Minnesota State Retirement System
Correctional Employees Retirement Fund

GASB Statement Nos. 67 and 68
Accounting and Financial Reporting for Pensions
June 30, 2020

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November 30, 2020

Minnesota State Retirement System
Correctional Employees Retirement Fund
St. Paul, Minnesota

Dear Board of Directors:

This report provides accounting and financial reporting information that is intended to comply with the Governmental Accounting Standards Board (GASB) Statements No. 67 and No. 68 for the Correctional Employees Retirement Fund ("CERF"), as amended by Statement No. 82. These calculations have been made on a basis that is consistent with our understanding of these accounting statements.

GASB Statement No. 67 is the accounting standard that applies to the financial reports issued by retirement systems. GASB Statement No. 68 establishes accounting and financial reporting for state and local government employers who provide their employees (including former employees) pension benefits through a trust. GASB Statement No. 82 is an amendment to Statements No. 67, No. 68, and No. 73, intended to improve consistency in the application of the accounting standards.

Our calculation of the liability associated with the benefits described in this report was performed for the purpose of providing reporting and disclosure information that satisfies the requirements of GASB Statements No. 67 and No. 68. The Net Pension Liability is not an appropriate measure for measuring the sufficiency of plan assets to cover the estimated cost of settling the employer's benefit obligation. The Net Pension Liability is not an appropriate measure for assessing the need for or amount of future employer contributions. The calculation of the plan's liability for this report may not be applicable for purposes of funding the plan. A calculation of the plan's liability for purposes other than satisfying the requirements of GASB Statements No. 67 and No. 68 may produce significantly different results. The information in this report is calculated on a total plan basis. The Minnesota State Retirement System (MSRS) is responsible for preparing the Schedule of Employer Allocations and the Schedule of Pension Amounts by Employer. This report may be provided to parties other than MSRS only in its entirety and only with the permission of MSRS. GRS is not responsible for unauthorized use of this report.

This report is based upon information, furnished to us by MSRS, concerning retirement and ancillary benefits, active members, deferred vested members, retirees and beneficiaries, and financial data. If your understanding of this information is different, please let us know. This information was checked for internal consistency, but it was not audited.

277 Coon Rapids Boulevard | Suite 212 | Coon Rapids, Minnesota 55433-2629

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.

This report complements the actuarial valuation report for funding purposes that was or will be provided to the System and should be considered in conjunction with that report. Please see the actuarial valuation report as of June 30, 2020 for additional discussion of the nature of actuarial calculations and more information related to participant data, economic and demographic assumptions, and benefit provisions.

To the best of our knowledge, the information contained within this report is accurate and fairly represents the actuarial position of the Correctional Employees Retirement Fund as of the measurement date. All calculations have been made in conformity with generally accepted actuarial principles and practices as well as with the Actuarial Standards of Practice issued by the Actuarial Standards Board.

The signing actuaries are independent of the plan sponsor.

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.

Respectfully submitted,

Brian B. Murphy

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

Bonita J. Wurst

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

BBM/BJW:sc

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SECTION A

EXECUTIVE SUMMARY

Executive Summary
as of June 30, 2020 (Dollars in Thousands)

	2020
Actuarial Valuation Date	June 30, 2020
Measurement Date of the Net Pension Liability	June 30, 2020
Membership	
Number of	
- Service Retirements	3,013
- Survivors	253
- Disability Retirements	320
- Deferred Retirements	1,426
- Terminated other non-vested	1,008
- Active Members	4,523
- Total	10,543
Covered-employee Payroll [1]	$ 278,479
Net Pension Liability	
Total Pension Liability	$ 1,670,854
Plan Fiduciary Net Position	1,223,537
Net Pension Liability	$ 447,317
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	73.23%
Net Pension Liability as a Percentage of Covered-Employee Payroll	160.63%
Development of the Single Discount Rate	
Single Discount Rate	7.50%
Long-Term Expected Rate of Investment Return	7.50%
Long-Term Municipal Bond Rate [2]	2.45%
Last year ending June 30 in the 2021 to 2120 projection period for which projected benefit payments are fully funded	2120
Total Pension Expense/ (Income)	$ 25,946

Deferred Outflows and Deferred Inflows of Resources by Source Arising from Current and Prior Periods to be Recognized in Future Pension Expenses

	Deferred Outflows of Resources	Deferred Inflows of Resources
Difference between expected and actual experience in the measurement of the Total Pension Liability	$ 12,262	$ 1,399
Changes in assumptions	-	289,767
Net difference between projected and actual earnings on pension plan investments	32,390	25,266
Total	$ 44,652	$ 316,432

[1] *Assumed equal to actual member contributions divided by employee contribution rate.*

[2] *Based on the 20-Year Municipal GO Index of mixed maturity general obligation municipal bonds as of the weekly rate closest to but not later than the Measurement Date.*

Discussion

Accounting Standard

For pension plans that are administered through trusts or equivalent arrangements, Governmental Accounting Standards Board (GASB) Statement No. 67, *Financial Reporting for Pension Plans,* establishes standards of financial reporting for separately issued financial reports and specifies the required approach for measuring the pension liability. Similarly, GASB Statement No. 68, *Accounting and Financial Reporting for Pensions,* establishes standards for state and local government employers (as well as non-employer contributing entities) to account for and disclose the net pension liability, pension expense, and other information associated with providing retirement benefits to their employees (and former employees) on their basic financial statements. GASB Statement No. 82, Pension Issues, is an amendment to Statements No. 67, No. 68, and No. 73, intended to improve consistency in the application of the accounting standards.

The following discussion provides a summary of the information that is required to be disclosed under these accounting standards. A number of these disclosure items are provided in this report. However, certain information, such as notes regarding accounting policies and investments, is not included in this report and the retirement system and/or plan sponsor will be responsible for preparing and disclosing that information to comply with these accounting standards.

Financial Statements

GASB Statement No. 68 requires state and local governmental employers to recognize the net pension liability and the pension expense on their financial statements. The net pension liability is the difference between the total pension liability and the plan's fiduciary net position. In traditional actuarial terms, this is analogous to the accrued liability less the market value of assets (not the smoothed actuarial value of assets that is often encountered in actuarial valuations performed to determine the employer's contribution requirement).

Paragraph 57 of GASB Statement No. 68 states, "Contributions to the pension plan from the employer subsequent to the measurement date of the collective net pension liability and before the end of the employer's reporting period should be reported as a deferred outflow of resources related to pensions." The information contained in this report does not incorporate any contributions made to CERF subsequent to the measurement date of June 30, 2020.

The pension expense recognized each fiscal year is equal to the change in the net pension liability from the beginning of the year to the end of the year, adjusted for deferred recognition of the difference between expected and actual experience in the measurement of the Total Pension Liability, assumption changes and investment experience.

Pension plans that prepare their own, stand-alone financial statements are required to present two financial statements – a Statement of Fiduciary Net Position and a Statement of Changes in Fiduciary Net Position in accordance with GASB Statement No. 67. The *Statement of Fiduciary Net Position* presents the assets and liabilities of the pension plan at the end of the pension plan's reporting period. The *Statement of Changes in Fiduciary Net Position* presents the additions, such as contributions and investment income, and deductions, such as benefit payments and expenses, and net increase or decrease in the fiduciary net position.

Notes to Financial Statements

GASB Statement No. 68 requires the notes of the employer's financial statements to disclose the total pension expense, the pension plan's liabilities and assets, and deferred outflows and inflows of resources related to pensions.

GASB Statement Nos. 67 and 68 require the notes of the financial statements for the employers and pension plans to include certain descriptive information about the pension plans through which the pension benefits are provided. The list of disclosure items should include:

- A description of benefits provided by the plan;
- The classes of employees and number of members covered by the pension plan;
- A description of the plan's funding policy, which includes member and employer contribution requirements;
- The pension plan's investment policies;
- The pension plan's fiduciary net position, net pension liability, and the pension plan's fiduciary net position as a percentage of the total pension liability;
- The net pension liability using a discount rate that is 1% higher and 1% lower than the current discount rate used to calculate the total pension liability and net pension liability for financial reporting purposes;
- Significant assumptions and methods used to calculate the total pension liability;
- Inputs to the discount rates; and
- Certain information about mortality assumptions and the dates of experience studies.

Retirement systems that issue stand-alone financial statements are required to disclose additional information in accordance with GASB Statement No. 67. This information includes:

- The composition of the pension plan's Board and the authority under which benefit terms may be amended;
- A description of how fair value is determined;
- Information regarding certain reserves and investments, which include concentrations of investments greater than or equal to 5%, receivables, and insurance contracts excluded from plan assets; and
- Annual money-weighted rate of return.

MSRS' comprehensive annual financial report, which contains the basic financial statements and related note disclosures for the Correctional Employees Retirement Fund can be found online at www.msrs.state.mn.us/annual-reports-fy-2020 or obtained from MSRS at 60 Empire Drive, Suite 300, St. Paul, Minnesota, 55103 or requested via email at info@msrs.us or telephone at 1.800.657.5757.

Required Supplementary Information

GASB Statement No. 67 requires a 10-year fiscal history of:

- Sources of changes in the net pension liability;
- Information about the components of the net pension liability and related ratios, including the pension plan's fiduciary net position as a percentage of the total pension liability, and the net pension liability as a percent of covered-employee payroll; and
- A comparison of the actual employer contributions to the actuarially determined contributions based on the plan's funding policy.

Measurement of the Net Pension Liability

The net pension liability is to be measured as the total pension liability, less the amount of the pension plan's fiduciary net position. In actuarial terms, this will be the accrued liability less the market value of assets (not the smoothed actuarial value of assets that is often encountered in actuarial valuations performed to determine the employer's contribution requirement).

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 all actuarial assumptions are met (including the assumption of the plan earning 7.50%), then the following outcomes are expected:

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.

The projections in this report are strictly for the purpose of determining the GASB single discount rate and are different from a funding projection for the ongoing plan.

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 market 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 actuarial value of assets were used instead of the market value of assets.

Limitation 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.

Timing of the Valuation

An actuarial valuation to determine the total pension liability is required to be performed at least every two years. For employer reporting, the net pension liability and pension expense should be measured as of a date (measurement date) no earlier than the end of the employer's prior fiscal year, consistently applied from period to period. If the actuarial valuation used to determine the total pension liability is not calculated as of the measurement date, the total pension liability is required to be rolled forward from the actuarial valuation date to the measurement date.

The total pension liability shown in this report is based on an actuarial valuation performed as of June 30, 2020 and a measurement date of June 30, 2020.

