Minnesota State Retirement System
Correctional Employees Retirement Fund

GASB Statement Nos. 67 and 68
Accounting and Financial Reporting for Pensions
June 30, 2019

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November 27, 2019

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.

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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, 2019 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, 2019 (Dollars in Thousands)

		2019
Actuarial Valuation Date		June 30, 2019
Measurement Date of the Net Pension Liability		June 30, 2019
Membership		
Number of		
- Service Retirements		2,879
- Survivors		241
- Disability Retirements		308
- Deferred Retirements		1,386
- Terminated other non-vested		950
- Active Members		4,582
- Total		10,346
Covered-employee Payroll [1]	$	267,563
Net Pension Liability		
Total Pension Liability	$	1,579,374
Plan Fiduciary Net Position		1,183,995
Net Pension Liability	$	395,379
Plan Fiduciary Net Position as a Percentage of Total Pension Liability		74.97%
Net Pension Liability as a Percentage of Covered-Employee Payroll		147.77%
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]		3.13%
Last year ending June 30 in the 2020 to 2119 projection period for which projected benefit payments are fully funded		2119
Total Pension Expense/ (Income)	$	(2,734)

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	$	10,356	$	2,251
Changes in assumptions		135,046		455,967
Net difference between projected and actual earnings on pension plan investments		16,115		44,729
Total	$	161,517	$	502,947

(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, 2019.

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/financial-information 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 29 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

GASB Statement Nos. 67 and 68 require that an actuarial valuation to determine the total pension liability be performed at least every two years. The net pension liability and pension expense should be measured as of the pension plan's fiscal year end (measurement date) on a date that is within the employer's prior fiscal year. 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, 2019 and a measurement date of June 30, 2019.

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 3.13% (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, 2019 (Dollars in Thousands)

A. Expense

1.	Service Cost	$	44,912
2.	Interest on the Total Pension Liability		110,664
3.	Current-Period Benefit Changes		-
4.	Employee Contributions (made negative for addition here)		(25,686)
5.	Projected Earnings on Plan Investments (made negative for addition here)		(83,173)
6.	Pension Plan Administrative Expense		856
7.	Other Changes in Plan Fiduciary Net Position		6
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		1,636
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		446
11.	**Increases/(Decreases) from Experience in the Current Reporting Period**	**$**	**49,661**
12.	Recognition of Outflow (Inflow) of Resources due to differences between expected and actual experience in the measurement of the Total Pension Liability		
	Arising from Prior Reporting Periods		2,329
13.	Recognition of Outflow (Inflow) of Resources due to assumption changes		
	Arising from Prior Reporting Periods		(55,669)
14.	Recognition of Outflow (Inflow) of Resources due to the difference between projected and actual earnings on Pension Plan Investments		
	Arising from Prior Reporting Periods		945
15.	**Total Pension Expense / (Income)**	**$**	**(2,734)**

Statement of Outflows and Inflows
Arising from Current Reporting Period
Fiscal Year Ended June 30, 2019 (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	$	8,180
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		1,636
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	$	1,636
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	$	6,544
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	$	6,544
B. Outflows (Inflows) of Resources due to Assets		
1. Net difference between projected and actual earnings on pension plan investments (gains) or losses	$	2,231
2. Recognition period for Assets {in years}		5
3. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Assets		446
4. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Assets	$	1,785

Statement of Outflows and Inflows
Arising from Current and Prior Reporting Periods
Fiscal Year Ended June 30, 2019 (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	$ 139,861	$ 191,565	$ (51,704)
2. Due to Assets	20,854	19,463	1,391
3. Totals	$ 160,715	$ 211,028	$ (50,313)

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	$ 4,818	$ 853	$ 3,965
2. Assumption Changes	135,043	190,712	(55,669)
3. Net Difference between projected and actual earnings on pension plan investments	20,854	19,463	1,391
4. Totals	$ 160,715	$ 211,028	$ (50,313)

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	$ 10,356	$ 2,251	$ 8,105
2. Assumption Changes	135,046	455,967	(320,921)
3. Net Difference between projected and actual earnings on pension plan investments*	16,115	44,729	(28,614)
4. Total	$ 161,517	$ 502,947	$ (341,430)

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
2020	$ (32,559)
2021	(182,968)
2022	(127,986)
2023	2,083
2024	-
Thereafter	-
Total	$ (341,430)

** 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, 2019 (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					
2014	$ 4,103	6.0000	$ 683	$ -	0.0000
2015	7,115	6.0000	1,186	1,185	1.0000
2016	(764)	5.0000	(153)	(152)	1.0000
2017	6,566	5.0000	1,313	2,627	2.0000
2018	(3,499)	5.0000	(700)	(2,099)	3.0000
2019	8,180	5.0000	1,636	6,544	4.0000
Total			**$ 3,965**	**$ 8,105**	
Deferred Outflow (Inflow) due to Assumption Changes					
2014	$ (147,067)	6.0000	$ (24,512)	$ -	0.0000
2015	118,399	6.0000	19,733	19,734	1.0000
2016	576,552	5.0000	115,310	115,312	1.0000
2017	(213,159)	5.0000	(42,632)	(85,263)	2.0000
2018	(617,840)	5.0000	(123,568)	(370,704)	3.0000
Total			**$ (55,669)**	**$ (320,921)**	
Deferred Outflow (Inflow) due to Differences Between Projected and Actual Earnings on Plan Investments					
2015	$ 30,400	5.0000	$ 6,080	$ -	0.0000
2016	71,642	5.0000	14,328	14,330	1.0000
2017	(68,307)	5.0000	(13,661)	(27,324)	2.0000
2018	(29,009)	5.0000	(5,802)	(17,405)	3.0000
2019	2,231	5.0000	446	1,785	4.0000
Total			**$ 1,391**	**$ (28,614)**	

