benefit		$ 29,202	$ 55,163	$ 57,443	$ 50,150			**$ 55,352**
70 - 74				25	90	19		**134**
Avg. Benefit				$ 51,029	$ 58,911	$ 61,193		**$ 57,764**
75 - 79		1		6	24	88	3	**122**
Avg. Benefit		$ 35,835		$ 47,030	$ 63,881	$ 66,979	$ 47,048	**$ 64,643**
80 - 84					1	29	38	**68**
Avg. Benefit					$ 13,059	$ 76,791	$ 68,635	**$ 71,296**
85 - 89						3	39	**42**
Avg. Benefit						$ 87,961	$ 77,782	**$ 78,509**
90+							24	**24**
Avg. Benefit							$ 78,714	**$ 78,714**
Total	**46**	**129**	**191**	**147**	**135**	**139**	**104**	**891**
Avg. Benefit	**$ 53,616**	**$ 53,222**	**$ 58,707**	**$ 53,821**	**$ 58,157**	**$ 68,688**	**$ 73,768**	**$ 60,076**

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

Membership Data

Distribution of Survivors

	Years Since Death as of June 30, 2020							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<45		7			1			**8**
Avg. Benefit		$ 25,471			$ 6,433			**$ 23,091**
45 - 49		1		3	2			**6**
Avg. Benefit		$ 48,445		$ 17,615	$ 34,752			**$ 28,465**
50 - 54		1						**1**
Avg. Benefit		$ 58,850						**$ 58,850**
55 - 59		2			2	1		**5**
Avg. Benefit		$ 51,759			$ 25,355	$ 64,883		**$ 43,822**
60 - 64		2	1		1	2		**6**
Avg. Benefit		$ 44,360	$ 27,919		$ 14,843	$ 28,817		**$ 31,519**
65 - 69		5	3	3	3			**14**
Avg. Benefit		$ 57,518	$ 27,996	$ 35,149	$ 42,382			**$ 43,155**
70 - 74	2	9	2	4	8	5		**30**
Avg. Benefit	$ 47,249	$ 41,626	$ 31,625	$ 37,347	$ 22,414	$ 51,311		**$ 37,255**
75 - 79		4	6	3	6	4	1	**24**
Avg. Benefit		$ 44,825	$ 33,383	$ 43,428	$ 46,886	$ 29,368	$ 34,091	**$ 39,282**
80 - 84	1	4	7	1	3	2	3	**21**
Avg. Benefit	$ 29,440	$ 37,555	$ 40,066	$ 53,501	$ 37,302	$ 39,582	$ 21,996	**$ 36,699**
85 - 89	2	2	2	2	3	2	2	**15**
Avg. Benefit	$ 40,759	$ 42,379	$ 43,533	$ 24,356	$ 33,334	$ 61,868	$ 33,607	**$ 39,534**
90+		2	4	4	5	3	4	**22**
Avg. Benefit		$ 48,319	$ 31,183	$ 44,421	$ 36,479	$ 44,826	$ 30,527	**$ 38,092**
Total	**5**	**39**	**25**	**20**	**34**	**19**	**10**	**152**
Avg. Benefit	**$ 41,091**	**$ 42,332**	**$ 34,709**	**$ 35,893**	**$ 33,046**	**$ 43,891**	**$ 28,940**	**$ 37,427**

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

Membership Data

Distribution of Disability Retirements

	Years Disabled as of June 30, 2020							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
< 45	1	2	1					**4**
Avg. Benefit	$ 47,472	$ 33,422	$ 52,304					**$ 41,655**
45 - 49	1	2	1	2				**6**
Avg. Benefit	$ 44,222	$ 48,614	$ 43,422	$ 32,089				**$ 41,508**
50 - 54	2	4	3	1				**10**
Avg. Benefit	$ 47,847	$ 56,131	$ 43,232	$ 39,360				**$ 48,927**
55 - 59		3	5	6		1		**15**
Avg. Benefit		$ 33,802	$ 59,409	$ 46,657		$ 30,034		**$ 47,229**
60 - 64			2	2	1			**5**
Avg. Benefit			$ 36,051	$ 52,105	$ 43,904			**$ 44,043**
65 - 69				2	4	3	2	**11**
Avg. Benefit				$ 44,324	$ 41,679	$ 32,603	$ 44,703	**$ 40,235**
70 - 74					7	1		**8**
Avg. Benefit					$ 38,226	$ 52,243		**$ 39,978**
75+					1		4	**5**
Avg. Benefit					$ 35,485		$ 61,347	**$ 56,175**
Total	**4**	**11**	**12**	**13**	**13**	**5**	**6**	**64**
Avg. Benefit	**$ 46,847**	**$ 44,546**	**$ 49,548**	**$ 44,334**	**$ 39,514**	**$ 36,017**	**$ 55,799**	**$ 44,951**