Single Discount Rate

Projected benefit payments are required to be discounted to their actuarial present values using a Single Discount Rate that reflects (1) a long-term expected rate of return on pension plan investments (to the extent that the plan's fiduciary net position is projected to be sufficient to pay benefits) and (2) tax-exempt municipal bond rate based on an index of 20-year general obligation bonds with an average AA credit rating as of the measurement date (to the extent that the contributions for use with the long-term expected rate of return are not met).

For the purpose of this valuation, the long-term expected rate of return on pension plan investments is 7.50%; the municipal bond rate is 2.45% (based on the weekly rate closest to but not later than the measurement date of the "20-Year Municipal GO AA Index" as published by Fidelity); and the resulting single discount rate is 7.50%.

SECTION B

FINANCIAL STATEMENTS

Statement of Pension Expense Under GASB Statement No. 68
Fiscal Year Ended June 30, 2020 (Dollars in Thousands)

A. Expense

1.	Service Cost	$	46,258
2.	Interest on the Total Pension Liability		117,205
3.	Current-Period Benefit Changes		-
4.	Employee Contributions (made negative for addition here)		(26,734)
5.	Projected Earnings on Plan Investments (made negative for addition here)		(88,422)
6.	Pension Plan Administrative Expense		924
7.	Other Changes in Plan Fiduciary Net Position		1
8.	Recognition of Outflow (Inflow) of Resources due to differences between expected and actual experience in the measurement of the Total Pension Liability		
	Arising from Current Reporting Period		1,510
9.	Recognition of Outflow (Inflow) of Resources due to assumption changes		
	Arising from Current Reporting Period		-
10.	Recognition of Outflow (Inflow) of Resources due to the difference between projected (7.50%) and actual earnings on Pension Plan Investments		
	Arising from Current Reporting Period		7,763
11.	**Increases/(Decreases) from Experience in the Current Reporting Period**	**$**	**58,505**
12.	Recognition of Outflow (Inflow) of Resources due to differences between expected and actual experience in the measurement of the Total Pension Liability		
	Arising from Prior Reporting Periods		3,282
13.	Recognition of Outflow (Inflow) of Resources due to assumption changes		
	Arising from Prior Reporting Periods		(31,154)
14.	Recognition of Outflow (Inflow) of Resources due to the difference between projected and actual earnings on Pension Plan Investments		
	Arising from Prior Reporting Periods		(4,687)
15.	**Total Pension Expense / (Income)**	**$**	**25,946**

Recognition of Deferred Outflows and Inflows of Resources

Differences between expected and actual experience and changes in assumptions are recognized in pension expense using a systematic and rational method over a closed period equal to the average of the expected remaining service lives of all employees that are provided with pension through the pension plan (active employees and inactive employees) determined as of the beginning of the measurement period.

At the beginning of the current measurement period, the expected remaining service lives of all active employees in the plan was approximately 48,515 years. Additionally, the total plan membership (active employees and inactive employees) was 10,346. As a result, the average of the expected remaining service lives for purposes of recognizing the applicable deferred outflows and inflows of resources established in the current measurement period is 5.0000 years.

Additionally, differences between projected and actual earnings on plan investments should be recognized in pension expense using a systematic and rational method over a closed five-year period. For this purpose, the deferred outflows and inflows of resources are recognized in the pension expense as a level dollar amount over the closed period identified above.

Statement of Outflows and Inflows
Arising from Current Reporting Period
Fiscal Year Ended June 30, 2020 (Dollars in Thousands)

A. Outflows (Inflows) of Resources due to Liabilities		
1. Difference between expected and actual experience of the Total Pension Liability (gains) or losses	$	7,550
2. Assumption Changes (gains) or losses		-
3. Recognition period for Liabilities: Average of the expected remaining service lives of all employees {in years}		5
4. Outflow (Inflow) of Resources to be recognized in the current pension expense for the difference between expected and actual experience of the Total Pension Liability		1,510
5. Outflow (Inflow) of Resources to be recognized in the current pension expense for Assumption Changes		-
6. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Liabilities	$	1,510
7. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses for the difference between expected and actual experience of the Total Pension Liability	$	6,040
8. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses for Assumption Changes		-
9. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Liabilities	$	6,040
B. Outflows (Inflows) of Resources due to Assets		
1. Net difference between projected and actual earnings on pension plan investments (gains) or losses	$	38,814
2. Recognition period for Assets {in years}		5
3. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Assets		7,763
4. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Assets	$	31,051

Statement of Outflows and Inflows
Arising from Current and Prior Reporting Periods
Fiscal Year Ended June 30, 2020 (Dollars in Thousands)

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

	Outflows of Resources	Inflows of Resources	Net Outflows/(Inflows) of Resources
1. Due to Liabilities	$ 140,690	$ 167,052	$ (26,362)
2. Due to Assets	22,539	19,463	3,076
3. Totals	$ 163,229	$ 186,515	$ (23,286)

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

	Outflows of Resources	Inflows of Resources	Net Outflows/(Inflows) of Resources
1. Differences between expected and actual experience	$ 5,644	$ 852	$ 4,792
2. Assumption Changes	135,046	166,200	(31,154)
3. Net Difference between projected and actual earnings on pension plan investments	22,539	19,463	3,076
4. Totals	$ 163,229	$ 186,515	$ (23,286)

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

	Deferred Outflows of Resources	Deferred Inflows of Resources	Net Deferred Outflows/ (Inflows) of Resources
1. Differences between expected and actual experience	$ 12,262	$ 1,399	$ 10,863
2. Assumption Changes	-	289,767	(289,767)
3. Net Difference between projected and actual earnings on pension plan investments*	32,390	25,266	7,124
4. Total	$ 44,652	$ 316,432	$ (271,780)

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

Year Ending June 30	Net Deferred Outflows/ (Inflows) of Resources
2021	$ (173,695)
2022	(118,713)
2023	11,356
2024	9,272
2025	-
Thereafter	-
Total	$ (271,780)

** Paragraph 71(b) of GASB Statement No. 68 requires deferred outflows and inflows arising from differences between projected and actual earnings on pension plan investments to be aggregated and shown as a net amount. For purposes of this valuation, amounts are shown separately for calculation purposes.*

Recognition of Deferred Outflows and Inflows of Resources
Fiscal Year Ended June 30, 2020 (Dollars in Thousands)

Year Established	Initial Amount	Initial Recognition Period	Current Year Recognition	Remaining Recognition	Remaining Recognition Period
Deferred Outflow (Inflow) due to Differences Between Expected and Actual Experience on Liabilities					
2015	$ 7,115	6.0000	$ 1,185	$ -	0.0000
2016	(764)	5.0000	(152)	-	0.0000
2017	6,566	5.0000	1,313	1,314	1.0000
2018	(3,499)	5.0000	(700)	(1,399)	2.0000
2019	8,180	5.0000	1,636	4,908	3.0000
2020	7,550	5.0000	1,510	6,040	4.0000
Total			**$ 4,792**	**$ 10,863**	
Deferred Outflow (Inflow) due to Assumption Changes					
2015	$ 118,399	6.0000	$ 19,734	$ -	0.0000
2016	576,552	5.0000	115,312	-	0.0000
2017	(213,159)	5.0000	(42,632)	(42,631)	1.0000
2018	(617,840)	5.0000	(123,568)	(247,136)	2.0000
Total			**$ (31,154)**	**$ (289,767)**	
Deferred Outflow (Inflow) due to Differences Between Projected and Actual Earnings on Plan Investments					
2016	$ 71,642	5.0000	$ 14,330	$ -	0.0000
2017	(68,307)	5.0000	(13,661)	(13,663)	1.0000
2018	(29,009)	5.0000	(5,802)	(11,603)	2.0000
2019	2,231	5.0000	446	1,339	3.0000
2020	38,814	5.0000	7,763	31,051	4.0000
Total			**$ 3,076**	**$ 7,124**	
Deferred Outflow (Inflow) due to All Sources					
Total			**$ (23,286)**	**$ (271,780)**	

Statement of Fiduciary Net Position as of June 30, 2020 (Dollars in Thousands)

Assets		June 30, 2020
Cash & Short-term Investments	$	55,142
Receivables		4,139
Investment Pools (at fair value)		1,165,999
Securities Lending Collateral		85,710
Capital Assets		-
Total Assets	**$**	**1,310,990**
Total Deferred Outflows of Resources	**$**	**-**
Total Liabilities	**$**	**(87,453)**
Total Deferred Inflows of Resources	**$**	**-**
Net Position Restricted for Pensions	**$**	**1,223,537**

Statement of Changes in Fiduciary Net Position for Year Ended June 30, 2020 (Dollars in Thousands)

1. Net position at market value at beginning of year	**$**	**1,183,995**
Additions		
2. Contributions		
a. Employee	$	26,734
b. Employer		43,658
c. Other sources		-
d. Total contributions	$	70,392
3. Investment income		
a. Investment income/(loss)	$	50,719
b. Investment expenses		(1,111)
c. Net investment income/(loss)	$	49,608
4. Other Additions		-
5. Total Additions *(2.d.) + (3.c.) + (4.)*	**$**	**120,000**
Deductions		
6. Benefits Paid		
a. Annuity benefits	$	(77,045)
b. Refunds		(2,488)
c. Total benefits paid	$	(79,533)
7. Expenses		
a. Other deductions	$	(1)
b. Administrative		(924)
c. Total expenses	$	(925)
8. Total deductions *(6.c.) + (7.c.)*	**$**	**(80,458)**
9. Net increase/(decrease) in fiduciary net position *(5.) + (8.)*	**$**	**39,542**
10. Net position at market value at end of year *(1.) + (9.)*	**$**	**1,223,537**
11. State Board of Investment calculated annual investment return for the Correctional Employees Retirement Fund*		4.2%

** The fiscal year 2020 investment return for the Combined Funds is 4.2%.*

SECTION C

REQUIRED SUPPLEMENTARY INFORMATION

Schedule of Changes in Net Pension Liability and Related Ratios
Current Period
Fiscal Year Ended June 30, 2020 (Dollars in Thousands)