Statement of Fiduciary Net Position as of June 30, 2019 (Dollars in Thousands)

Assets		June 30, 2019
Cash & Short-term Investments	$	35,664
Receivables		3,306
Investment Pools (at fair value)		1,146,592
Securities Lending Collateral		87,803
Capital Assets		-
Total Assets	**$**	**1,273,365**
Total Deferred Outflows of Resources	**$**	**-**
Total Liabilities	**$**	**(89,370)**
Total Deferred Inflows of Resources	**$**	**-**
Net Position Restricted for Pensions	**$**	**1,183,995**

Statement of Changes in Fiduciary Net Position for Year Ended June 30, 2019 (Dollars in Thousands)

1. Net position at market value at beginning of year	**$**	**1,114,887**
Additions		
2. Contributions		
a. Employee	$	25,686
b. Employer		38,245
c. Other sources		-
d. Total contributions	$	63,931
3. Investment income		
a. Investment income/(loss)	$	82,058
b. Investment expenses		(1,116)
c. Net investment income/(loss)	$	80,942
4. Other Additions		-
5. Total Additions *(2.d.) + (3.c.) + (4.)*	**$**	**144,873**
Deductions		
6. Benefits Paid		
a. Annuity benefits	$	(72,419)
b. Refunds		(2,484)
c. Total benefits paid	$	(74,903)
7. Expenses		
a. Other deductions	$	(6)
b. Administrative		(856)
c. Total expenses	$	(862)
8. Total deductions *(6.c.) + (7.c.)*	**$**	**(75,765)**
9. Net increase/(decrease) in fiduciary net position *(5.) + (8.)*	**$**	**69,108**
10. Net position at market value at end of year *(1.) + (9.)*	**$**	**1,183,995**
11. State Board of Investment calculated annual investment return for the Correctional Employees Retirement Fund*		7.3%

** The fiscal year 2019 investment return for the Combined Funds is 7.3%.*

SECTION C

REQUIRED SUPPLEMENTARY INFORMATION

Schedule of Changes in Net Pension Liability and Related Ratios
Current Period
Fiscal Year Ended June 30, 2019 (Dollars in Thousands)

A. Total Pension Liability		
1. Service Cost	$	44,912
2. Interest on the Total Pension Liability		110,664
3. Changes of benefit terms		-
4. Difference between expected and actual experience of the Total Pension Liability		8,180
5. Changes of assumptions		-
6. Benefit payments, including refunds of employee contributions		(74,903)
7. Net change in Total Pension Liability	$	88,853
8. Total Pension Liability – Beginning		1,490,521
9. Total Pension Liability – Ending	**$**	**1,579,374**
B. Plan Fiduciary Net Position		
1. Contributions – Employer	$	38,245
2. Contributions – Employee		25,686
3. Net investment income		80,942
4. Benefit payments, including refunds of employee contributions		(74,903)
5. Pension Plan Administrative Expense		(856)
6. Other changes		(6)
7. Net change in Plan Fiduciary Net Position	$	69,108
8. Plan Fiduciary Net Position – Beginning		1,114,887
9. Plan Fiduciary Net Position – Ending	**$**	**1,183,995**
C. Net Pension Liability, *A.9 - B.9.*	**$**	**395,379**
D. Plan Fiduciary Net Position as a percentage of the Total Pension Liability, *B.9 / A.9.*		**74.97%**
E. Covered-Employee payroll	**$**	**267,563** [1]
F. Net Pension Liability as a percentage of Covered-Employee payroll, *C. / E.*		**147.77%**