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

Membership Data

Reconciliation of Members

		Terminated		Recipients			
	Actives	Deferred Retirement	Other Non-Vested	Service Retirement	Disability Retirement	Survivor	Total
Members on 7/1/2019	**943**	**56**	**31**	**863**	**60**	**155**	**2,108**
New members	53						**53**
Return to active	0	0	0	0	0	0	**0**
Terminated non-vested	(4)	0	4	0	0	0	**0**
Service retirements	(37)	(4)	0	41	0	0	**0**
Terminated deferred	(10)	10	0	0	0	0	**0**
Terminated refund/transfer	(4)	0	(4)	0	0	0	**(8)**
Deaths	0	0	0	(18)	0	(7)	**(25)**
New beneficiary	0	0	0	0	0	5	**5**
Disabled	(4)	0	0	0	4	0	**0**
Unexpected status change	0	1	(1)	5	0	(1)	**4**
Net change	(6)	7	(1)	28	4	(3)	**29**
Members on 6/30/2020	**937**	**63**	**30**	**891**	**64**	**152**	**2,137**

Summary of Membership

Active Member Statistics	Total
Number	937
Average age	40.7
Average service	11.1
Average salary	$ 89,271

Terminated Member Statistics	Deferred Retirement	Other Non-Vested	Total
Number	63	30	93
Average age	45.2	33.9	41.6
Average service	8.3	0.7	5.8
Average annual benefit, with augmentation to December 31, 2018 and 13% CSA load	$ 23,011	N/A	$ 23,011
Average refund value, with 13% CSA load (0% for Non-Vested Members)	$ 104,040	$ 6,174	$ 72,470

Retiree & Survivor Member Statistics	Service Retirees	Disabled Retirees	Survivors	Total
Number	891	64	152	1,107
Average age	68.9	59.9	73.7	69.1
Average annual benefit	$ 60,076	$ 44,951	$ 37,427	$ 56,092

Development of Costs

Actuarial Valuation Balance Sheet *(Dollars in Thousands)*

The actuarial balance sheet is based on the principle that the long-term projected benefit obligations of the plan should be ideally equal to the long-term resources available to fund those obligations. A Projected Benefit Funding Ratio less than 100% indicates that contributions are insufficient. The resources available to meet projected obligations for current members consist of current fund assets plus the present value of anticipated future contributions intended to fund benefits for current members. In the exhibit below, B.2 is the estimated present value of contributions to fund the normal cost rate for current members until their respective termination dates. Item B.1 is the present value of the total 44.63% statutory contribution net of normal cost and anticipated plan expenses during the period from the valuation date to the statutory unfunded amortization date.

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

				June 30, 2020
A. Actuarial Value of Assets				$ 762,865
B. Expected Future Assets				
1. Present value of expected future statutory supplemental contributions*				285,830
2. Present value of future normal cost contributions				214,714
3. Total expected future assets: *(1.) + (2.)*				$ 500,544
C. Total Current and Expected Future Assets				1,263,409
D. Current Benefit Obligations**				
1. Benefit recipients	**Non-Vested**	**Vested**	**Total**	
a. Service retirements	$ -	$ 589,490	$ 589,490	
b. Disability retirements	-	49,929	49,929	
c. Survivors	-	36,997	36,997	
2. Deferred retirements	-	10,991	10,991	
3. Former members without vested rights***	72	-	72	
4. Active members	24,481	254,772	279,253	
5. Total Current Benefit Obligations	$ 24,553	$ 942,179	$ 966,732	
E. Expected Future Benefit Obligations				237,027
F. Total Current and Expected Future Benefit Obligations****				1,203,759
G. Unfunded Current Benefit Obligations: *(D.5.) - (A.)*				203,867
H. Unfunded Current and Future Benefit Obligations: *(F.) - (C.)*				(59,650)
I. Accrued Benefit Funding Ratio: *(A.)/(D.5.)*				78.91%
J. Projected Benefit Funding Ratio: *(C.)/(F.)*				104.96%

* *Per the LCPR Standards for Actuarial Work, calculated assuming the current percent of pay contribution toward the unfunded liability continues for the entire amortization period. Includes $1,000,000 state contribution and excludes future statutory contribution increases.*

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

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

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

Development of Costs

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

	Actuarial Present Value of Projected Benefits	Actuarial Present Value of Future Normal Costs	Actuarial Accrued Liability
A. Determination of Actuarial Accrued Liability (AAL)			
1. Active members			
a. Retirement annuities	$ 481,111	$ 189,021	$ 292,090
b. Disability benefits	24,766	17,079	7,687
c. Survivor's benefits	4,673	3,241	1,432
d. Deferred retirements	4,763	4,172	591
e. Refunds*	967	1,201	(234)
f. Total	$ 516,280	$ 214,714	$ 301,566
2. Deferred retirements	10,991	-	10,991
3. Former members without vested rights	72	-	72
4. Benefit recipients	676,416	-	676,416
5. Total	$ 1,203,759	$ 214,714	$ 989,045

B. Determination of Unfunded Actuarial Accrued Liability (UAAL)	
1. Actuarial accrued liability	$ 989,045
2. Current assets (AVA)	762,865
3. Unfunded actuarial accrued liability	$ 226,180
C. Determination of Supplemental Contribution Rate**	
1. Present value of future payrolls through the amortization date of June 30, 2048	$ 1,453,129
2. Supplemental contribution rate: *(B.3.) / (C.1.)*	15.57% ***