A. Total Pension Liability		
1. Service Cost	$	46,258
2. Interest on the Total Pension Liability		117,205
3. Changes of benefit terms		-
4. Difference between expected and actual experience of the Total Pension Liability		7,550
5. Changes of assumptions		-
6. Benefit payments, including refunds of employee contributions		(79,533)
7. Net change in Total Pension Liability	$	91,480
8. Total Pension Liability – Beginning		1,579,374
9. Total Pension Liability – Ending	**$**	**1,670,854**
B. Plan Fiduciary Net Position		
1. Contributions – Employer	$	43,658
2. Contributions – Employee		26,734
3. Net investment income		49,608
4. Benefit payments, including refunds of employee contributions		(79,533)
5. Pension Plan Administrative Expense		(924)
6. Other changes		(1)
7. Net change in Plan Fiduciary Net Position	$	39,542
8. Plan Fiduciary Net Position – Beginning		1,183,995
9. Plan Fiduciary Net Position – Ending	**$**	**1,223,537**
C. Net Pension Liability, *A.9 - B.9.*	**$**	**447,317**
D. Plan Fiduciary Net Position as a percentage of the Total Pension Liability, *B.9 / A.9.*		**73.23%**
E. Covered-Employee payroll	**$**	**278,479** [1]
F. Net Pension Liability as a percentage of Covered-Employee payroll, *C. / E.*		**160.63%**

[1] *Assumed equal to actual member contributions divided by employee contribution rate.*

Schedule of Changes in Net Pension Liability and Related Ratios Multiyear
(Dollars in Thousands)

Last 10 Fiscal Years (which will be built prospectively)

Fiscal year ending June 30,	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011
Total Pension Liability										
Service Cost	$ 46,258	$ 44,912	$ 85,364	$ 95,522	$ 56,718	$ 48,805	$ 54,443			
Interest on the Total Pension Liability	117,205	110,664	108,421	95,307	97,571	92,039	85,702			
Benefit Changes	-	-	(164,182)	-	-	-	-			
Difference between Expected and Actual Experience	7,550	8,180	(3,499)	6,566	(764)	7,115	4,103			
Assumption Changes	-	-	(617,840)	(213,159)	576,552	118,399	(147,067)			
Benefit Payments	(77,045)	(72,419)	(67,622)	(63,221)	(59,045)	(54,909)	(50,842)			
Refunds	(2,488)	(2,484)	(2,052)	(1,466)	(1,895)	(1,590)	(1,447)			
Net Change in Total Pension Liability	**$ 91,480**	**$ 88,853**	**$ (661,410)**	**$ (80,451)**	**$ 669,137**	**$ 209,859**	**$ (55,108)**			
Total Pension Liability - Beginning	**$ 1,579,374**	**$ 1,490,521**	**$ 2,151,931**	**$ 2,232,382**	**$ 1,563,245**	**$ 1,353,386**	**$ 1,408,494**			
Total Pension Liability - Ending (a)	**$ 1,670,854**	**$ 1,579,374**	**$ 1,490,521**	**$ 2,151,931**	**$ 2,232,382**	**$ 1,563,245**	**$ 1,353,386**			
Plan Fiduciary Net Position										
Employer Contributions	$ 43,658	$ 38,245	$ 32,893	$ 31,763	$ 30,678	$ 29,480	$ 26,468			
Employee Contributions	26,734	25,686	23,417	22,648	21,953	21,061	18,855			
Pension Plan Net Investment Income	49,608	80,942	105,263	135,359	(195)	38,624	137,523			
Benefit Payments	(77,045)	(72,419)	(67,622)	(63,221)	(59,045)	(54,909)	(50,842)			
Refunds	(2,488)	(2,484)	(2,052)	(1,466)	(1,895)	(1,590)	(1,447)			
Pension Plan Administrative Expense	(924)	(856)	(827)	(856)	(906)	(720)	(657)			
Other Changes	(1)	(6)	(2)	(2)	-	-	(1)			
Net Change in Plan Fiduciary Net Position	**$ 39,542**	**$ 69,108**	**$ 91,070**	**$ 124,225**	**$ (9,410)**	**$ 31,946**	**$ 129,899**			
Plan Fiduciary Net Position - Beginning	**$ 1,183,995**	**$ 1,114,887**	**$ 1,023,817**	**$ 899,592**	**$ 909,002**	**$ 877,056**	**$ 747,157**			
Plan Fiduciary Net Position - Ending (b)	**$ 1,223,537**	**$ 1,183,995**	**$ 1,114,887**	**$ 1,023,817**	**$ 899,592**	**$ 909,002**	**$ 877,056**			
Net Pension Liability - Ending (a) - (b)	**$ 447,317**	**$ 395,379**	**$ 375,634**	**$ 1,128,114**	**$ 1,332,790**	**$ 654,243**	**$ 476,330**			
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	**73.23 %**	**74.97 %**	**74.80 %**	**47.58 %**	**40.30 %**	**58.15 %**	**64.80 %**			
Covered-Employee Payroll [1]	**$ 278,479**	**$ 267,563**	**$ 257,330**	**$248,879**	**$241,242**	**$231,440**	**$219,244**			
Net Pension Liability as a Percentage of Covered-Employee Payroll	**160.63 %**	**147.77 %**	**145.97 %**	**453.28 %**	**552.47 %**	**282.68 %**	**217.26 %**			

Notes to Schedule:

(1) Assumed equal to plan member contributions divided by employee contribution rate.

Schedule of Net Pension Liability Multiyear
(Dollars in Thousands)

Last 10 Fiscal Years (which will be built prospectively)

Fiscal Year Ending June 30,	Total Pension Liability	Plan Net Position	Net Pension Liability	Plan Net Position as a % of Total Pension Liability	Covered-Employee Payroll	Net Pension Liability as a % of Covered-Employee Payroll
	(a)	(b)	(a) - (b) = (c)	(b)/(c)	(d)	(c)/(d)
2011						
2012						
2013						
2014	$ 1,353,386	$ 877,056	$ 476,330	64.80%	$ 219,244	217.26%
2015	1,563,245	909,002	654,243	58.15	231,440	282.68
2016	2,232,382	899,592	1,332,790	40.30	241,242	552.47
2017	2,151,931	1,023,817	1,128,114	47.58	248,879	453.28
2018	1,490,521	1,114,887	375,634	74.80	257,330	145.97
2019	1,579,374	1,183,995	395,379	74.97	267,563	147.77
2020	1,670,854	1,223,537	447,317	73.23	278,479	160.63

Schedule of Contributions Multiyear
(Dollars in Thousands)

Last 10 Fiscal Years

Fiscal Year Ending June 30,	Actuarially Determined Contribution	Actual Contributions	Contribution Deficiency (Excess)	Covered-Employee Payroll		Actual Contribution as a % of Covered-Employee Payroll
	(a)	(b)	(a) - (b) = (c)	(d)		(b)/(d)
2011	$ 33,274	$ 23,892	$ 9,382	$ 197,702		12.08%
2012	34,806	24,188	10,618	200,035	*	12.09
2013	34,060	24,632	9,428	204,198	*	12.06
2014	38,390	26,468	11,922	219,244	*	12.07
2015	40,109	29,480	10,629	231,440	*	12.74
2016	44,171	30,678	13,493	241,242	*	12.72
2017	45,943	31,763	14,180	248,879	*	12.76
2018	49,665	32,893	16,772	257,330	*	12.78
2019	43,265	38,245	5,020	267,563	*	14.29
2020	45,726	43,658	2,068	278,479	*	15.68

** Assumed equal to actual member contributions divided by employee contribution rate.*

Notes to Schedule of Contributions

Methods and Assumptions Used to Determine Fiscal Year Ending June 30, 2020 Contribution Rates Reported in this Schedule:

Notes	Actuarially determined contribution rates are calculated as of each June 30 and apply to the fiscal year beginning on the day after the measurement date.
Valuation Date	June 30, 2019
Actuarial Cost Method	Entry Age Normal
Amortization Method	Level Percentage of Payroll, Closed
Remaining Amortization Period	29 years
Asset Valuation Method	5-Year smoothed market; no corridor
Inflation	2.50%
Payroll Growth	3.25%
Salary Increases	Service based tables ranging from 12.25% with one year of service to 3.25% with 24 or more years of service, including inflation.
Investment Rate of Return	7.50%
Retirement Age	Experience-based table of rates that are specific to the type of eligibility condition. Last updated for the 2017 valuation pursuant to an experience study of the period 2011-2015.
Healthy Post-Retirement Mortality	RP-2014 annuitant generational mortality table, projected with mortality improvement scale MP-2015 from a base year of 2006, white collar adjustment, set forward 2-years for males and set forward 1-year for females.

Other Information

Benefit Increases After Retirement	1.5% per annum beginning January 1, 2019.
	See separate funding actuarial valuation report as of July 1, 2019 for additional detail. To obtain this report, contact MSRS as noted on page 3. This report is also available online at www.msrs.state.mn.us/annual-reports-fy-2019.

Schedule of Investment Returns Multiyear

Last 10 Fiscal Years

Fiscal Year Ending June 30,	Annual Return[1]
2011	
2012	
2013	
2014	18.6 %
2015	4.4
2016	(0.0)
2017	15.2
2018	10.4
2019	7.3
2020	4.2

[1] *Annual money-weighted rate of return, net of investment expenses.*

The Minnesota State Board of Investment (SBI) compiled this data and the related investment notes and provided it to MSRS for GASB-compliance purposes. MSRS furnished this information to us for inclusion within this report. We did not audit this information. We are not responsible for its accuracy or completeness.

Rate of Return

For the fiscal year ended June 30, 2020, the annual money-weighted rate of return for the Correctional Employees Retirement Fund was 4.2%. The money-weighted rate of return is a method of calculating period-by-period returns on pension plan investments that adjusts for the changing amounts actually invested. For purposes of this schedule, the money-weighted rate of return is calculated as the internal rate of return on pension plan investments, net of pension plan investment expense.

10-Year Schedule of Money-Weighted Investment Return

Ten-year data is not available. Additional years will be provided when they become available.

To request additional information about the computation of the annual money-weighted rate of return and the investments for the Minnesota Retirement Systems (including the investments for MSRS' defined benefit retirement funds), contact SBI at 60 Empire Drive, Suite 355, St. Paul, Minnesota, 55103, via email at minn.sbi@state.mn.us or telephone at 651.296.3328.