[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,	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010
Total Pension Liability										
Service Cost	$ 44,912	$85,364	$ 95,522	$ 56,718	$ 48,805	$ 54,443				
Interest on the Total Pension Liability	110,664	108,421	95,307	97,571	92,039	85,702				
Benefit Changes	-	(164,182)	-	-	-	-				
Difference between Expected and Actual Experience	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	(72,419)	(67,622)	(63,221)	(59,045)	(54,909)	(50,842)				
Refunds	(2,484)	(2,052)	(1,466)	(1,895)	(1,590)	(1,447)				
Net Change in Total Pension Liability	**$ 88,853**	**($661,410)**	**$ (80,451)**	**$ 669,137**	**$ 209,859**	**$ (55,108)**				
Total Pension Liability - Beginning	**$ 1,490,521**	**$2,151,931**	**$ 2,232,382**	**$ 1,563,245**	**$ 1,353,386**	**$ 1,408,494**				
Total Pension Liability - Ending (a)	**$ 1,579,374**	**$1,490,521**	**$ 2,151,931**	**$ 2,232,382**	**$ 1,563,245**	**$ 1,353,386**				
Plan Fiduciary Net Position										
Employer Contributions	$ 38,245	$32,893	$ 31,763	$ 30,678	$ 29,480	$ 26,468				
Employee Contributions	25,686	23,417	22,648	21,953	21,061	18,855				
Pension Plan Net Investment Income	80,942	105,263	135,359	(195)	38,624	137,523				
Benefit Payments	(72,419)	(67,622)	(63,221)	(59,045)	(54,909)	(50,842)				
Refunds	(2,484)	(2,052)	(1,466)	(1,895)	(1,590)	(1,447)				
Pension Plan Administrative Expense	(856)	(827)	(856)	(906)	(720)	(657)				
Other Changes	(6)	(2)	(2)	-	-	(1)				
Net Change in Plan Fiduciary Net Position	**$ 69,108**	**$91,070**	**$ 124,225**	**$ (9,410)**	**$ 31,946**	**$ 129,899**				
Plan Fiduciary Net Position - Beginning	**$ 1,114,887**	**$1,023,817**	**$ 899,592**	**$ 909,002**	**$ 877,056**	**$ 747,157**				
Plan Fiduciary Net Position - Ending (b)	**$ 1,183,995**	**$1,114,887**	**$ 1,023,817**	**$ 899,592**	**$ 909,002**	**$ 877,056**				
Net Pension Liability - Ending (a) - (b)	**$ 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	**74.97 %**	**74.80 %**	**47.58 %**	**40.30 %**	**58.15 %**	**64.80 %**				
Covered-Employee Payroll [1]	**$ 267,563**	**$257,330**	**$ 248,879**	**$241,242**	**$231,440**	**$219,244**				
Net Pension Liability as a Percentage of Covered-Employee Payroll	**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)
2010						
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

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)
2010	$ 32,557	$ 21,988	$ 10,569	$ 192,450	11.43%
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

** 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, 2019 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, 2018
Actuarial Cost Method	Entry Age Normal
Amortization Method	Level Percentage of Payroll, Closed
Remaining Amortization Period	30 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, 2018 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/actuarial-reports.

Schedule of Investment Returns Multiyear

Last 10 Fiscal Years

Fiscal Year Ending June 30,	Annual Return[1]
2010	
2011	
2012	
2013	
2014	18.6 %
2015	4.4
2016	(0.0)
2017	15.2
2018	10.4
2019	7.3

[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, 2019, the annual money-weighted rate of return for the Correctional Employees Retirement Fund was 7.3%. 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, 2019, 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	$ 1,802,674	$ 1,579,374	$ 1,397,215
Net Position Restricted for Pensions	1,183,995	1,183,995	1,183,995
Net Pension Liability	**$ 618,679**	**$ 395,379**	**$ 213,220**

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	**$ 1,490,521**	**$ 1,114,887**	**$ 375,634**	**$ 311,821**	**$ 713,975**	
Changes for the Year:						
Service Cost	$ 44,912		$ 44,912			$ 44,912
Interest on Total Pension Liability	110,664		110,664			110,664
Interest on Plan Fiduciary Net Position [1]		$ 83,173 [1]	(83,173)			(83,173)
Changes in Benefit Terms	-		-			-
Liability Experience Gains and Losses	8,180		8,180	$ 6,544	$ -	1,636
Changes in Assumptions	-		-	-	-	-
Recognition of Deferred Outflows/(Inflows) of Resources Arising from Prior Reporting Periods						
Liability Experience Gains/(Losses)				(3,182)	(853)	2,329
Assumption Changes				(135,043)	(190,712)	(55,669)
Investment Gains/(Losses)				(20,408)	(19,463)	945
Contributions - Employer		38,245	(38,245)			
Contributions - Employees		25,686	(25,686)			(25,686)
Asset Gain/(Loss) [1]		(2,231) [1]	2,231	1,785	-	446
Benefit Payment and Refunds	(74,903)	(74,903)				
Administrative Expenses		(856)	856			856
Other Changes		(6)	6			6
Net Changes	**$ 88,853**	**$ 69,108**	**$ 19,745**	**$ (150,304)**	**$ (211,028)**	**$ (2,734)**
Balance End of Year	**$ 1,579,374**	**$ 1,183,995**	**$ 395,379**	**$ 161,517**	**$ 502,947**	

[1] *The sum of these items in column (b) equals the net investment income of $80,942.*

Summary of Population Statistics

		Terminated		Recipients			
	Actives	Deferred Retirement	Other Non-Vested	Service Retirement	Disability Retirement	Survivor	Total
Members on 7/1/2018	**4,650**	**1,347**	**843**	**2,736**	**297**	**226**	**10,099**
New members	455						**455**
Return to active	24	(13)	(11)	0	0	0	**0**
Terminated non-vested	(170)	0	170	0	0	0	**0**
Service retirements	(125)	(47)	0	172	0	0	**0**
Terminated deferred	(113)	113	0	0	0	0	**0**
Terminated refund/transfer	(122)	(12)	(84)	0	0	0	**(218)**
Deaths	(9)	(4)	(3)	(39)	(5)	(7)	**(67)**
New beneficiary	0	0	0	0	0	24	**24**
Disabled	(8)	0	0	0	8	0	**0**
Unexpected status changes	0	2	35	10	8	(2)	**53**
Net change	(68)	39	107	143	11	15	**247**
Members on 6/30/2019	**4,582**	**1,386**	**950**	**2,879**	**308**	**241**	**10,346**

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	
Normal retirement benefit	
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.
Early retirement	
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.
Form of payment	Life annuity. Actuarially equivalent options are: 50%, 75%, or 100% Joint and Survivor, or 15-year certain. If a Joint and Survivor benefit is elected and the beneficiary predeceases the annuitant, the annuitant's benefit increases to the Life Annuity amount. This "bounce back" is subsidized by the plan.
Benefit increases	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	
Duty Disability	
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).