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

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

*** *The amortization factor as of June 30, 2020 is 16.46830.*

Development of Costs

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

	Year Ending June 30, 2020		
	Actuarial Accrued Liability	Current Assets	Unfunded Actuarial Accrued Liability
A. Unfunded Actuarial Accrued Liability at beginning of year	$ 959,964	$ 737,700	$ 222,264
B. Changes due to interest requirements and current rate of funding			
1. Normal cost, including expenses	21,346	-	21,346
2. Benefit payments	(61,971)	(61,971)	-
3. Contributions	-	35,570	(35,570)
4. Interest on A., B.1., B.2. and B.3.	70,474	54,337	16,137
5. Total *(B.1. + B.2. + B.3. + B.4.)*	$ 29,849	$ 27,936	$ 1,913
C. Expected Unfunded Actuarial Accrued Liability at end of year *(A. + B.5.)*	$ 989,813	$ 765,636	$ 224,177
D. Increase (decrease) due to actuarial losses (gains) because of experience deviations from expected			
1. Age and service retirements			$ 868
2. Disability retirements			527
3. Death-in-service benefits			(145)
4. Withdrawals			(1,008)
5. Salary increases			(1,327)
6. Investment income			2,771
7. Mortality of annuitants			(1,626)
8. Other items			1,943
9. Total			$ 2,003
E. Unfunded Actuarial Accrued Liability at end of year before plan amendments and changes in actuarial assumptions *(C. + D.9.)*			$ 226,180
F. Change in Unfunded Actuarial Accrued Liability due to changes in plan provisions			-
G. Change in Unfunded Actuarial Accrued Liability due to changes in actuarial assumptions			-
H. Change in Unfunded Actuarial Accrued Liability due to changes in actuarial methods			-
I. Unfunded Actuarial Accrued Liability at end of year *(E. + F. + G. + H.)**			$ 226,180

** The Unfunded Actuarial Accrued Liability on a market value of assets basis is $231,455.*

Development of Costs

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

The required contribution is defined in Minnesota Statutes as the sum of normal cost, a supplemental contribution to amortize the UAAL, and an allowance for expenses. The dollar amounts shown are for illustrative purposes and equal percent of payroll multiplied by projected annual payroll.

	Percent of Payroll	Dollar Amount
A. Statutory contributions - Chapter 352B		
1. Employee contributions	15.40%	$ 13,589
2. Employer contributions	23.10%	20,383
3. Employer supplemental contributions	5.00%	4,412
4. State contributions***	1.13%	1,000
5. Total	44.63%	$ 39,384
B. Required contributions - Chapter 356		
1. Normal cost		
a. Retirement benefits	21.76%	$ 19,201
b. Disability benefits	1.97%	1,738
c. Survivors	0.40%	353
d. Deferred retirement benefits	0.46%	406
e. Refunds*	0.11%	97
f. Total	24.70%	$ 21,795
2. Supplemental contribution amortization of Unfunded Actuarial Accrued Liability by June 30, 2048	15.57%	$ 13,739
3. Allowance for expenses	0.26%	$ 229
4. Total	40.53% **	$ 35,763
C. Contribution Sufficiency/(Deficiency) *(A.5. - B.4.)*	4.10%	$ 3,621

Note: Projected annual payroll for fiscal year beginning on the valuation date: $88,238 (determined according to the requirements of the LCPR Standards for Actuarial Work).

* *Includes non-vested refunds and non-married survivor benefits only.*
** *The required contribution on a Market Value of Assets basis is 40.89% of payroll.*
*** *Contributions paid until both the Public Employees Retirement Association Police and Fire Plan and the State Patrol Retirement Fund reach 90% funding (on a Market Value of Assets basis) or July 1, 2048 if earlier.*

Actuarial Basis

Actuarial Methods

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

Actuarial Cost Method

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

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

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.

Actuarial Basis

Actuarial Methods (Concluded)

Asset Valuation Method

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

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

Payment on the Unfunded Actuarial Accrued Liability

Payment equals a level percentage of payroll each year to the statutory amortization date of June 30, 2048 assuming payroll increases of 3.25% per annum. If there is a negative Unfunded Actuarial Accrued Liability, the surplus amount is amortized over 30 years as a level percentage of payroll. If the unfunded liability increases due to changes in benefits, assumptions, or methods, the statutory amortization date may be extended.

As required by the Standards for Actuarial Work, projected payroll is 1) determined by increasing reported payroll for each member by one full year's assumed pay increase according to the actuarial salary scale and 2) multiplied by 0.962 in the determination of the present value of future payroll to account for timing differences. This statutory method produces a required contribution that is similar to, but slightly below, the contribution that would be produced by more common actuarial methods.

Changes in Methods since Prior Valuation

There have been no changes in actuarial methods since the prior valuation.

Actuarial Basis

Summary of Actuarial Assumptions

The following assumptions were used in valuing the liabilities and benefits under the plan. All actuarial assumptions are prescribed by Minnesota Statutes, the Legislative Commission on Pensions and Retirement (LCPR), or the MSRS Board of Directors. These parties are responsible for selecting the assumptions used for this valuation. The assumptions prescribed are based on the last experience study, dated July 26, 2016, and a review of inflation and investment return assumptions, dated September 11, 2017. An experience study for the 2015-2019 period was issued on June 30, 2020. This report recommended changes to economic and demographic assumptions, expected to be effective at a future date. The Allowance for Combined Service Annuity assumptions are based on an analysis completed by the LCPR actuary and documented in a report dated October 2016.