SECTION D

ADDITIONAL FINANCIAL STATEMENT DISCLOSURES

Asset Allocation

Long-Term Expected Return on Plan Assets

The long-term expected rate of return on pension plan investments was determined using a building-block method. Estimates for expected future real rates of return (expected returns, net of inflation) were developed for each asset class using both long-term historical returns and long-term capital market expectation from a number of investment management and consulting organizations. The asset class estimates and the target allocations were then combined to produce a geometric, long-term expected real rate of return for the portfolio. Inflation expectations were applied to derive the nominal rate of return for the portfolio. For each major asset class that is included in the pension fund's target asset allocation as of June 30, 2020, these estimates are summarized in the following table:

Asset Class	Target Allocation	Long-Term Expected Real Rate of Return (Geometric Mean)
Domestic Equity	36%	5.10%
International Equity	17%	5.30%
Private Markets	25%	5.90%
Fixed Income	20%	0.75%
Cash	2%	0.00%
Total	100%	

The Minnesota State Board of Investment (SBI) compiled this data and the related investment notes and provided it to MSRS for GASB-compliance purposes. MSRS furnished this information to us for inclusion within this report. We did not audit this information. We are not responsible for its accuracy or completeness.

For purposes of this valuation, the long-term expected rate of return assumption is 7.50%. This assumption is based on a review of inflation and investment return assumptions in our experience study for the Minnesota State Employees Retirement Fund, dated June 27, 2019.

Sensitivity of Net Pension Liability to the Single Discount Rate Assumption

Single Discount Rate

A Single Discount Rate of 7.50% was used to measure the total pension liability. This Single Discount Rate was based on an expected rate of return on pension plan investments of 7.50%. The projection of cash flows used to determine this single discount rate assumed that plan member, employer, and state contributions will be made at the current statutory contribution rates. Based on these assumptions, the pension plan's fiduciary net position was projected to be available to make all projected future benefit payments of current plan members. Therefore, the long-term expected rate of return on pension plan investments was applied to all periods of projected benefit payments to determine the total pension liability.

Regarding the sensitivity of the net pension liability to changes in the Single Discount Rate, the following presents the plan's net pension liability, calculated using a Single Discount Rate of 7.50%, as well as what the fund's net pension liability would be if it were calculated using a Single Discount Rate that is 1-percentage-point lower (6.50%) or 1-percentage-point higher (8.5%) than the current rate.

Sensitivity of Net Pension Liability to the Single Discount Rate Assumption

(Dollars in Thousands)

	1% Decrease 6.50%	Current Single Discount Rate Assumption 7.50%	1% Increase 8.50%
Total Pension Liability	$ 1,906,195	$ 1,670,854	$ 1,478,790
Net Position Restricted for Pensions	1,223,537	1,223,537	1,223,537
Net Pension Liability	**$ 682,658**	**$ 447,317**	**$ 255,253**

For more information on the calculation of the Single Discount Rate, refer to Section G of this report.

Note that we believe the 8.5% interest rate assumption would not comply with Actuarial Standards of Practice.

GASB Statement No. 68 Reconciliation (Dollars in Thousands)

	Total Pension Liability (a)	Plan Fiduciary Net Position (b)	Net Pension Liability (a) - (b)	Deferred Outflows	Deferred Inflows	Total Pension Expense
Balance Beginning of Year	**$ 1,579,374**	**$ 1,183,995**	**$ 395,379**	**$ 161,517**	**$ 502,947**	
Changes for the Year:						
Service Cost	$ 46,258		$ 46,258			$ 46,258
Interest on Total Pension Liability	117,205		117,205			117,205
Interest on Plan Fiduciary Net Position [1]		$ 88,422 [1]	(88,422)			(88,422)
Changes in Benefit Terms	-		-			-
Liability Experience Gains and Losses	7,550		7,550	$ 6,040	$ -	1,510
Changes in Assumptions	-		-	-	-	-
Recognition of Deferred Outflows/(Inflows) of Resources Arising from Prior Reporting Periods						
Liability Experience Gains/(Losses)				(4,134)	(852)	3,282
Assumption Changes				(135,046)	(166,200)	(31,154)
Investment Gains/(Losses)				(14,776)	(19,463)	(4,687)
Contributions - Employer		43,658	(43,658)			
Contributions - Employees		26,734	(26,734)			(26,734)
Asset Gain/(Loss) [1]		(38,814) [1]	38,814	31,051	-	7,763
Benefit Payment and Refunds	(79,533)	(79,533)				
Administrative Expenses		(924)	924			924
Other Changes		(1)	1			1
Net Changes	**$ 91,480**	**$ 39,542**	**$ 51,938**	**$ (116,865)**	**$ (186,515)**	**$ 25,946**
Balance End of Year	**$ 1,670,854**	**$ 1,223,537**	**$ 447,317**	**$ 44,652**	**$ 316,432**	

[1] *The sum of these items in column (b) equals the net investment income of $49,608.*

Summary of Population Statistics

		Terminated		Recipients			
	Actives	Deferred Retirement	Other Non-Vested	Service Retirement	Disability Retirement	Survivor	Total
Members on 7/1/2019	**4,582**	**1,386**	**950**	**2,879**	**308**	**241**	**10,346**
New members	457						**457**
Return to active	24	(11)	(13)	0	0	0	**0**
Terminated non-vested	(186)	0	186	0	0	0	**0**
Service retirements	(127)	(43)	0	170	0	0	**0**
Terminated deferred	(95)	95	0	0	0	0	**0**
Terminated refund/transfer	(118)	(11)	(152)	0	0	0	**(281)**
Deaths	(3)	(2)	0	(43)	(6)	(6)	**(60)**
New beneficiary	0	0	0	0	0	20	**20**
Disabled	(11)	0	0	0	11	0	**0**
Unexpected status changes	0	12	37	7	7	(2)	**61**
Net change	(59)	40	58	134	12	12	**197**
Members on 6/30/2020	**4,523**	**1,426**	**1,008**	**3,013**	**320**	**253**	**10,543**

SECTION E

SUMMARY OF BENEFITS

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 employees in covered correctional service. Certain state employees with 75 percent working time spent in direct contact with inmates or patients are also eligible.

Contributions — Shown as a percent of salary:

Effective as of	Member	Regular Employer	Supplemental Employer	Total
Prior to July 1, 2018	9.10%	12.85%	0.00%	21.95%
July 1, 2018	9.60%	14.40%	0.00%	24.00%
July 1, 2019	9.60%	14.40%	1.45%	25.45%
July 1, 2020	9.60%	14.40%	2.95%	26.95%
July 1, 2021 and later	9.60%	14.40%	4.45%	28.45%

Supplemental employer contribution remains 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).

Allowable service — Service during which member contributions were made. May also include certain leave of absence, military service and periods while temporary Worker's Compensation is paid.

Salary — Includes wages, allowances and fees. Excludes lump sum payments of separation and reduced salary while receiving Worker's Compensation benefits.

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

Vesting —

Hired before July 1, 2010: 100% vested after 3 years of Allowable Service.

Hired after June 30, 2010:
50% vested after 5 years of Allowable Service;
60% vested after 6 years of Allowable Service;
70% vested after 7 years of Allowable Service;
80% vested after 8 years of Allowable Service;
90% vested after 9 years of Allowable Service;
100% vested after 10 years of Allowable Service.

Summary of Plan Provisions (Continued)

Retirement	
<u>Normal retirement benefit</u>	
Age/Service requirement	Age 55 and vested. Proportionate Retirement Annuity is available at age 65 and one year of Allowable Service.
Amount	2.40% (2.20% if first hired after June 30, 2010) of Average Salary for each year of Allowable Service, pro-rata for completed months.
<u>Early retirement</u>	
Age/Service requirement	Age 50 and vested.
Amount	Normal Retirement Benefit based on Allowable Service and Average Salary at retirement date reduced by 2/10% (5/12% if first hired after June 30, 2010, or if hired before July 1, 2010, and retire after June 30, 2015) per month for each month that the member is under age 55.
<u>Form of payment</u>	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.
<u>Benefit increases</u>	Through December 31, 2018: 2.00% January 1, 2019 and after: 1.50% 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	
<u>Duty Disability</u>	
Age/Service requirement	Physically or mentally unable to perform normal job duties as a direct result of a disability relating to an incident while performing the duties of the job which present inherent dangers to the employee. Members who become disabled after June 30, 2009, will have disability benefits converted to retirement benefits at age 55 instead of age 65.
Amount	50.00% of Average Salary plus 2.40% (2.20% if first hired after June 30, 2010) of Average Salary for each year in excess of 20 years and 10 months of Allowable Service (pro rata for completed months).

Summary of Plan Provisions (Continued)

Disability (Continued)	
Duty Disability Continued	
Amount (Continued)	Payment begins at disability and ends at age 55 (age 65 if disabled prior to July 1, 2009) 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 paid upon re-employment but salary plus benefit cannot exceed current salary of position held at time of disability. Member is reclassified from disabled to retired at age 55 (age 65 if disabled prior to July 1, 2009). Optional amount continues. Otherwise, normal retirement benefit equal to the disability benefit paid, or an actuarially equivalent option.
Regular Disability	
Age/Service requirement	At least one year of covered Correctional service for employees hired before July 1, 2009, or a vested Correctional employee hired after June 30, 2009, and the employee is determined to have a regular disability not related to an incident while performing the duties of the job.
Amount	Normal retirement benefit based on covered Correctional Service (minimum of 15 years if hired prior to July 1, 2009) and Average Salary at disability. Payment begins at disability and ends at age 55 (age 65 if disabled prior to July 1, 2009) 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 paid upon re-employment but salary plus benefit cannot exceed current salary of position held at time of disability. Member is reclassified from disabled to retired at age 55 (age 65 if disabled prior to July 1, 2009). Optional amount continues. Otherwise, normal retirement benefit equal to the disability benefit paid, or an actuarially equivalent option.
Benefit Increases	Same as for retirement.
Death	
Surviving spouse benefit	
Age/Service requirement	Member at any age or former member age 50 or older who dies before retirement or disability benefit commences and was vested. If a former member dies before age 55 and has less than 30 years of Allowable Service, benefits commence when the former member would have been age 55. If an active member dies, benefits may commence immediately, regardless of age.

Death (Continued)	
<u>Surviving spouse benefit Continued)</u>	
Amount	Surviving spouse receives the 100% joint and survivor benefits using the Normal Retirement formula above. If commencement is prior to age 55, the appropriate early retirement formula described above applies except that one-half the monthly reduction factor is used from age 50 to the commencement age and the Rule of 90 does not apply. In lieu of this benefit, the surviving spouse may elect a refund of member contributions with interest or an actuarially equivalent term certain annuity (lump sum payable to estate at death).
Benefit increases	Same as for retirement.
<u>Surviving dependent children's benefit</u>	
Age/service requirement	If no surviving spouse, all children (biological or adopted) below age 20 who are dependent for more than half of their support on deceased member.
Amount	Actuarially equivalent to surviving spouse 100% joint and survivor annuity payable to the later of age 20 or five years. The amount is to be proportionally divided among surviving children.
Benefit increases	Same as for retirement.
<u>Refund of contributions with interest</u>	
Age/service requirement	Active employee dies and survivor benefits are not payable or a former employee dies before annuity begins. If accumulated member contributions with interest exceed total payments to the surviving spouse and children, then the remainder is paid out.
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	
<u>Refund of contributions</u>	
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.