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.

Summary of Plan Provisions (Continued)

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, compounded daily. Beginning July 1, 2011, a member's contributions increase with 4.00% interest compounded daily. Beginning July 1, 2018, member contributions increase with 3.00% interest compounded daily.
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, compounded daily. Beginning July 1, 2011, a member's contributions increase with 4.00% interest compounded daily. Beginning July 1, 2018, member contributions increase with 3.00% interest compounded daily. If a member is vested, a deferred annuity may be elected in lieu of a refund.

Summary of Plan Provisions (Concluded)

Termination (Continued)	
<u>**Deferred benefit**</u>	
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 Allowances for Combined Service Annuity 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 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:
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:

Select withdrawal rates:

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

Form of payment elections:

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 MSRS. 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, based on average results for applicable members at the time of the last experience study, were applied: <u>Data for active members</u>: There were 11 members reported without a gender and no members reported with an invalid date of birth. We assumed male gender. There were 8 members reported with zero or invalid salary. We used prior year salary (7 members), if available, otherwise, high five salary with a 10% load to account for salary increases (0 member). 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 0 service, and based on direction from MSRS, we used service of 0 years for this member.

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 43 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 (15 members), we assumed a value of $45,000. There were no members reported without a Termination Date or Credited Service. There were 50 members who terminated after June 30, 1997 and who were reported with a benefit in the Accelerated to Age 62 option. Based on direction from MSRS, we adjusted benefits for these members to reflect the assumed life annuity election. Benefits were estimated for 247 members at the direction of MSRS. Data for members receiving benefits: There were 7 members 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 2 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 bounce back annuity and an unreasonable reduction factor. A factor of 0.80, 0.85 and 0.90 was assumed for the 100%, 75% and 50% joint and survivor annuity, respectively. There was 1 retiree reported with an accelerated benefit election, who is younger than the accelerated age and is missing the accelerated benefit amount and end date. We assumed the accelerated period has ended. There were retired members reported with a survivor option and an invalid or missing survivor gender (362 members) and/or survivor date of birth (298 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)

	Percentage of Members Dying Each Year*					
	Healthy Post-Retirement Mortality**		Healthy Pre-Retirement Mortality**		Disability Mortality**	
Age in 2019	Male	Female	Male	Female	Male	Female
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	0.41	0.22
35	0.09	0.09	0.03	0.03	0.76	0.44
40	0.13	0.12	0.04	0.03	1.10	0.65
45	0.18	0.15	0.06	0.05	1.43	0.82
50	0.27	0.20	0.10	0.08	1.78	1.08
55	0.40	0.29	0.18	0.14	2.17	1.44
60	0.59	0.44	0.32	0.21	2.56	1.70
65	0.90	0.69	0.56	0.30	3.03	2.00
70	1.48	1.10	0.98	0.52	3.85	2.68
75	2.57	1.88	1.76	0.91	5.25	3.95
80	4.61	3.37	3.16	1.63	7.51	6.03
85	8.55	6.22	6.57	4.35	11.15	9.11
90	15.25	11.27	12.48	9.73	16.92	13.30

* *Generally, mortality rates are expected to increase as age increases. These standard mortality rates have been adjusted slightly to prevent decreasing mortality rates. If the rates were not adjusted as described, we would not expect the valuation results to be materially different.*