Investment return	7.50% per annum.
Salary increases	Reported salary at valuation date increased according to the rate table, to current fiscal year and annually for each future year. Prior fiscal year salary is annualized for members with less than one year of service.
Inflation	2.50% per year.
Payroll growth	3.25% per year.
Mortality rates	
Healthy pre-retirement	RP-2014 employee generational mortality table projected with mortality improvement Scale MP-2015 from a base year of 2006, white collar adjustment.
Healthy post-retirement	RP-2014 annuitant generational mortality table projected with mortality improvement Scale MP-2015 from a base year of 2006, white collar adjustment.
Disabled	RP-2014 annuitant generational mortality table projected with mortality improvement Scale MP-2015 from a base year of 2006, white collar adjustment.
Notes	The RP-2014 employee mortality table as published by the Society of Actuaries (SOA) contains mortality rates for ages 18 to 80 and the annuitant mortality table contains mortality rates for ages 50 to 120. We have extended the annuitant mortality table as needed for members younger than age 50 who are receiving a benefit by deriving rates based on the employee table and the juvenile table. Similarly, we have extended the employee table as needed for members older than age 80 by deriving rates based on the annuitant table.
Retirement	Members retiring from active status are assumed to retire according to the age related rates shown in the rate table. Members who have attained the highest assumed retirement age are assumed to retire in one year. Note that plan changes reflected in this report may result in behavior changes that are not anticipated in the current retirement rates.
Withdrawal	Select and Ultimate rates based on actual experience. Ultimate rates after the third year are shown in rate table. Select rates in the first three years are:

Year	Select Withdrawal Rates
1	2.50%
2	2.00%
3	1.50%

Actuarial Basis

Summary of Actuarial Assumptions (Continued)

Disability	Age-related rates based on experience; see table of sample rates. All incidences are assumed to be duty-related.
Allowance for combined service annuity	Liabilities for former, vested members are increased by 13.00% to account for the effect of some participants having eligibility for a Combined Service Annuity.
Administrative expenses	Prior year administrative expenses expressed as percentage of prior year projected payroll.
Refund of contributions	Account balances accumulate interest until normal retirement date and are discounted back to the valuation date. All employees withdrawing after becoming eligible for a deferred benefit are assumed to take the larger of the contributions accumulated with interest or the value of the deferred benefit.
Commencement of deferred benefits	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 55.
Percentage married	85% of active members are assumed to be married. Actual marital status is used for members in payment status.
Age of spouse	Females are assumed to be two years younger than their spouses, and males are assumed to be two years older than their spouses.
Eligible children	Each member may have two dependent children depending on member's age. Assumed first child is born at member's age 28 and second child at member's age 31.
Form of payment	Married members retiring from active status are assumed to elect subsidized Joint and Survivor form of annuity as follows: 20% elect 50% Joint & Survivor option 10% elect 75% Joint & Survivor option 55% elect 100% Joint & Survivor option Remaining married and unmarried members are assumed to elect the Straight Life option.
Eligibility testing	Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.
Decrement operation	Withdrawal decrements do not operate during retirement eligibility. Decrements are assumed to occur mid-fiscal year.
Service credit accruals	It is assumed that members accrue one year of service credit per year.
Pay increases	Pay increases are assumed to happen at the beginning of the fiscal year. This is equivalent to assuming that reported earnings are pensionable earnings for the year ending on the valuation date.

Actuarial Basis

Summary of Actuarial Assumptions (Continued)

Unknown data for certain members	To prepare this report, GRS has used and relied on participant data supplied by the Fund. Although GRS has reviewed the data in accordance with Actuarial Standards of Practice No. 23, GRS has not verified or audited any of the data or information provided. There are no members reported with missing birth dates. In cases where submitted data was missing or incomplete, the following assumptions were applied: Data for active members: There were no members reported with missing salary or service. Data for terminated members: There were two members reported without a benefit. We calculated benefits for these members using the reported Credited Service and Termination Date. Average Salary was not reported, so we assumed a value of $45,000. Data for members receiving benefits: There were no members reported without a benefit. There were no survivors reported with an expired benefit. There were six retirees reported with a bounceback annuity and an unreasonable reduction factor. A factor of 0.80, 0.85 and 0.90 was assumed for the 100%, 75% and 50% joint and survivor annuity, respectively. There was one retiree reported with a survivor option and a survivor date of death. We assumed no benefit was payable to the survivor, and the member benefit already reflected the "pop-up," if any. For retirees who elected a survivor benefit option, we used the valuation assumptions if the survivor date of birth was missing or invalid (170 members) and/or the survivor gender was missing or invalid (186 members).
Changes in actuarial assumptions	There have been no changes in actuarial assumptions since the prior valuation.