Summary of Plan Provisions (Concluded)

Termination (Continued)	
Deferred benefit	
Age/service requirement	Partially or fully vested.
Amount	Benefit 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 of the year following attainment of age 55 or January 1, 2012, whichever is earlier; (d.) 5.00% thereafter until the annuity begins (2.50% if hired after June 30, 2006), but before January 1, 2012; and (e.) 2.00% from January 1, 2012 to December 31, 2018; and (f.) 0.00% thereafter. Amount is payable at normal or early retirement.
Optional form conversion factors	Effective July 1, 2019 and phased in over a 12-month period, actuarially equivalent factors based on the RP-2014 mortality table for healthy annuitants for a member turning age 56 in 2021, reflecting projected mortality improvements using Scale MP-2017, white collar adjustment, male rates set forward two years, female rates set forward one year, blended 70% males, 5.91% 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.
Changes in plan provisions	There were no changes in plan provisions since the prior valuation.

SECTION F

ACTUARIAL COST METHOD AND ACTUARIAL ASSUMPTIONS

Actuarial Methods Used for the Determination of Total Pension Liability and Related Values

Actuarial Cost Method

Normal cost and the allocation of benefit values between service rendered before and after the valuation date were determined using an **Individual Entry-Age Actuarial Cost Method** having the following characteristics:

(i) the annual normal cost for each individual active member, payable from the date of employment to the date of retirement, is sufficient to accumulate the value of the member's benefit at the time of retirement; and

(ii) each annual normal cost is a constant percentage of the member's year by year projected covered pay.

Actuarial gains/(losses), as they occur, reduce (increase) the Total Pension Liability.

Asset Valuation Method

Fair value of assets.

Summary of Actuarial Assumptions Used in the Determination of Total Pension Liability and Related Values

The following assumptions were used in valuing the liabilities and benefits under the plan. The assumptions are based on the last experience study, dated July 26, 2016, and a review of inflation and investment return assumptions in the last experience study for the State Employees Retirement fund, dated June 27, 2019.

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.
Single discount rate	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.
Payroll growth	3.25% per year.
Inflation	2.50% 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, set forward two years for males and set forward one year for females.
Disabled	RP-2014 disabled mortality table projected with mortality improvement Scale MP-2015 from a base year of 2006.
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 and beneficiaries 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 ultimately result in behavior changes not anticipated in these actuarial assumptions.

Summary of Actuarial Assumptions (Continued)

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:

	Select Withdrawal Rates	
Year	**Male**	**Female**
1	10%	12%
2	10%	12%
3	10%	12%

Disability	Age-related rates based on experience; see table of sample rates. All incidences are assumed to be duty-related.
Allowance for combined service annuity	Liabilities for former members are increased by 17.0% for vested members and 6.0% for non-vested members to account for the effect of some participants having eligibility for a Combined Service Annuity.
Administrative expenses	In the valuation year, equal to prior year administrative expenses expressed as a percentage of prior year projected payroll. In each subsequent year, equal to the initial administrative expense percentage applied to payroll for the closed group.
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 take the larger of their contributions accumulated with interest or the value of their 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	75% 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 male spouses.
Form of payment	Married members retiring from active status are assumed to elect subsidized joint and survivor form of annuity as follows:

Males:	15% elect 50% Joint & Survivor option 15% elect 75% Joint & Survivor option 50% elect 100% Joint & Survivor option
Females:	10% elect 50% Joint & Survivor option 10% elect 75% Joint & Survivor option 35% elect 100% Joint & Survivor option

Remaining married members and unmarried members are assumed to elect the Straight Life option.

Members receiving deferred annuities (including current terminated deferred members) are assumed to elect a straight life annuity, except that current terminated deferred members who terminated prior to July 1, 1997, are assumed to receive the Level Social Security option to age 62.

Summary of Actuarial Assumptions (Continued)

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.
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. In cases where submitted data was missing or incomplete, the following assumptions were applied: <u>Data for active members</u>: There were 8 members reported without a gender and no members reported with an invalid date of birth. We assumed male gender. There were 3 members reported with zero or invalid salary. We used prior year salary (2 members), if available, otherwise, high five salary with a 10% load to account for salary increases (0 members). If neither pay or high five salary was available, we assumed a value of $45,000 (1 member). There was 1 member reported with zero service. Due to the small number of members with zero service, and based on direction from MSRS, we used service of 0 years for these members.

Summary of Actuarial Assumptions (Continued)

Unknown data for certain members	Data for terminated members: There were no members reported with missing or invalid gender or birth dates. There were 47 members reported without a benefit. If available, we calculated benefits for these members using the reported Average Salary, Credited Service and Termination Date provided. If Average Salary was not reported (18 members), we assumed a value of $45,000. There were no members reported without Credited Service or a Termination Date. Data for members receiving benefits: There was 1 member reported with a missing gender. We assumed male gender for retirees and female gender for survivors. There were no members reported with a missing or invalid birth date. There were no survivors reported on the data file with an expired benefit. There were 4 members reported without a benefit. Due to the small number of members with missing benefits, we made no adjustment to the reported data for members receiving benefits. There were no retirees reported with a survivor option and a survivor date of death. There were 21 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% join and survivor annuity, respectively. There were 2 retirees reported with an accelerated benefit election, who are younger than the accelerated age, and are missing the accelerated benefit amount and end date. Due to the small number of affected members, we did not modify the valuation data. There were retired members reported with a survivor option and an invalid or missing survivor gender (352 members) and/or survivor date of birth (296 members). We used the valuation assumptions if the survivor gender or date of birth was missing or invalid.
Changes in actuarial assumptions	There were no changes in actuarial assumptions since the prior valuation.

Summary of Actuarial Assumptions (Continued)

Age in 2020	Healthy Post-Retirement Mortality** Male	Healthy Post-Retirement Mortality** Female	Healthy Pre-Retirement Mortality** Male	Healthy Pre-Retirement Mortality** Female	Disability Mortality** Male	Disability Mortality** Female
	Percentage of Members Dying Each Year*					
20	0.02%	0.01%	0.02%	0.01%	0.04%	0.02%
25	0.04	0.02	0.03	0.01	0.16	0.08
30	0.06	0.05	0.03	0.02	0.40	0.21
35	0.09	0.09	0.03	0.03	0.75	0.44
40	0.13	0.12	0.04	0.03	1.08	0.65
45	0.18	0.15	0.06	0.05	1.40	0.81
50	0.27	0.19	0.10	0.08	1.75	1.07
55	0.39	0.29	0.18	0.14	2.14	1.42
60	0.59	0.44	0.31	0.20	2.54	1.68
65	0.89	0.68	0.55	0.30	3.00	1.98
70	1.47	1.09	0.97	0.51	3.81	2.64
75	2.54	1.85	1.74	0.90	5.19	3.90
80	4.55	3.33	3.12	1.61	7.41	5.96
85	8.45	6.15	6.50	4.31	11.02	9.01
90	15.07	11.14	12.34	9.62	16.73	13.15

* *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 these results.*

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

Age	Termination (Withdrawal) Rates After Third Year Male	Termination (Withdrawal) Rates After Third Year Female	Disability Retirement Male	Disability Retirement Female
	Percent of Members Decrementing Each Year			
20	10.00%	12.00%	0.05%	0.05%
25	10.00	11.50	0.08	0.08
30	5.00	9.10	0.11	0.11
35	4.50	7.10	0.15	0.15
40	3.50	5.70	0.22	0.22
45	1.95	3.50	0.35	0.35
50	0.00	0.00	0.54	0.54
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
70	0.00	0.00	0.00	0.00

Summary of Actuarial Assumptions (Concluded)

Age	Percent Retiring
50	5%
51	3
52	3
53	3
54	5
55	45
56	20
57	15
58	15
59	15
60	15
61	15
62	25
63	25
64	25
65	30
66	30
67	25
68	25
69	40
70+	100

Salary Scale	
Year	Increase
1	12.25%
2	8.75
3	5.75
4	5.25
5	5.00
6	4.75
7	4.75
8	4.75
9	4.75
10	4.75
11	4.75
12	4.50
13	4.25
14	4.25
15	4.00
16	4.00
17	4.00
18	3.75
19	3.75
20	3.75
21	3.50
22	3.50
23	3.50
24+	3.25

SECTION G

CALCULATION OF THE SINGLE DISCOUNT RATE

Calculation of the Single Discount Rate

GASB Statement No. 67 includes a specific requirement for the discount rate that is used for the purpose of the measurement of the Total Pension Liability. This rate considers the ability of the fund to meet benefit obligations in the future. To make this determination, employer contributions, employee contributions, benefit payments, expenses and investment returns are projected into the future. The Plan Fiduciary Net Position (assets) in future years can then be determined and compared to its obligation to make benefit payments in those years. As long as assets are projected to be on hand in a future year, the long-term expected rate of return is used as the discount rate. In years where assets are not projected to be sufficient to meet benefit payments, the use of a municipal bond rate is required, as described in the following paragraph.

The Single Discount Rate (SDR) is equivalent to applying these two rates to the benefits that are projected to be paid during the different time periods. The SDR reflects (1) the long-term expected rate of return on pension plan investments (during the period in which the fiduciary net position is projected to be sufficient to pay benefits) and (2) tax-exempt municipal bond rate based on an index of 20-year general obligation bonds with an average AA credit rating as of the measurement date (to the extent that the contributions for use with the long-term expected rate of return are not met).

For the purpose of this valuation, the expected rate of return on pension plan investments is 7.50%; the municipal bond rate is 2.45% (based on the weekly rate closest to but not later than the measurement date of the “20-Year Municipal GO Index” as published by Fidelity) and **the resulting single discount rate as of June 30, 2020 is 7.50%**. In describing this index, Fidelity notes that the municipal curves are constructed using option-adjusted analytics of a diverse population of over 10,000 tax-exempt securities.

The tables in this section provide background for the development of the Single Discount Rate.