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

	Percent of Members Decrementing Each Year			
	Termination (Withdrawal) Rates After Third Year		Disability Retirement	
Age	Male	Female	Male	Female
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 3.13% (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, 2019 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)
2019	$ 267,563		$ 267,563				
2020	277,162		277,162	$ 26,608	$ 43,930		$ 70,538
2021	266,326	$ 19,843	286,169	25,567	46,208	$ 1,972	73,747
2022	255,152	40,318	295,470	24,495	48,096	4,612	77,203
2023	244,551	60,522	305,073	23,477	46,098	6,924	76,499
2024	234,174	80,814	314,988	22,481	44,142	9,245	75,868
2025	224,376	100,849	325,225	21,540	42,295	11,537	75,372
2026	214,407	121,387	335,794	20,583	40,416	13,887	74,886
2027	204,335	142,373	346,708	19,616	38,517	16,287	74,420
2028	195,137	162,839	357,976	18,733	36,783	18,629	74,145
2029	186,492	183,118	369,610	17,903	35,154	20,949	74,006
2030	177,797	203,825	381,622	17,069	33,515	23,318	73,902
2031	168,960	225,065	394,025	16,220	31,849	25,747	73,816
2032	160,090	246,741	406,831	15,369	30,177	28,227	73,773
2033	151,272	268,781	420,053	14,522	28,515	30,749	73,786
2034	142,404	291,301	433,705	13,671	26,843	33,325	73,839
2035	133,512	314,288	447,800	12,817	25,167	35,955	73,939
2036	124,225	338,128	462,353	11,926	23,416	38,682	74,024
2037	114,613	362,767	477,380	11,003	21,605	41,501	74,109
2038	105,388	387,507	492,895	10,117	19,866	44,331	74,314
2039	96,523	412,391	508,914	9,266	13,899	28,826	51,991
2040	87,584	437,870	525,454	8,408	12,612	30,607	51,627
2041	78,591	463,940	542,531	7,545	11,317	32,429	51,291
2042	70,063	490,100	560,163	6,726	10,089	34,258	51,073
2043	62,135	516,233	578,368	5,965	8,947	36,085	50,997
2044	54,677	542,488	597,165	5,249	7,873	37,920	51,042
2045	47,618	568,955	616,573	4,571	6,857	39,770	51,198
2046	40,885	595,727	636,612	3,925	5,887	41,641	51,453
2047	34,681	622,621	657,302	3,329	4,994	43,521	51,844
2048	29,166	649,498	678,664	2,800	4,200	45,400	52,400
2049	24,234	676,487	700,721	2,326	3,490	47,286	53,102
2050	19,810	703,684	723,494	1,902	2,853	49,187	53,942
2051	15,991	731,016	747,007	1,535	2,303	51,098	54,936
2052	12,836	758,449	771,285	1,232	1,848	53,016	56,096
2053	10,258	786,094	796,352	985	1,477	54,948	57,410
2054	8,071	814,162	822,233	775	1,162	56,910	58,847
2055	6,268	842,688	848,956	602	903	58,904	60,409
2056	4,829	871,718	876,547	464	695	60,933	62,092
2057	3,665	901,370	905,035	352	528	63,006	63,886
2058	2,734	931,715	934,449	262	394	65,127	65,783
2059	1,999	962,819	964,818	192	288	67,301	67,781
2060	1,426	994,749	996,175	137	205	69,533	69,875
2061	981	1,027,569	1,028,550	94	141	71,827	72,062
2062	654	1,061,324	1,061,978	63	94	74,187	74,344
2063	425	1,096,068	1,096,493	41	61	76,615	76,717
2064	263	1,131,866	1,132,129	25	38	79,117	79,180
2065	150	1,168,773	1,168,923	14	22	81,697	81,733
2066	79	1,206,834	1,206,913	8	11	84,358	84,377
2067	40	1,246,097	1,246,137	4	6	87,102	87,112
2068	19	1,286,618	1,286,637	2	3	89,935	89,940
2069	6	1,328,447	1,328,453	1	1	92,858	92,860

* *Equal to total contributions (ultimately 28.45% of new employee payroll) net of normal cost and expenses (17.01% of pay).*

** *Employer contributions are equal to15.85% and 17.35% for fiscal years ending June 30, 2020 and 2021 respectively; the supplemental employer contribution is assumed to stop after 20 years.*

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

Fiscal Year Ending	Projected Covered-Employee Payroll: Payroll for Current Employees	Payroll for New Employees	Total Employee Payroll	Projected Contributions: 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)
2070	$ 1	$ 1,371,626	$ 1,371,627	$ -	$ -	$ 95,877	$ 95,877
2071	-	1,416,205	1,416,205	-	-	98,993	98,993
2072	-	1,462,232	1,462,232	-	-	102,210	102,210
2073	-	1,509,754	1,509,754	-	-	105,532	105,532
2074	-	1,558,821	1,558,821	-	-	108,962	108,962
2075	-	1,609,483	1,609,483	-	-	112,503	112,503
2076	-	1,661,791	1,661,791	-	-	116,159	116,159
2077	-	1,715,799	1,715,799	-	-	119,934	119,934
2078	-	1,771,563	1,771,563	-	-	123,832	123,832
2079	-	1,829,139	1,829,139	-	-	127,857	127,857
2080	-	1,888,586	1,888,586	-	-	132,012	132,012
2081	-	1,949,965	1,949,965	-	-	136,303	136,303
2082	-	2,013,339	2,013,339	-	-	140,732	140,732
2083	-	2,078,772	2,078,772	-	-	145,306	145,306
2084	-	2,146,332	2,146,332	-	-	150,029	150,029
2085	-	2,216,088	2,216,088	-	-	154,905	154,905
2086	-	2,288,111	2,288,111	-	-	159,939	159,939
2087	-	2,362,474	2,362,474	-	-	165,137	165,137
2088	-	2,439,255	2,439,255	-	-	170,504	170,504
2089	-	2,518,531	2,518,531	-	-	176,045	176,045
2090	-	2,600,383	2,600,383	-	-	181,767	181,767
2091	-	2,684,895	2,684,895	-	-	187,674	187,674
2092	-	2,772,154	2,772,154	-	-	193,774	193,774
2093	-	2,862,250	2,862,250	-	-	200,071	200,071
2094	-	2,955,273	2,955,273	-	-	206,574	206,574
2095	-	3,051,319	3,051,319	-	-	213,287	213,287
2096	-	3,150,487	3,150,487	-	-	220,219	220,219
2097	-	3,252,878	3,252,878	-	-	227,376	227,376
2098	-	3,358,596	3,358,596	-	-	234,766	234,766
2099	-	3,467,751	3,467,751	-	-	242,396	242,396
2100	-	3,580,452	3,580,452	-	-	250,274	250,274
2101	-	3,696,817	3,696,817	-	-	258,408	258,408
2102	-	3,816,964	3,816,964	-	-	266,806	266,806
2103	-	3,941,015	3,941,015	-	-	275,477	275,477
2104	-	4,069,098	4,069,098	-	-	284,430	284,430
2105	-	4,201,344	4,201,344	-	-	293,674	293,674
2106	-	4,337,887	4,337,887	-	-	303,218	303,218
2107	-	4,478,869	4,478,869	-	-	313,073	313,073
2108	-	4,624,432	4,624,432	-	-	323,248	323,248
2109	-	4,774,726	4,774,726	-	-	333,753	333,753
2110	-	4,929,905	4,929,905	-	-	344,600	344,600
2111	-	5,090,127	5,090,127	-	-	355,800	355,800
2112	-	5,255,556	5,255,556	-	-	367,363	367,363
2113	-	5,426,361	5,426,361	-	-	379,303	379,303
2114	-	5,602,718	5,602,718	-	-	391,630	391,630
2115	-	5,784,806	5,784,806	-	-	404,358	404,358
2116	-	5,972,812	5,972,812	-	-	417,500	417,500
2117	-	6,166,929	6,166,929	-	-	431,068	431,068
2118	-	6,367,354	6,367,354	-	-	445,078	445,078
2119	-	6,574,293	6,574,293	-	-	459,543	459,543