Actuarial Basis

Summary of Actuarial Assumptions (Continued)

Age in 2020	Percentage of Members Dying each Year*					
	Healthy Post-Retirement Mortality**		Healthy Pre-Retirement Mortality**		Disability Mortality**	
	Male	Female	Male	Female	Male	Female
20	0.02%	0.01%	0.02%	0.01%	0.02%	0.01%
25	0.03	0.02	0.03	0.01	0.03	0.02
30	0.05	0.04	0.03	0.02	0.05	0.04
35	0.07	0.08	0.03	0.03	0.07	0.08
40	0.11	0.11	0.04	0.03	0.11	0.11
45	0.16	0.14	0.06	0.05	0.16	0.14
50	0.24	0.19	0.10	0.08	0.24	0.19
55	0.36	0.27	0.18	0.14	0.36	0.27
60	0.50	0.39	0.31	0.20	0.50	0.39
65	0.72	0.62	0.55	0.30	0.72	0.62
70	1.17	0.99	0.97	0.51	1.17	0.99
75	2.03	1.67	1.74	0.90	2.03	1.67
80	3.61	2.97	3.12	1.61	3.61	2.97
85	6.65	5.44	6.50	4.31	6.65	5.44
90	12.20	9.94	12.34	9.62	12.20	9.94

* *Generally, mortality rates are expected to increase as age increases. These standard mortality rates have been adjusted slightly to prevent decreasing mortality rates. The adjustment has no material effect on results.*

** *Rates are adjusted for mortality improvements using Scale MP-2015 from a base year of 2006.*

Age	Percent of Members Decrementing Each Year			
	Termination (Withdrawal) Rates After Third Year		Disability Retirement	
	Male	Female	Male	Female
20	1.47%	1.47%	0.03%	0.03%
25	1.13	1.13	0.05	0.05
30	0.80	0.80	0.06	0.06
35	0.47	0.47	0.11	0.11
40	0.40	0.40	0.18	0.18
45	0.40	0.40	0.30	0.30
50	0.00	0.00	0.48	0.48
55	0.00	0.00	0.00	0.00
60	0.00	0.00	0.00	0.00
65	0.00	0.00	0.00	0.00

Actuarial Basis

Summary of Actuarial Assumptions (Concluded)

Age	Percent Retiring
50	5 %
51	5
52	5
53	5
54	5
55	65
56	50
57	30
58	20
59	30
60+	100

Salary Scale	
Year	Increase
1	15.25%
2	9.25
3	7.75
4	7.25
5	6.75
6	6.25
7	6.00
8	5.75
9	5.50
10	5.25
11	5.00
12	4.75
13	4.50
14	4.25
15	4.25
16	4.25
17	4.00
18	4.00
19	3.75
20	3.75
21	3.65
22	3.55
23	3.45
24	3.35
25+	3.25

Actuarial Basis

Summary of Plan Provisions

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

Plan year	July 1 through June 30.
Eligibility	State troopers, conservation officers, certain crime bureau and gambling enforcement officers, and certain other persons listed in Minnesota Statutes 352B.011 subdivision 10.
Contributions	Percent of Salary:

Effective as of	Member	Regular Employer	Supplemental Employer	Total
Prior to July 1, 2018	14.40%	21.60%	0.00%	36.00%
July 1, 2018	14.90%	22.35%	1.75%	39.00%
July 1, 2019	14.90%	23.10%	3.00%	41.00%
July 1, 2020	15.40%	23.10%	5.00%	43.50%
July 1, 2021 and later	15.40%	23.10%	7.00%	45.50%

Supplemental employer contributions remain in effect until the plan is 100% funded on a market value of assets basis.

Member contributions are “picked up” according to the provisions of Internal Revenue Code 414(h).

State contributions	$1 million paid annually on October 1 until the earlier of 1) both the Public Employees Retirement Association Police and Fire Plan and the State Patrol Retirement Fund attaining 90% funded status (on an actuarial value of assets basis), or 2) July 1, 2048.
Allowable service	Service during which member contributions were deducted. Includes period receiving temporary Worker's Compensation and reduced salary from employer. See Normal Retirement benefit definition on the following page for information about service limits.
Salary	Salaries excluding lump sum payments at separation.
Average salary	Average of the five highest years of Salary. Average Salary is based on all Allowable Service if less than five years. Average Salary is based on all years without regard to any service limits.

Actuarial Basis

Summary of Plan Provisions (Continued)

Retirement	
Normal retirement benefit	
Age/Service requirement	Age 55 and three years (ten years if first hired after June 30, 2013) of Allowable Service.
Amount	3.00% of Average Salary for each year of Allowable Service up to 33 years. Members with at least 28 years of service as of July 1, 2013, are not subject to this service limit. Member contributions made after the service cap will be refunded at retirement.
Early retirement benefit	
Age/Service requirement	Age 50 and three years (ten years if first hired after June 30, 2013) of Allowable Service.
Amount	Normal Retirement Benefit based on Allowable Service and Average Salary at retirement reduced by 0.34% for each month that the member is under age 55. If the effective date of retirement is before July 1, 2015, the reduction is 1/10% for each month that the member is under age 55 at the time of retirement.
Form of payment	Life annuity. Actuarially equivalent options are: 50%, 75%, or 100% Joint and Survivor, or 15-year certain. If a Joint and Survivor benefit is elected and the beneficiary predeceases the annuitant, the annuitant's benefit increases to the Life Annuity amount. This "bounce back" is subsidized by the plan.
Benefit increases	1.00% per year. A benefit recipient who has been receiving a benefit for at least 12 full months as of the June 30 of the calendar year immediately before the adjustment will receive a full increase. Members receiving benefits for at least one month but less than 12 full months as of the June 30 of the calendar year immediately before the adjustment will receive a pro rata increase.
Disability	
Occupational disability benefit	
Age/Service requirement	Member who cannot perform his duties as a direct result of a disability relating to an act of duty.