The **Projection of Contributions** table shows the development of expected contributions in future years. Normal Cost contributions for future hires are not included (nor are their liabilities).

The **Projection of Plan Fiduciary Net Position** table shows the development of expected asset levels in future years.

The **Present Values of Projected Benefit Payments** table shows the development of the Single Discount Rate. It breaks down the benefit payments into present values for funded and unfunded portions and shows the equivalent total at the SDR.

Single Discount Rate Development
Projection of Contributions (Dollars in Thousands)

	Projected Covered-Employee Payroll			Projected Contributions			
Fiscal Year Ending	Payroll for Current Employees	Payroll for New Employees	Total Employee Payroll	Contributions from Current Employees	Employer Contributions for Current Employees	Contributions on Future Payroll toward Current UAL*	Total Contributions
	(a)	(b)	(c) = (a) + (b)	(d) = (a) x 9.60%	(e) = (a) x 18.85%**	(f)	(g) = (d) + (e) + (f)
2020	$ 278,479		$ 278,479				
2021	274,420	$ 6,684	281,104	$ 26,344	$ 47,612	$ 673	$ 74,629
2022	263,386	26,854	290,240	25,285	49,648	3,107	78,040
2023	252,190	47,483	299,673	24,210	47,538	5,494	77,242
2024	241,935	67,477	309,412	23,226	45,605	7,807	76,638
2025	232,184	87,284	319,468	22,290	43,767	10,099	76,156
2026	222,080	107,771	329,851	21,320	41,862	12,469	75,651
2027	212,072	128,499	340,571	20,359	39,976	14,867	75,202
2028	202,936	148,703	351,639	19,482	38,254	17,205	74,941
2029	194,177	168,891	363,068	18,641	36,602	19,541	74,784
2030	185,346	189,521	374,867	17,793	34,938	21,928	74,659
2031	176,485	210,566	387,051	16,943	33,267	24,362	74,572
2032	167,649	231,981	399,630	16,094	31,602	26,840	74,536
2033	158,823	253,795	412,618	15,247	29,938	29,364	74,549
2034	149,890	276,138	426,028	14,389	28,254	31,949	74,592
2035	140,931	298,943	439,874	13,529	26,566	34,588	74,683
2036	131,567	322,603	454,170	12,630	24,800	37,325	74,755
2037	121,918	347,012	468,930	11,704	22,981	40,149	74,834
2038	112,574	371,596	484,170	10,807	21,220	42,994	75,021
2039	103,583	396,323	499,906	9,944	19,525	45,855	75,324
2040	94,535	421,618	516,153	9,075	13,613	30,019	52,707
2041	85,306	447,622	532,928	8,189	12,284	31,871	52,344
2042	76,534	473,714	550,248	7,347	11,021	33,728	52,096
2043	68,499	499,632	568,131	6,576	9,864	35,574	52,014
2044	60,922	525,673	586,595	5,848	8,773	37,428	52,049
2045	53,565	552,095	605,660	5,142	7,713	39,309	52,164
2046	46,518	578,825	625,343	4,466	6,699	41,212	52,377
2047	39,918	605,749	645,667	3,832	5,748	43,129	52,709
2048	34,013	632,638	666,651	3,265	4,898	45,044	53,207
2049	28,721	659,597	688,318	2,757	4,136	46,963	53,856
2050	23,819	686,869	710,688	2,287	3,430	48,905	54,622
2051	19,450	714,335	733,785	1,867	2,801	50,861	55,529
2052	15,728	741,905	757,633	1,510	2,265	52,824	56,599
2053	12,634	769,622	782,256	1,213	1,819	54,797	57,829
2054	10,022	797,658	807,680	962	1,443	56,793	59,198
2055	7,873	826,056	833,929	756	1,134	58,815	60,705
2056	6,158	854,874	861,032	591	887	60,867	62,345
2057	4,770	884,245	889,015	458	687	62,958	64,103
2058	3,645	914,263	917,908	350	525	65,096	65,971
2059	2,735	945,005	947,740	263	394	67,284	67,941
2060	2,000	976,542	978,542	192	288	69,530	70,010
2061	1,417	1,008,928	1,010,345	136	204	71,836	72,176
2062	975	1,042,206	1,043,181	94	140	74,205	74,439
2063	659	1,076,425	1,077,084	63	95	76,641	76,799
2064	431	1,111,658	1,112,089	41	62	79,150	79,253
2065	262	1,147,970	1,148,232	25	38	81,735	81,798
2066	149	1,185,401	1,185,550	14	21	84,401	84,436
2067	79	1,224,001	1,224,080	8	11	87,149	87,168
2068	38	1,263,825	1,263,863	4	5	89,984	89,993
2069	14	1,304,924	1,304,938	1	2	92,911	92,914
2070	3	1,347,346	1,347,349	-	-	95,931	95,931

* *Equal to total contributions (ultimately 28.45% of new employee payroll) net of normal cost and expenses (16.88% of pay).*

** *Employer contributions are equal to 17.35% for fiscal year ending June 30, 2021; the supplemental employer contribution is assumed to stop after 20 years.*

Single Discount Rate Development
Projection of Contributions (Dollars in Thousands) (Concluded)

	Projected Covered-Employee Payroll			Projected Contributions			
Fiscal Year Ending	Payroll for Current Employees	Payroll for New Employees	Total Employee Payroll	Contributions from Current Employees	Employer Contributions for Current Employees	Contributions on Future Payroll toward Current UAL*	Total Contributions
	(a)	(b)	(c) = (a) + (b)	(d) = (a) x 9.60%	(e) = (a) x 18.85%	(f)	(g) = (d) + (e) + (f)
2071	$ 1	$ 1,391,137	$ 1,391,138	$ -	$ -	$ 99,049	$ 99,049
2072	-	1,436,350	1,436,350	-	-	102,268	102,268
2073	-	1,483,031	1,483,031	-	-	105,592	105,592
2074	-	1,531,230	1,531,230	-	-	109,024	109,024
2075	-	1,580,995	1,580,995	-	-	112,567	112,567
2076	-	1,632,377	1,632,377	-	-	116,225	116,225
2077	-	1,685,429	1,685,429	-	-	120,003	120,003
2078	-	1,740,206	1,740,206	-	-	123,903	123,903
2079	-	1,796,762	1,796,762	-	-	127,929	127,929
2080	-	1,855,157	1,855,157	-	-	132,087	132,087
2081	-	1,915,450	1,915,450	-	-	136,380	136,380
2082	-	1,977,702	1,977,702	-	-	140,812	140,812
2083	-	2,041,977	2,041,977	-	-	145,389	145,389
2084	-	2,108,341	2,108,341	-	-	150,114	150,114
2085	-	2,176,862	2,176,862	-	-	154,993	154,993
2086	-	2,247,610	2,247,610	-	-	160,030	160,030
2087	-	2,320,658	2,320,658	-	-	165,231	165,231
2088	-	2,396,079	2,396,079	-	-	170,601	170,601
2089	-	2,473,952	2,473,952	-	-	176,145	176,145
2090	-	2,554,355	2,554,355	-	-	181,870	181,870
2091	-	2,637,372	2,637,372	-	-	187,781	187,781
2092	-	2,723,086	2,723,086	-	-	193,884	193,884
2093	-	2,811,587	2,811,587	-	-	200,185	200,185
2094	-	2,902,963	2,902,963	-	-	206,691	206,691
2095	-	2,997,309	2,997,309	-	-	213,408	213,408
2096	-	3,094,722	3,094,722	-	-	220,344	220,344
2097	-	3,195,301	3,195,301	-	-	227,505	227,505
2098	-	3,299,148	3,299,148	-	-	234,899	234,899
2099	-	3,406,370	3,406,370	-	-	242,534	242,534
2100	-	3,517,077	3,517,077	-	-	250,416	250,416
2101	-	3,631,382	3,631,382	-	-	258,554	258,554
2102	-	3,749,402	3,749,402	-	-	266,957	266,957
2103	-	3,871,258	3,871,258	-	-	275,634	275,634
2104	-	3,997,073	3,997,073	-	-	284,592	284,592
2105	-	4,126,978	4,126,978	-	-	293,841	293,841
2106	-	4,261,105	4,261,105	-	-	303,391	303,391
2107	-	4,399,591	4,399,591	-	-	313,251	313,251
2108	-	4,542,578	4,542,578	-	-	323,432	323,432
2109	-	4,690,212	4,690,212	-	-	333,943	333,943
2110	-	4,842,643	4,842,643	-	-	344,796	344,796
2111	-	5,000,029	5,000,029	-	-	356,002	356,002
2112	-	5,162,530	5,162,530	-	-	367,572	367,572
2113	-	5,330,313	5,330,313	-	-	379,518	379,518
2114	-	5,503,548	5,503,548	-	-	391,853	391,853
2115	-	5,682,413	5,682,413	-	-	404,588	404,588
2116	-	5,867,091	5,867,091	-	-	417,737	417,737
2117	-	6,057,772	6,057,772	-	-	431,313	431,313
2118	-	6,254,650	6,254,650	-	-	445,331	445,331
2119	-	6,457,926	6,457,926	-	-	459,804	459,804
2120	-	6,667,808	6,667,808	-	-	474,748	474,748

* *Equal to total contributions (ultimately 28.45% of new employee payroll) net of normal cost and expenses (16.88% of pay).*

Single Discount Rate Development
Projection of Plan Fiduciary Net Position (Dollars in Thousands)