* *Equal to total contributions (ultimately 28.45% of new employee payroll) net of normal cost and expenses (17.01% 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)
2020	$ 1,183,995	$ 70,538	$ 79,705	$ 887	$ 88,429	$ 1,262,370
2021	1,262,370	73,747	83,985	852	94,269	1,345,549
2022	1,345,549	77,203	88,393	816	100,474	1,434,017
2023	1,434,017	76,499	92,800	783	106,922	1,523,855
2024	1,523,855	75,868	97,483	749	113,466	1,614,957
2025	1,614,957	75,372	102,456	718	120,098	1,707,253
2026	1,707,253	74,886	107,649	686	126,812	1,800,616
2027	1,800,616	74,420	113,481	654	133,584	1,894,485
2028	1,894,485	74,145	119,423	624	140,396	1,988,979
2029	1,988,979	74,006	125,307	597	147,262	2,084,343
2030	2,084,343	73,902	131,600	569	154,180	2,180,256
2031	2,180,256	73,816	138,192	541	161,129	2,276,468
2032	2,276,468	73,773	144,642	512	168,107	2,373,194
2033	2,373,194	73,786	151,354	484	175,115	2,470,257
2034	2,470,257	73,839	158,099	456	182,150	2,567,691
2035	2,567,691	73,939	165,086	427	189,205	2,665,322
2036	2,665,322	74,024	172,519	398	196,258	2,762,687
2037	2,762,687	74,109	180,413	367	203,274	2,859,290
2038	2,859,290	74,314	187,981	337	210,249	2,955,535
2039	2,955,535	51,991	195,170	309	216,381	3,028,428
2040	3,028,428	51,627	202,467	280	221,567	3,098,875
2041	3,098,875	51,291	209,410	251	226,584	3,167,089
2042	3,167,089	51,073	215,718	224	231,461	3,233,681
2043	3,233,681	50,997	221,421	199	236,243	3,299,301
2044	3,299,301	51,042	226,598	175	240,977	3,364,547
2045	3,364,547	51,198	231,290	152	245,704	3,430,007
2046	3,430,007	51,453	235,656	131	250,463	3,496,136
2047	3,496,136	51,844	239,477	111	255,297	3,563,689
2048	3,563,689	52,400	242,436	93	260,275	3,633,835
2049	3,633,835	53,102	244,676	78	265,480	3,707,663
2050	3,707,663	53,942	246,295	63	270,989	3,786,236
2051	3,786,236	54,936	247,094	51	276,890	3,870,917
2052	3,870,917	56,096	246,935	41	283,290	3,963,327
2053	3,963,327	57,410	245,966	33	290,305	4,065,043
2054	4,065,043	58,847	244,417	26	298,044	4,177,491
2055	4,177,491	60,409	242,187	20	306,617	4,302,310
2056	4,302,310	62,092	239,300	15	316,147	4,441,234
2057	4,441,234	63,886	235,931	12	326,757	4,595,934
2058	4,595,934	65,783	232,128	9	338,569	4,768,149
2059	4,768,149	67,781	227,926	6	351,714	4,959,712
2060	4,959,712	69,875	223,360	5	366,326	5,172,548
2061	5,172,548	72,062	218,462	3	382,550	5,408,695
2062	5,408,695	74,344	213,247	2	400,537	5,670,327
2063	5,670,327	76,717	207,736	1	420,450	5,959,757
2064	5,959,757	79,180	201,959	1	442,460	6,279,437
2065	6,279,437	81,733	195,934	-	466,752	6,631,988
2066	6,631,988	84,377	189,672	-	493,522	7,020,215
2067	7,020,215	87,112	183,189	-	522,978	7,447,116
2068	7,447,116	89,940	176,502	-	555,346	7,915,900
2069	7,915,900	92,860	169,627	-	590,865	8,429,998