Actuarial Basis

Summary of Plan Provisions (Continued)

Disability (Concluded)	
Occupational disability benefit (Continued)	
Amount	60% of Average Salary plus 3.00% of Average Salary for each year in excess of 20 years of Allowable Service (pro rata for completed months). Payments cease at age 65 (age 55 if disabled after June 30, 2015) or the 5-year anniversary of the effective date of the disability benefit, whichever is later. Payments stop earlier if disability ceases or death occurs. Benefits may be paid upon re-employment but salary plus benefit cannot exceed current salary of position held at time of disability.
Non-duty disability benefit	
Age/Service requirement	At least one year of Allowable Service and disability not related to covered employment.
Amount	Normal Retirement Benefit based on Allowable Service (minimum of 15 years) and Average Salary at disability without reduction for commencement before age 55. Payments cease at age 65 (age 55 if disabled after June 30, 2015) or earlier if disability ceases or death occurs. Benefits may be paid upon re-employment but salary plus benefit cannot exceed current salary of position held at time of disability.
Retirement after disability	
Age/Service requirement	Age 65 (age 55 if disabled after June 30, 2015) with continued disability.
Amount	Optional annuity continues. Otherwise, normal retirement benefit equal to the disability benefit paid, or an actuarially equivalent option.
Form of payment	Same as for retirement.
Benefit increases	Same as for retirement.

Actuarial Basis

Summary of Plan Provisions (Continued)

Death

Surviving spouse benefit

Age/Service requirement	Member who is active or receiving a disability benefit or former member.
Amount	50% of Average Salary if member was active or occupational disability and either had less than three years (five years if first hired after June 30, 2013) of Allowable Service or was under age 55. Annuity is paid for life. Surviving spouse receives the 100% Joint and Survivor benefit commencing on the member's 55th birthday if member was active or a disability with three years (five years if first hired after June 30, 2013) of Allowable Service. A spouse who had been receiving the 50% benefit shall be entitled to the greater benefit. The surviving spouse of a former member receives the 100% Joint and Survivor benefit commencing on the member's 55th birthday if former member had three years (five years if first hired after June 30, 2013) of Allowable Service.
Benefit increases	Same as for retirement.

Surviving dependent children's benefit

Age/Service requirement	Member who is active or receiving a disability benefit. Child must be unmarried, under age 18 (or 23 if full-time student) and dependent upon the member.
Amount	10% of Average Salary for each child and $20 per month prorated among all dependent children. Benefit must not be less than 50% nor exceed 70% of Average Salary.
Benefit increases	Same as for retirement.

Refund of contributions

Age/Service requirement	Member dies before receiving any retirement benefits and survivor benefits are not payable.
Amount	Member's contributions with 6.00% interest through June 30, 2011. Beginning July 1, 2011, a member's contributions increase with 4.00% interest. Beginning July 1, 2018, member contributions increase with 3.00% interest.

Termination

Refund of contributions

Age/service requirement	Termination of state service.
Amount	Member's contributions with 6.00% interest through June 30, 2011. Beginning July 1, 2011, a member's contributions increase with 4.00% interest. Beginning July 1, 2018, member contributions increase with 3.00% interest. If a member is vested, a deferred annuity may be elected in lieu of a refund.

Actuarial Basis

Summary of Plan Provisions (Continued)

Termination (Concluded)	
Deferred benefit	
Age/service requirement	Three years (ten years if first hired after June 30, 2013) of Allowable Service.
Amount	Benefit is computed under law in effect at termination and increased by the following annual augmentation percentage: (a.) 0.00% before July 1, 1971; (b.) 5.00% from July 1, 1971, to January 1, 1981; (c.) 3.00% thereafter (2.50% if hired after June 30, 2006) until January 1, 2012; (d.) 2.00% after December 31, 2011, through December 31, 2018; and (e.) 0.00% thereafter. Amount is payable at normal or early retirement. If a member terminated employment prior to July 1, 1997, but was not eligible to commence their pension before July 1, 1997, an actuarial increase shall be made for the change in the post-retirement interest rates from 5.00% to 6.00%.
Optional form conversion factors	Effective July 1, 2019 and phased in over a 24-month period, actuarially equivalent factors based on the RP-2014 mortality table for healthy annuitants for a member turning age 55 in 2021, reflecting projected mortality improvements using Scale MP-2017, white collar adjustment, blended 90% males, 6.44% post-retirement interest, and 7.50% pre-retirement interest. Reflecting statutory requirements, joint and survivor factors are based on an interest assumption of 6.50%.
Combined service annuity	Members are eligible for combined service benefits if they: (a.) Have sufficient allowable service in total that equals or exceeds the applicable service credit vesting requirement of the retirement plan with the longest applicable service credit vesting requirement; (b.) Have at least six months of allowable service credit in each plan worked under; and (c.) Are not in receipt of a benefit from another plan, or have applied for benefits with an effective date within one year. Members who meet the above requirements must have their benefit based on the following: (a.) Allowable service in all covered plans are combined in order to determine eligibility for early retirement. (b.) Average salary is based on the high five consecutive years during their entire service in all covered plans.