Fiscal Year Ending	Projected Beginning Plan Fiduciary Net Position	Projected Total Contributions	Projected Benefit Payments	Projected Administrative Expenses	Projected Investment Earnings at 7.50%	Projected Ending Plan Net Position
	(a)	(b)	(c)	(d)	(e)	(f)=(a)+(b)-(c)-(d)+(e)
2021	$ 1,223,537	$ 74,629	$ 85,150	$ 906	$ 91,344	$ 1,303,454
2022	1,303,454	78,040	89,663	869	97,299	1,388,261
2023	1,388,261	77,242	94,079	832	103,469	1,474,061
2024	1,474,061	76,638	98,662	798	109,714	1,560,953
2025	1,560,953	76,156	103,317	766	116,043	1,649,069
2026	1,649,069	75,651	108,538	733	122,442	1,737,891
2027	1,737,891	75,202	114,041	700	128,886	1,827,238
2028	1,827,238	74,941	119,847	670	135,365	1,917,027
2029	1,917,027	74,784	125,794	641	141,875	2,007,251
2030	2,007,251	74,659	132,077	612	148,407	2,097,628
2031	2,097,628	74,572	138,797	582	154,936	2,187,757
2032	2,187,757	74,536	145,391	553	161,452	2,277,801
2033	2,277,801	74,549	152,322	524	167,952	2,367,456
2034	2,367,456	74,592	159,288	495	174,422	2,456,687
2035	2,456,687	74,683	166,494	465	180,854	2,545,265
2036	2,545,265	74,755	174,218	434	187,216	2,632,584
2037	2,632,584	74,834	182,363	402	193,470	2,718,123
2038	2,718,123	75,021	190,323	371	199,600	2,802,050
2039	2,802,050	75,324	197,836	342	205,630	2,884,826
2040	2,884,826	52,707	205,524	312	210,723	2,942,420
2041	2,942,420	52,344	212,913	282	214,759	2,996,328
2042	2,996,328	52,096	219,659	253	218,545	3,047,057
2043	3,047,057	52,014	225,699	226	222,126	3,095,272
2044	3,095,272	52,049	231,223	201	225,540	3,141,437
2045	3,141,437	52,164	236,417	177	228,817	3,185,824
2046	3,185,824	52,377	241,298	154	231,975	3,228,724
2047	3,228,724	52,709	245,733	132	235,042	3,270,610
2048	3,270,610	53,207	249,272	112	238,072	3,312,505
2049	3,312,505	53,856	252,088	95	241,135	3,355,313
2050	3,355,313	54,622	254,417	79	244,289	3,399,728
2051	3,399,728	55,529	256,017	64	247,595	3,446,771
2052	3,446,771	56,599	256,703	52	251,138	3,497,753
2053	3,497,753	57,829	256,531	42	255,013	3,554,022
2054	3,554,022	59,198	255,646	33	259,317	3,616,858
2055	3,616,858	60,705	253,960	26	264,148	3,687,725
2056	3,687,725	62,345	251,485	20	269,614	3,768,179
2057	3,768,179	64,103	248,430	16	275,826	3,859,662
2058	3,859,662	65,971	244,890	12	282,886	3,963,617
2059	3,963,617	67,941	240,919	9	290,902	4,081,532
2060	4,081,532	70,010	236,556	7	299,982	4,214,961
2061	4,214,961	72,176	231,827	5	310,243	4,365,548
2062	4,365,548	74,439	226,743	3	321,808	4,535,049
2063	4,535,049	76,799	221,323	2	334,807	4,725,330
2064	4,725,330	79,253	215,599	1	349,379	4,938,362
2065	4,938,362	81,798	209,597	1	365,671	5,176,233
2066	5,176,233	84,436	203,327	-	383,840	5,441,182
2067	5,441,182	87,168	196,802	-	404,052	5,735,600
2068	5,735,600	89,993	190,041	-	426,486	6,062,038
2069	6,062,038	92,914	183,060	-	451,334	6,423,226
2070	6,423,226	95,931	175,873	-	478,798	6,822,082

For purposes of this projection, we assumed the current fixed rate contribution would continue after the plan becomes fully funded. If we reflected a decrease in contribution rates due to full funding, future assets and contributions would be less than what is shown herein.

Single Discount Rate Development
Projection of Plan Fiduciary Net Position (Dollars in Thousands) (Concluded)

Fiscal Year Ending	Projected Beginning Plan Fiduciary Net Position	Projected Total Contributions	Projected Benefit Payments	Projected Administrative Expenses	Projected Investment Earnings at 7.50%	Projected Ending Plan Net Position
	(a)	(b)	(c)	(d)	(e)	(f)=(a)+(b)-(c)-(d)+(e)
2071	$ 6,822,082	$ 99,049	$ 168,498	$ -	$ 509,099	$ 7,261,732
2072	7,261,732	102,268	160,954	-	542,469	7,745,515
2073	7,745,515	105,592	153,262	-	579,159	8,277,004
2074	8,277,004	109,024	145,445	-	619,434	8,860,017
2075	8,860,017	112,567	137,529	-	663,582	9,498,637
2076	9,498,637	116,225	129,543	-	711,908	10,197,227
2077	10,197,227	120,003	121,520	-	764,736	10,960,446
2078	10,960,446	123,903	113,494	-	822,417	11,793,272
2079	11,793,272	127,929	105,504	-	885,321	12,701,018
2080	12,701,018	132,087	97,591	-	953,847	13,689,361
2081	13,689,361	136,380	89,798	-	1,028,417	14,764,360
2082	14,764,360	140,812	82,171	-	1,109,486	15,932,487
2083	15,932,487	145,389	74,752	-	1,197,538	17,200,662
2084	17,200,662	150,114	67,587	-	1,293,089	18,576,278
2085	18,576,278	154,993	60,718	-	1,396,692	20,067,245
2086	20,067,245	160,030	54,181	-	1,508,941	21,682,035
2087	21,682,035	165,231	48,008	-	1,630,469	23,429,727
2088	23,429,727	170,601	42,225	-	1,761,957	25,320,060
2089	25,320,060	176,145	36,848	-	1,904,134	27,363,491
2090	27,363,491	181,870	31,892	-	2,057,784	29,571,253
2091	29,571,253	187,781	27,360	-	2,223,751	31,955,425
2092	31,955,425	193,884	23,254	-	2,402,940	34,528,995
2093	34,528,995	200,185	19,565	-	2,596,325	37,305,940
2094	37,305,940	206,691	16,285	-	2,804,957	40,301,303
2095	40,301,303	213,408	13,398	-	3,029,962	43,531,275
2096	43,531,275	220,344	10,886	-	3,272,558	47,013,291
2097	47,013,291	227,505	8,727	-	3,534,053	50,766,122
2098	50,766,122	234,899	6,896	-	3,815,855	54,809,980
2099	54,809,980	242,534	5,366	-	4,119,482	59,166,630
2100	59,166,630	250,416	4,108	-	4,446,567	63,859,505
2101	63,859,505	258,554	3,091	-	4,798,870	68,913,838
2102	68,913,838	266,957	2,284	-	5,178,284	74,356,795
2103	74,356,795	275,634	1,656	-	5,586,848	80,217,621
2104	80,217,621	284,592	1,176	-	6,026,758	86,527,795
2105	86,527,795	293,841	819	-	6,500,374	93,321,191
2106	93,321,191	303,391	558	-	7,010,240	100,634,264
2107	100,634,264	313,251	372	-	7,559,091	108,506,234
2108	108,506,234	323,432	243	-	8,149,868	116,979,291
2109	116,979,291	333,943	156	-	8,785,738	126,098,816
2110	126,098,816	344,796	98	-	9,470,104	135,913,618
2111	135,913,618	356,002	61	-	10,206,628	146,476,187
2112	146,476,187	367,572	37	-	10,999,247	157,842,969
2113	157,842,969	379,518	22	-	11,852,197	170,074,662
2114	170,074,662	391,853	14	-	12,770,028	183,236,529
2115	183,236,529	404,588	8	-	13,757,637	197,398,746
2116	197,398,746	417,737	5	-	14,820,288	212,636,766
2117	212,636,766	431,313	3	-	15,963,639	229,031,715
2118	229,031,715	445,331	2	-	17,193,777	246,670,821
2119	246,670,821	459,804	1	-	18,517,242	265,647,866
2120	265,647,866	474,748	1	-	19,941,071	286,063,684

For purposes of this projection, we assumed the current fixed rate contribution would continue after the plan becomes fully funded. If we reflected a decrease in contribution rates due to full funding, future assets and contributions would be less than what is shown herein.

Single Discount Rate Development
Present Values of Projected Benefits (Dollars in Thousands)

Fiscal Year Ending	Projected Beginning Plan Fiduciary Net Position	Projected Benefit Payments	Funded Portion of Benefit Payments	Unfunded Portion of Benefit Payments	Present Value of Funded Benefit Payments using Expected Return Rate (v)	Present Value of Unfunded Benefit Payments using Municipal Bond Rate (vf)	Present Value of Benefit Payments using Single Discount Rate (sdr)
(a)	(b)	(c)	(d)	(e)	(f)=(d)*v^((a)-.5)	(g)=(e)*vf ^((a)-.5)	(h)=(c)/(1+sdr)^(a-.5)
2021	$ 1,223,537	$ 85,150	$ 85,150	$ -	$ 82,126	$ -	$ 82,126
2022	1,303,454	89,663	89,663	-	80,445	-	80,445
2023	1,388,261	94,079	94,079	-	78,519	-	78,519
2024	1,474,061	98,662	98,662	-	76,599	-	76,599
2025	1,560,953	103,317	103,317	-	74,616	-	74,616
2026	1,649,069	108,538	108,538	-	72,918	-	72,918
2027	1,737,891	114,041	114,041	-	71,270	-	71,270
2028	1,827,238	119,847	119,847	-	69,673	-	69,673
2029	1,917,027	125,794	125,794	-	68,028	-	68,028
2030	2,007,251	132,077	132,077	-	66,443	-	66,443
2031	2,097,628	138,797	138,797	-	64,952	-	64,952
2032	2,187,757	145,391	145,391	-	63,291	-	63,291
2033	2,277,801	152,322	152,322	-	61,682	-	61,682
2034	2,367,456	159,288	159,288	-	60,002	-	60,002
2035	2,456,687	166,494	166,494	-	58,341	-	58,341
2036	2,545,265	174,218	174,218	-	56,789	-	56,789
2037	2,632,584	182,363	182,363	-	55,296	-	55,296
2038	2,718,123	190,323	190,323	-	53,684	-	53,684
2039	2,802,050	197,836	197,836	-	51,910	-	51,910
2040	2,884,826	205,524	205,524	-	50,165	-	50,165
2041	2,942,420	212,913	212,913	-	48,343	-	48,343
2042	2,996,328	219,659	219,659	-	46,394	-	46,394
2043	3,047,057	225,699	225,699	-	44,344	-	44,344
2044	3,095,272	231,223	231,223	-	42,260	-	42,260
2045	3,141,437	236,417	236,417	-	40,195	-	40,195
2046	3,185,824	241,298	241,298	-	38,163	-	38,163
2047	3,228,724	245,733	245,733	-	36,153	-	36,153
2048	3,270,610	249,272	249,272	-	34,115	-	34,115
2049	3,312,505	252,088	252,088	-	32,093	-	32,093
2050	3,355,313	254,417	254,417	-	30,130	-	30,130
2051	3,399,728	256,017	256,017	-	28,204	-	28,204
2052	3,446,771	256,703	256,703	-	26,307	-	26,307
2053	3,497,753	256,531	256,531	-	24,455	-	24,455
2054	3,554,022	255,646	255,646	-	22,670	-	22,670
2055	3,616,858	253,960	253,960	-	20,950	-	20,950
2056	3,687,725	251,485	251,485	-	19,298	-	19,298
2057	3,768,179	248,430	248,430	-	17,734	-	17,734
2058	3,859,662	244,890	244,890	-	16,261	-	16,261
2059	3,963,617	240,919	240,919	-	14,881	-	14,881
2060	4,081,532	236,556	236,556	-	13,593	-	13,593
2061	4,214,961	231,827	231,827	-	12,391	-	12,391
2062	4,365,548	226,743	226,743	-	11,274	-	11,274
2063	4,535,049	221,323	221,323	-	10,237	-	10,237
2064	4,725,330	215,599	215,599	-	9,276	-	9,276
2065	4,938,362	209,597	209,597	-	8,389	-	8,389
2066	5,176,233	203,327	203,327	-	7,570	-	7,570
2067	5,441,182	196,802	196,802	-	6,816	-	6,816
2068	5,735,600	190,041	190,041	-	6,123	-	6,123
2069	6,062,038	183,060	183,060	-	5,486	-	5,486
2070	6,423,226	175,873	175,873	-	4,903	-	4,903