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)
2070	$ 8,429,998	$ 95,877	$ 162,576	$ -	$ 629,793	$ 8,993,092
2071	8,993,092	98,993	155,363	-	672,406	9,609,128
2072	9,609,128	102,210	148,010	-	718,998	10,282,326
2073	10,282,326	105,532	140,534	-	769,885	11,017,209
2074	11,017,209	108,962	132,959	-	825,407	11,818,619
2075	11,818,619	112,503	125,310	-	885,924	12,691,736
2076	12,691,736	116,159	117,616	-	951,826	13,642,105
2077	13,642,105	119,934	109,909	-	1,023,527	14,675,657
2078	14,675,657	123,832	102,225	-	1,101,470	15,798,734
2079	15,798,734	127,857	94,601	-	1,186,129	17,018,119
2080	17,018,119	132,012	87,077	-	1,278,013	18,341,067
2081	18,341,067	136,303	79,697	-	1,377,664	19,775,337
2082	19,775,337	140,732	72,505	-	1,485,662	21,329,226
2083	21,329,226	145,306	65,543	-	1,602,629	23,011,618
2084	23,011,618	150,029	58,854	-	1,729,228	24,832,021
2085	24,832,021	154,905	52,478	-	1,866,173	26,800,621
2086	26,800,621	159,939	46,449	-	2,014,225	28,928,336
2087	28,928,336	165,137	40,796	-	2,174,203	31,226,880
2088	31,226,880	170,504	35,541	-	2,346,985	33,708,828
2089	33,708,828	176,045	30,698	-	2,533,514	36,387,689
2090	36,387,689	181,767	26,274	-	2,734,802	39,277,984
2091	39,277,984	187,674	22,272	-	2,951,939	42,395,325
2092	42,395,325	193,774	18,686	-	3,186,096	45,756,509
2093	45,756,509	200,071	15,506	-	3,438,534	49,379,608
2094	49,379,608	206,574	12,718	-	3,710,608	53,284,072
2095	53,284,072	213,287	10,301	-	4,003,779	57,490,837
2096	57,490,837	220,219	8,234	-	4,319,618	62,022,440
2097	62,022,440	227,376	6,489	-	4,659,816	66,903,143
2098	66,903,143	234,766	5,037	-	5,026,194	72,159,066
2099	72,159,066	242,396	3,849	-	5,420,713	77,818,326
2100	77,818,326	250,274	2,892	-	5,845,483	83,911,191
2101	83,911,191	258,408	2,135	-	6,302,775	90,470,239
2102	90,470,239	266,806	1,548	-	6,795,035	97,530,532
2103	97,530,532	275,477	1,101	-	7,324,892	105,129,800
2104	105,129,800	284,430	768	-	7,895,180	113,308,642
2105	113,308,642	293,674	525	-	8,508,942	122,110,733
2106	122,110,733	303,218	352	-	9,169,457	131,583,056
2107	131,583,056	313,073	232	-	9,880,248	141,776,145
2108	141,776,145	323,248	150	-	10,645,107	152,744,350
2109	152,744,350	333,753	96	-	11,468,112	164,546,119
2110	164,546,119	344,600	60	-	12,353,645	177,244,304
2111	177,244,304	355,800	38	-	13,306,422	190,906,488
2112	190,906,488	367,363	24	-	14,331,512	205,605,339
2113	205,605,339	379,303	15	-	15,434,366	221,418,993
2114	221,418,993	391,630	9	-	16,620,844	238,431,458
2115	238,431,458	404,358	6	-	17,897,248	256,733,058
2116	256,733,058	417,500	4	-	19,270,352	276,420,906
2117	276,420,906	431,068	2	-	20,747,440	297,599,412
2118	297,599,412	445,078	1	-	22,336,344	320,380,833
2119	320,380,833	459,543	1	-	24,045,483	344,885,858

