Minnesota State Retirement System
Correctional Employees Retirement Fund

GASB Statement Nos. 67 and 68

Accounting and Financial Reporting for Pensions

June 30, 2018

GRS Retirement Consulting

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November 29, 2018

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.

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, 2018 for additional discussion of the nature of actuarial calculations and more information related to participant data, economic and demographic assumptions, and benefit provisions.

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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

Bonita J. Wurst

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

BBM/BJW:rmn

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SECTION A

EXECUTIVE SUMMARY

Executive Summary
as of June 30, 2018 (Dollars in Thousands)

	2018
Actuarial Valuation Date	June 30, 2018
Measurement Date of the Net Pension Liability	June 30, 2018
Membership	
Number of	
- Service Retirements	2,736
- Survivors	226
- Disability Retirements	297
- Deferred Retirements	1,347
- Terminated other non-vested	843
- Active Members	4,650
- Total	10,099
Covered-employee Payroll [1]	$ 257,330
Net Pension Liability	
Total Pension Liability	$ 1,490,521
Plan Fiduciary Net Position	1,114,887
Net Pension Liability	$ 375,634
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	74.80%
Net Pension Liability as a Percentage of Covered-Employee Payroll	145.97%
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]	3.62%
Last year ending June 30 in the 2019 to 2118 projection period for which projected benefit payments are fully funded	2118
Total Pension Expense/ (Income)	$ (137,391)

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	$ 6,994	$ 3,104
Changes in assumptions	270,089	646,679
Net difference between projected and actual earnings on pension plan investments	34,738	64,192
Total	$ 311,821	$ 713,975

(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, 2018.

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, MN, 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 30 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, 2018 and a measurement date of June 30, 2018.

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 3.62% (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, 2018 (Dollars in Thousands)

A. Expense

1.	Service Cost	$	85,364
2.	Interest on the Total Pension Liability		108,421
3.	Current-Period Benefit Changes		(164,182)
4.	Employee Contributions (made negative for addition here)		(23,417)
5.	Projected Earnings on Plan Investments (made negative for addition here)		(76,254)
6.	Pension Plan Administrative Expense		827
7.	Other Changes in Plan Fiduciary Net Position		2
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		(700)
9.	Recognition of Outflow (Inflow) of Resources due to assumption changes		
	Arising from Current Reporting Period		(123,568)
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		(5,802)
11.	**Increases/(Decreases) from Experience in the Current Reporting Period**	**$**	**(199,309)**
12.	Recognition of Outflow (Inflow) of Resources due to differences between expected and actual experience in the measurement of the Total Pension Liability		
	Arising from Prior Reporting Periods		3,030
13.	Recognition of Outflow (Inflow) of Resources due to assumption changes		
	Arising from Prior Reporting Periods		67,900
14.	Recognition of Outflow (Inflow) of Resources due to the difference between projected and actual earnings on Pension Plan Investments		
	Arising from Prior Reporting Periods		(9,012)
15.	**Total Pension Expense / (Income)**	**$**	**(137,391)**

Benefit changes since the previous measurement date are described on page 26.

Statement of Outflows and Inflows
Arising from Current Reporting Period
Fiscal Year Ended June 30, 2018 (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	$	(3,499)
2. Assumption Changes (gains) or losses		(617,840)
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		(700)
5. Outflow (Inflow) of Resources to be recognized in the current pension expense for Assumption Changes		(123,568)
6. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Liabilities	$	(124,268)
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	$	(2,799)
8. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses for Assumption Changes		(494,272)
9. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Liabilities	$	(497,071)
B. Outflows (Inflows) of Resources due to Assets		
1. Net difference between projected and actual earnings on pension plan investments (gains) or losses	$	(29,009)
2. Recognition period for Assets {in years}		5
3. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Assets		(5,802)
4. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Assets	$	(23,207)

Statement of Outflows and Inflows
Arising from Current and Prior Reporting Periods
Fiscal Year Ended June 30, 2018 (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	$ 138,226	$ 191,564	$ (53,338)
2. Due to Assets	20,408	35,222	(14,814)
3. Totals	$ 158,634	$ 226,786	$ (68,152)

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	$ 3,183	$ 853	$ 2,330
2. Assumption Changes	135,043	190,711	(55,668)
3. Net Difference between projected and actual earnings on pension plan investments	20,408	35,222	(14,814)
4. Totals	$ 158,634	$ 226,786	$ (68,152)

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	$ 6,994	$ 3,104	$ 3,890
2. Assumption Changes	270,089	646,679	(376,590)
3. Net Difference between projected and actual earnings on pension plan investments*	34,738	64,192	(29,454)
4. Total	$ 311,821	$ 713,975	$ (402,154)

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
2019	$ (52,395)
2020	(34,641)
2021	(185,050)
2022	(130,068)
2023	-
Thereafter	-
Total	$ (402,154)

** 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.*

Statement of Fiduciary Net Position as of June 30, 2018 (Dollars in Thousands)

Assets		June 30, 2018
Cash & Short-term Investments	$	15,753
Receivables		2,873
Investment Pools (at fair value)		1,097,846
Securities Lending Collateral		111,689
Capital Assets		-
Total Assets	**$**	**1,228,161**
Total Deferred Outflows of Resources	**$**	**-**
Total Liabilities	**$**	**(113,274)**
Total Deferred Inflows of Resources	**$**	**-**
Net Position Restricted for Pensions	**$**	**1,114,887**