Single Discount Rate Development
Present Values of Projected Benefits
(Dollars in Thousands) (Concluded)

Fiscal Year Ending	Projected Beginning Plan Fiduciary Net Position	Projected Benefit Payments	Funded Portion of Benefit Payments	Unfunded Portion of Benefit Payments	Present Value of Funded Benefit Payments using Expected Return Rate (v)	Present Value of Unfunded Benefit Payments using Municipal Bond Rate (vf)	Present Value of Benefit Payments using Single Discount Rate (sdr)
(a)	(b)	(c)	(d)	(e)	(f)=(d)*v^((a)-.5)	(g)=(e)*vf ^((a)-.5)	(h)=(c)/(1+sdr)^(a-.5)
2071	$ 6,822,082	$ 168,498	$ 168,498	$ -	$ 4,370	$ -	$ 4,370
2072	7,261,732	160,954	160,954	-	3,883	-	3,883
2073	7,745,515	153,262	153,262	-	3,439	-	3,439
2074	8,277,004	145,445	145,445	-	3,036	-	3,036
2075	8,860,017	137,529	137,529	-	2,671	-	2,671
2076	9,498,637	129,543	129,543	-	2,340	-	2,340
2077	10,197,227	121,520	121,520	-	2,042	-	2,042
2078	10,960,446	113,494	113,494	-	1,774	-	1,774
2079	11,793,272	105,504	105,504	-	1,534	-	1,534
2080	12,701,018	97,591	97,591	-	1,320	-	1,320
2081	13,689,361	89,798	89,798	-	1,130	-	1,130
2082	14,764,360	82,171	82,171	-	962	-	962
2083	15,932,487	74,752	74,752	-	814	-	814
2084	17,200,662	67,587	67,587	-	685	-	685
2085	18,576,278	60,718	60,718	-	572	-	572
2086	20,067,245	54,181	54,181	-	475	-	475
2087	21,682,035	48,008	48,008	-	391	-	391
2088	23,429,727	42,225	42,225	-	320	-	320
2089	25,320,060	36,848	36,848	-	260	-	260
2090	27,363,491	31,892	31,892	-	209	-	209
2091	29,571,253	27,360	27,360	-	167	-	167
2092	31,955,425	23,254	23,254	-	132	-	132
2093	34,528,995	19,565	19,565	-	103	-	103
2094	37,305,940	16,285	16,285	-	80	-	80
2095	40,301,303	13,398	13,398	-	61	-	61
2096	43,531,275	10,886	10,886	-	46	-	46
2097	47,013,291	8,727	8,727	-	35	-	35
2098	50,766,122	6,896	6,896	-	25	-	25
2099	54,809,980	5,366	5,366	-	18	-	18
2100	59,166,630	4,108	4,108	-	13	-	13
2101	63,859,505	3,091	3,091	-	9	-	9
2102	68,913,838	2,284	2,284	-	6	-	6
2103	74,356,795	1,656	1,656	-	4	-	4
2104	80,217,621	1,176	1,176	-	3	-	3
2105	86,527,795	819	819	-	2	-	2
2106	93,321,191	558	558	-	1	-	1
2107	100,634,264	372	372	-	1	-	1
2108	108,506,234	243	243	-	-	-	-
2109	116,979,291	156	156	-	-	-	-
2110	126,098,816	98	98	-	-	-	-
2111	135,913,618	61	61	-	-	-	-
2112	146,476,187	37	37	-	-	-	-
2113	157,842,969	22	22	-	-	-	-
2114	170,074,662	14	14	-	-	-	-
2115	183,236,529	8	8	-	-	-	-
2116	197,398,746	5	5	-	-	-	-
2117	212,636,766	3	3	-	-	-	-
2118	229,031,715	2	2	-	-	-	-
2119	246,670,821	1	1	-	-	-	-
2120	265,647,866	1	1	-	-	-	-
				Totals	$ 2,028,691	$ -	$ 2,028,691

SECTION H

GLOSSARY OF TERMS

Glossary of Terms

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

Glossary of Terms

Amortization Payment	The amortization payment is the periodic payment required to pay off an interest-discounted amount with payments of interest and principal.
Amortization Method	The method used to determine the periodic amortization payment may be a level dollar amount, or a level percent of pay amount. The period will typically be expressed in years, and the method will either be "open" (meaning, reset each year) or "closed" (the number of years remaining will decline each year).
Cost-of-Living Adjustments	Postemployment benefit changes intended to adjust benefit payments for the effects of inflation.
Cost-Sharing Multiple-Employer Defined Benefit Pension Plan (cost-sharing pension plan)	A multiple-employer defined benefit pension plan in which the pension obligations to the employees of more than one employer are pooled and pension plan assets can be used to pay the benefits of the employees of any employer that provides pensions through the pension plan.
Covered-Employee Payroll	The payroll of covered employees, which is typically only the pensionable pay and does not include pay above any pay cap.
Deferred Inflows and Outflows of Resources	The deferred inflows and outflows of pension resources are amounts used under GASB Statement No. 68 in developing the annual pension expense. Deferred inflows and outflows arise with differences between expected and actual experiences; changes of assumptions. The portion of these amounts not included in pension expense should be included in the deferred inflows or outflows of resources.
Discount Rate or Single Discount Rate	For GASB purposes, the discount rate is the single rate of return that results in the present value of all projected benefit payments to be equal to the sum of the funded and unfunded projected benefit payments, specifically: 1. The benefit payments to be made while the pension plans' fiduciary net position is projected to be greater than the benefit payments that are projected to be made in the period; and 2. The present value of the benefit payments not in (1) above, discounted using the municipal bond rate.
Entry Age Actuarial Cost Method (EAN)	The EAN is a funding method for allocating the costs of the plan between the normal cost and the accrued liability. The actuarial present value of the projected benefits of each individual included in an actuarial valuation is allocated on a level basis (either level dollar or level percent of pay) over the earnings or service of the individual between entry age and assumed exit age(s). The portion of the actuarial present value allocated to a valuation year is the normal cost. The portion of this actuarial present value not provided for at a valuation date by the actuarial present value of future normal costs is the actuarial accrued liability. The sum of the accrued liability plus the present value of all future normal costs is the present value of all benefits.

Glossary of Terms

Fiduciary Net Position	The fiduciary net position is the value of the net assets of the trust restricted for pension benefits.
GASB	The Governmental Accounting Standards Board is an organization that exists with authority to promulgate accounting standards for state and local governmental entities.
Long-Term Expected Rate of Return	The long-term rate of return is the expected return to be earned over the entire trust portfolio based on the asset allocation of the portfolio.
Money-Weighted Rate of Return	The money-weighted rate of return is a method of calculating the returns that adjusts for the changing amounts actually invested. For purposes of GASB Statement No. 67, money-weighted rate of return is calculated as the internal rate of return on pension plan investments, net of pension plan investment expense.
Multiple-Employer Defined Benefit Pension Plan	A multiple-employer plan is a defined benefit pension plan that is used to provide pensions to the employees of more than one employer.
Municipal Bond Rate	The Municipal Bond Rate is the discount rate to be used for those benefit payments that occur after the assets of the trust have been depleted.
Net Pension Liability (NPL)	The NPL is the liability of employers and non-employer contributing entities to plan members for benefits provided through a defined benefit pension plan.
Non-Employer Contributing Entities	Non-employer contributing entities are entities that make contributions to a pension plan that is used to provide pensions to the employees of other entities. For purposes of the GASB Accounting Statements No. 67 and No. 68 plan members are not considered non-employer contributing entities.
Normal Cost	The actuarial present value of the pension trust benefits allocated to the current year by the actuarial cost method.
Other Postemployment Benefits (OPEB)	All postemployment benefits other than retirement income (such as death benefits, life insurance, disability, and long-term care) that are provided separately from a pension plan, as well as postemployment healthcare benefits regardless of the manner in which they are provided. Other postemployment benefits do not include termination benefits.
Real Rate of Return	The real rate of return is the rate of return on an investment after adjustment to eliminate inflation.
Service Cost	The service cost is the portion of the actuarial present value of projected benefit payments that is attributed to a valuation year.

Glossary of Terms

Total Pension Expense The total pension expense is the sum of the following items that are recognized at the end of the employer's fiscal year:

1. Service Cost
2. Interest on the Total Pension Liability
3. Current-Period Changes in Benefit Terms
4. Employee Contributions
5. Projected Earnings on Plan Investments
6. Pension Plan Administrative Expense
7. Other Changes in Plan Fiduciary Net Position
8. Recognition of Outflow (Inflow) of Resources due to the difference between expected and actual in measurement of the Total Pension Liability
9. Recognition of Outflow (Inflow) of Resources due to Assumption Changes
10. Recognition of Outflow (Inflow) of Resources due to the difference between projected and actual earnings on pension plan investments

Total Pension Liability (TPL) The TPL is the portion of the actuarial present value of projected benefit payments that is attributed to past periods of member service.

Unfunded Actuarial Accrued Liability (UAAL) The UAAL is the difference between actuarial accrued liability and valuation assets.

Valuation Assets The valuation assets are the plan fiduciary net position used in determining the net position liability of the plan. For purposes of the GASB Statement No. 67, the asset valuation method is equal to the market value of assets.