Actuarial Basis

Summary of Plan Provisions (Concluded)

Changes in plan provisions	There have been no changes in plan provisions since the prior valuation.

Additional Schedules

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

Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL) (b)	Unfunded (Overfunded) AAL (UAAL) (b) - (a)	Funded Ratio (a)/(b)	Actual Covered Payroll (Previous FY) (c)	UAAL as a Percentage of Covered Payroll [(b)-(a)]/(c)
7-1-1991	$ 200,068	$ 224,033	$ 23,965	89.30%	$ 32,365	74.05 %
7-1-1992	222,314	233,656	11,342	95.15	32,882	34.49
7-1-1993	244,352	258,202	13,850	94.64	35,765	38.73
7-1-1994	262,570	275,377	12,807	95.35	35,341	36.24
7-1-1995	284,918	283,078	(1,840)	100.65	37,518	(4.90)
7-1-1996	323,868	303,941	(19,927)	106.56	41,476	(48.04)
7-1-1997	375,650	332,427	(43,223)	113.00	41,996	(102.92)
7-1-1998	430,011	371,369	(58,642)	115.79	43,456	(134.95)
7-1-1999	472,687	406,215	(66,472)	116.36	45,333	(146.63)
7-1-2000	528,573	458,384	(70,189)	115.31	48,167	(145.72)
7-1-2001	572,815	489,483	(83,332)	117.02	48,935	(170.29)
7-1-2002	591,383	510,344	(81,039)	115.88	49,278	(164.45)
7-1-2003	591,521	538,980	(52,541)	109.75	54,175	(96.98)
7-1-2004	594,785	545,244	(49,542)	109.09	51,619	(95.98)
7-1-2005	601,220	566,764	(34,456)	106.08	55,142	(62.49)
7-1-2006	618,990	641,479	22,489	96.49	57,765	38.93
7-1-2007	617,901	673,444	55,543	91.75	61,498	90.32
7-1-2008	595,082	693,686	98,604	85.79	60,029	164.26
7-1-2009	584,501	725,334	140,833	80.58	61,511	228.96
7-1-2010	567,211	683,360	116,149	83.00	63,250	183.63
7-1-2011	563,046	700,898	137,852	80.33	63,250	217.95
7-1-2012	554,244	760,955	206,711	72.84	62,524 [2]	330.61
7-1-2013	552,319	741,850	189,531	74.45	62,121 [2]	305.10
7-1-2014	597,870	800,421	202,551	74.69	63,952 [2]	316.72
7-1-2015	639,863	833,033	193,170	76.81	68,463 [3]	282.15
7-1-2016	654,842	833,886	179,044	78.53	69,343 [3]	258.20
7-1-2017	685,077	880,846	195,769	77.77	73,056 [4]	267.97
7-1-2018	715,964	930,408	214,444	76.95	74,007 [4]	289.76
7-1-2019	737,700	959,964	222,264	76.85	80,792 [5]	275.11
7-1-2020	762,865	989,045	226,180	77.13	84,530 [5]	267.57

[1] Information prior to 2012 provided by prior actuary. See prior reports for additional detail.
[2] Assumed equal to actual member contributions divided by 12.4%.
[3] Assumed equal to actual member contributions divided by 13.4%.
[4] Assumed equal to actual member contributions divided by 14.4%.
[5] Assumed equal to actual member contributions divided by 14.9%.

Additional Schedules

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

(Dollars in Thousands)

Plan Year Ended June 30	Actuarially Required Contribution Rate (a)	Actual Covered Payroll (b)	Actual Member Contributions (c)	Annual Required Contributions [(a)x(b)] - (c) = (d)	Actual Employer Contributions[2] (e)	Percentage Contributed (e)/(d)
1991	22.15%	$ 32,365	$ 2,751	$ 4,418	$ 4,825	109.21%
1992	22.58	32,882	2,795	4,630	4,893	105.68
1993	22.27	35,765	3,040	4,925	5,288	107.37
1994	21.94	35,341	3,004	4,750	5,159	108.61
1995	21.79	37,518	3,189	4,986	5,583	111.97
1996	21.34	41,476	3,484	5,367	5,742	106.99
1997	21.33	41,996	3,746	5,212	6,151	118.02
1998	15.67	43,456	3,634	3,176	5,475	172.39
1999	14.14	45,333	3,850	2,560	5,712	223.13
2000	15.17	48,167	4,044	3,263	6,069	185.99
2001	15.48	48,935	4,145	3,430	6,166	179.77
2002	14.00	49,278	4,215	2,684	6,209	231.33
2003	14.34	54,175	4,555	3,214	6,826	212.38
2004	17.81	51,619	4,493	4,700	6,504	138.39
2005	18.15	55,142	4,517	5,491	6,670	121.47
2006	19.84	57,765	4,719	6,741	7,055	104.66
2007	26.69	61,498	4,987	11,427	7,461	65.30
2008	29.90	60,029	5,594	12,355	8,279	67.01
2009	34.49	61,511	6,216	14,999	9,178	61.19
2010	38.16	63,250	6,726	17,410	10,104	58.04
2011	33.84	63,250	6,578	14,826	9,873	66.59
2012	36.25	62,524 [3]	7,753	14,912	11,620	77.92
2013	42.52	62,121 [3]	7,703	18,711	11,482	61.37
2014	41.24	63,952 [3]	7,930	18,444	12,894	69.91
2015	43.56	68,463 [4]	9,174	20,648	14,763	71.50
2016	42.91	69,343 [4]	9,292	20,463	14,938	73.00
2017	40.45	73,056 [5]	10,520	19,031	16,783	88.19
2018	42.64	74,007 [5]	10,657	20,900	16,952	81.11
2019	41.24	80,792 [6]	12,038	21,281	20,479	96.23
2020	40.43	84,530 [6]	12,595	21,580	22,975	106.46
2021	40.53	N/A	N/A	N/A	N/A	N/A