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)
2020	$ 1,183,995	$ 79,705	$ 79,705	$ -	$ 76,874	$ -	$ 76,874
2021	1,262,370	83,985	83,985	-	75,351	-	75,351
2022	1,345,549	88,393	88,393	-	73,773	-	73,773
2023	1,434,017	92,800	92,800	-	72,047	-	72,047
2024	1,523,855	97,483	97,483	-	70,403	-	70,403
2025	1,614,957	102,456	102,456	-	68,832	-	68,832
2026	1,707,253	107,649	107,649	-	67,275	-	67,275
2027	1,800,616	113,481	113,481	-	65,972	-	65,972
2028	1,894,485	119,423	119,423	-	64,583	-	64,583
2029	1,988,979	125,307	125,307	-	63,037	-	63,037
2030	2,084,343	131,600	131,600	-	61,584	-	61,584
2031	2,180,256	138,192	138,192	-	60,157	-	60,157
2032	2,276,468	144,642	144,642	-	58,572	-	58,572
2033	2,373,194	151,354	151,354	-	57,014	-	57,014
2034	2,470,257	158,099	158,099	-	55,400	-	55,400
2035	2,567,691	165,086	165,086	-	53,812	-	53,812
2036	2,665,322	172,519	172,519	-	52,311	-	52,311
2037	2,762,687	180,413	180,413	-	50,889	-	50,889
2038	2,859,290	187,981	187,981	-	49,324	-	49,324
2039	2,955,535	195,170	195,170	-	47,638	-	47,638
2040	3,028,428	202,467	202,467	-	45,971	-	45,971
2041	3,098,875	209,410	209,410	-	44,230	-	44,230
2042	3,167,089	215,718	215,718	-	42,383	-	42,383
2043	3,233,681	221,421	221,421	-	40,469	-	40,469
2044	3,299,301	226,598	226,598	-	38,526	-	38,526
2045	3,364,547	231,290	231,290	-	36,580	-	36,580
2046	3,430,007	235,656	235,656	-	34,670	-	34,670
2047	3,496,136	239,477	239,477	-	32,774	-	32,774
2048	3,563,689	242,436	242,436	-	30,864	-	30,864
2049	3,633,835	244,676	244,676	-	28,976	-	28,976
2050	3,707,663	246,295	246,295	-	27,133	-	27,133
2051	3,786,236	247,094	247,094	-	25,322	-	25,322
2052	3,870,917	246,935	246,935	-	23,540	-	23,540
2053	3,963,327	245,966	245,966	-	21,812	-	21,812
2054	4,065,043	244,417	244,417	-	20,162	-	20,162
2055	4,177,491	242,187	242,187	-	18,584	-	18,584
2056	4,302,310	239,300	239,300	-	17,082	-	17,082
2057	4,441,234	235,931	235,931	-	15,666	-	15,666
2058	4,595,934	232,128	232,128	-	14,338	-	14,338
2059	4,768,149	227,926	227,926	-	13,097	-	13,097
2060	4,959,712	223,360	223,360	-	11,939	-	11,939
2061	5,172,548	218,462	218,462	-	10,862	-	10,862
2062	5,408,695	213,247	213,247	-	9,863	-	9,863
2063	5,670,327	207,736	207,736	-	8,938	-	8,938
2064	5,959,757	201,959	201,959	-	8,083	-	8,083
2065	6,279,437	195,934	195,934	-	7,295	-	7,295
2066	6,631,988	189,672	189,672	-	6,569	-	6,569
2067	7,020,215	183,189	183,189	-	5,902	-	5,902
2068	7,447,116	176,502	176,502	-	5,290	-	5,290
2069	7,915,900	169,627	169,627	-	4,729	-	4,729

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)
2070	$ 8,429,998	$ 162,576	$ 162,576	$ -	$ 4,216	$ -	$ 4,216
2071	8,993,092	155,363	155,363	-	3,748	-	3,748
2072	9,609,128	148,010	148,010	-	3,322	-	3,322
2073	10,282,326	140,534	140,534	-	2,934	-	2,934
2074	11,017,209	132,959	132,959	-	2,582	-	2,582
2075	11,818,619	125,310	125,310	-	2,264	-	2,264
2076	12,691,736	117,616	117,616	-	1,976	-	1,976
2077	13,642,105	109,909	109,909	-	1,718	-	1,718
2078	14,675,657	102,225	102,225	-	1,486	-	1,486
2079	15,798,734	94,601	94,601	-	1,280	-	1,280
2080	17,018,119	87,077	87,077	-	1,096	-	1,096
2081	18,341,067	79,697	79,697	-	933	-	933
2082	19,775,337	72,505	72,505	-	789	-	789
2083	21,329,226	65,543	65,543	-	664	-	664
2084	23,011,618	58,854	58,854	-	555	-	555
2085	24,832,021	52,478	52,478	-	460	-	460
2086	26,800,621	46,449	46,449	-	379	-	379
2087	28,928,336	40,796	40,796	-	309	-	309
2088	31,226,880	35,541	35,541	-	251	-	251
2089	33,708,828	30,698	30,698	-	201	-	201
2090	36,387,689	26,274	26,274	-	160	-	160
2091	39,277,984	22,272	22,272	-	126	-	126
2092	42,395,325	18,686	18,686	-	99	-	99
2093	45,756,509	15,506	15,506	-	76	-	76
2094	49,379,608	12,718	12,718	-	58	-	58
2095	53,284,072	10,301	10,301	-	44	-	44
2096	57,490,837	8,234	8,234	-	33	-	33
2097	62,022,440	6,489	6,489	-	24	-	24
2098	66,903,143	5,037	5,037	-	17	-	17
2099	72,159,066	3,849	3,849	-	12	-	12
2100	77,818,326	2,892	2,892	-	9	-	9
2101	83,911,191	2,135	2,135	-	6	-	6
2102	90,470,239	1,548	1,548	-	4	-	4
2103	97,530,532	1,101	1,101	-	3	-	3
2104	105,129,800	768	768	-	2	-	2
2105	113,308,642	525	525	-	1	-	1
2106	122,110,733	352	352	-	1	-	1
2107	131,583,056	232	232	-	-	-	-
2108	141,776,145	150	150	-	-	-	-
2109	152,744,350	96	96	-	-	-	-
2110	164,546,119	60	60	-	-	-	-
2111	177,244,304	38	38	-	-	-	-
2112	190,906,488	24	24	-	-	-	-
2113	205,605,339	15	15	-	-	-	-
2114	221,418,993	9	9	-	-	-	-
2115	238,431,458	6	6	-	-	-	-
2116	256,733,058	4	4	-	-	-	-
2117	276,420,906	2	2	-	-	-	-
2118	297,599,412	1	1	-	-	-	-
2119	320,380,833	1	1	-	-	-	-
				Totals	$ 1,928,365	$ -	$ 1,928,365

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.