[1] Information prior to 2012 provided by prior actuary. See prior reports for additional detail.
[2] Includes contributions from other sources (if applicable).
[3] Assumed equal to actual member contributions divided by 12.4%.
[4] Assumed equal to actual member contributions divided by 13.4%.
[5] Assumed equal to actual member contributions divided by 14.4%.
[6] Assumed equal to actual member contributions divided by 14.9%.

Glossary of Terms

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

Glossary of Terms (Continued)

Actuarial Value of Assets	The value of the assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets or a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the actuarially required contribution (ARC).
Amortization Method	A method for determining the Amortization Payment. Under the Level Percentage of Pay method, the Amortization payment is one of a stream of increasing payments, whose Actuarial Present Value is equal to the UAAL. The stream of payments increases at the rate at which total covered payroll of all active members is assumed to increase.
Amortization Payment	That portion of the plan contribution or ARC which is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.
Amortization Period	The period used in calculating the Amortization Payment.
Annual Required Contribution (ARC)	The employer's periodic required contributions, expressed as a dollar amount or a percentage of covered plan compensation. The ARC consists of the Employer Normal Cost and Amortization Payment.
Augmentation	Annual increases to deferred benefits.
Closed Amortization Period	A specific number of years that is reduced by one each year, and declines to zero with the passage of time. For example, if the amortization period is initially set at 30 years, it is 29 years at the end of one year, 28 years at the end of two years, etc.
Current Benefit Obligations	The present value of benefits earned to the valuation date, based on current service and including future salary increases to retirement (comparable to a Projected Unit Credit measurement).
Employer Normal Cost	The portion of the Normal Cost to be paid by the employer. This is equal to the Normal Cost less expected member contributions.
Expected Assets	The present value of anticipated future contributions intended to fund benefits for current members.

Glossary of Terms (Continued)

Experience Gain/Loss	A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions, during the period between two actuarial valuations. To the extent that actual experience differs from that assumed, Unfunded Actuarial Accrued Liabilities emerge which may be larger or smaller than projected. Gains are due to favorable experience, e.g., the assets earn more than projected, salaries do not increase as fast as assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, losses are the result of unfavorable experience, i.e., actual results that produce Unfunded Actuarial Accrued Liabilities which are larger than projected.
GASB	Governmental Accounting Standards Board.
GASB Statements No. 25 and No. 27	These are the governmental accounting standards that previously set the accounting and financial reporting rules for public retirement systems and the employers that sponsor or contribute to them. Statement No. 27 sets the accounting and financial reporting rules for the employers that sponsor or contribute to public retirement systems, while Statement No. 25 sets the rules for the systems themselves. These statements remain in effect only for pension plans that are not administered as trusts or equivalent arrangements. Please refer to the definition for GASB Statements No. 67 and No. 68 below.
GASB Statement No. 50	The accounting standard governing a state or local governmental employer's accounting for pensions. This statement remains in effect for pension plans that are not administered as trusts. Please refer to the definition of GASB Statements No. 67 and No. 68 below.
GASB Statements No. 67 and No. 68	Statements No. 67 and No. 68, issued in June 2012, replace the requirements of Statements No. 25, No. 27 and No. 50, respectively, for pension plans administered as trusts. Statement No. 68 sets the accounting and financial reporting rules for the employers that sponsor or contribute to public retirement systems, while Statement No. 67 sets the rules for the systems themselves. Accounting and financial reporting information prepared according to Statements No. 67 and No. 68 is provided in a separate report beginning with the June 30, 2014 actuarial valuation.
GASB Statement No. 82	Statement No. 82, issued in March 2016, is an amendment to Statements No. 67, No. 68, and No. 73, and is intended to improve consistency in the application of the accounting statements.

Glossary of Terms (Concluded)

Normal Cost	The annual cost assigned, under the Actuarial Cost Method, to the current plan year.
Projected Benefit Funding Ratio	The ratio of the sum of Actuarial Value of Assets and Expected Assets to the Actuarial Present Value of Projected Benefits. A Ratio less than 100% indicates that contributions are insufficient.
Unfunded Actuarial Accrued Liability	The difference between the Actuarial Accrued Liability and Actuarial Value of Assets.
Valuation Date	The date as of which the Actuarial Present Value of Future Benefits is determined. The benefits expected to be paid in the future are discounted to this date.