Statement of Changes in Fiduciary Net Position for Year Ended June 30, 2018 (Dollars in Thousands)

1. Net position at market value at beginning of year	**$**	**1,023,817**
Additions		
2. Contributions		
a. Employee	$	23,417
b. Employer		32,893
c. Other sources		-
d. Total contributions	$	56,310
3. Investment income		
a. Investment income/(loss)	$	106,422
b. Investment expenses		(1,159)
c. Net investment income/(loss)	$	105,263
4. Other Additions		-
5. Total Additions *(2.d.) + (3.c.) + (4.)*	**$**	**161,573**
Deductions		
6. Benefits Paid		
a. Annuity benefits	$	(67,622)
b. Refunds		(2,052)
c. Total benefits paid	$	(69,674)
7. Expenses		
a. Other deductions	$	(2)
b. Administrative		(827)
c. Total expenses	$	(829)
8. Total deductions *(6.c.) + (7.c.)*	**$**	**(70,503)**
9. Net increase/(decrease) in fiduciary net position *(5.) + (8.)*	**$**	**91,070**
10. Net position at market value at end of year *(1.) + (9.)*	**$**	**1,114,887**
11. State Board of Investment calculated annual investment return for the Correctional Employees Retirement Fund*		10.4%

** The fiscal year 2018 investment return for the Combined Funds is 10.3%.*

SECTION C

REQUIRED SUPPLEMENTARY INFORMATION

Schedule of Changes in Net Pension Liability and Related Ratios
Current Period
Fiscal Year Ended June 30, 2018 (Dollars in Thousands)

A. Total Pension Liability		
1. Service Cost	$	85,364
2. Interest on the Total Pension Liability		108,421
3. Changes of benefit terms		(164,182)
4. Difference between expected and actual experience of the Total Pension Liability		(3,499)
5. Changes of assumptions		(617,840)
6. Benefit payments, including refunds of employee contributions		(69,674)
7. Net change in Total Pension Liability	$	(661,410)
8. Total Pension Liability – Beginning		2,151,931
9. Total Pension Liability – Ending	**$**	**1,490,521**
B. Plan Fiduciary Net Position		
1. Contributions – Employer	$	32,893
2. Contributions – Employee		23,417
3. Net investment income		105,263
4. Benefit payments, including refunds of employee contributions		(69,674)
5. Pension Plan Administrative Expense		(827)
6. Other changes		(2)
7. Net change in Plan Fiduciary Net Position	$	91,070
8. Plan Fiduciary Net Position – Beginning		1,023,817
9. Plan Fiduciary Net Position – Ending	**$**	**1,114,887**
C. Net Pension Liability, *A.9 - B.9.*	**$**	**375,634**
D. Plan Fiduciary Net Position as a percentage of the Total Pension Liability, *B.9 / A.9.*		**74.80%**
E. Covered-Employee payroll	**$**	**257,330** [1]
F. Net Pension Liability as a percentage of Covered-Employee payroll, *C. / E.*		**145.97%**

[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,	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
Total Pension Liability										
Service Cost	$ 85,364	$ 95,522	$ 56,718	$ 48,805	$ 54,443					
Interest on the Total Pension Liability	108,421	95,307	97,571	92,039	85,702					
Benefit Changes	(164,182)	-	-	-	-					
Difference between Expected and Actual Experience	(3,499)	6,566	(764)	7,115	4,103					
Assumption Changes	(617,840)	(213,159)	576,552	118,399	(147,067)					
Benefit Payments	(67,622)	(63,221)	(59,045)	(54,909)	(50,842)					
Refunds	(2,052)	(1,466)	(1,895)	(1,590)	(1,447)					
Net Change in Total Pension Liability	**$ (661,410)**	**$ (80,451)**	**$ 669,137**	**$ 209,859**	**$ (55,108)**					
Total Pension Liability - Beginning	**$ 2,151,931**	**$ 2,232,382**	**$ 1,563,245**	**$ 1,353,386**	**$ 1,408,494**					
Total Pension Liability - Ending (a)	**$ 1,490,521**	**$ 2,151,931**	**$ 2,232,382**	**$ 1,563,245**	**$ 1,353,386**					
Plan Fiduciary Net Position										
Employer Contributions	$ 32,893	$ 31,763	$ 30,678	$ 29,480	$ 26,468					
Employee Contributions	23,417	22,648	21,953	21,061	18,855					
Pension Plan Net Investment Income	105,263	135,359	(195)	38,624	137,523					
Benefit Payments	(67,622)	(63,221)	(59,045)	(54,909)	(50,842)					
Refunds	(2,052)	(1,466)	(1,895)	(1,590)	(1,447)					
Pension Plan Administrative Expense	(827)	(856)	(906)	(720)	(657)					
Other Changes	(2)	(2)	-	-	(1)					
Net Change in Plan Fiduciary Net Position	**$ 91,070**	**$ 124,225**	**$ (9,410)**	**$ 31,946**	**$ 129,899**					
Plan Fiduciary Net Position - Beginning	**$ 1,023,817**	**$ 899,592**	**$ 909,002**	**$ 877,056**	**$ 747,157**					
Plan Fiduciary Net Position - Ending (b)	**$ 1,114,887**	**$ 1,023,817**	**$ 899,592**	**$ 909,002**	**$ 877,056**					
Net Pension Liability - Ending (a) - (b)	**$ 375,634**	**$ 1,128,114**	**$ 1,332,790**	**$ 654,243**	**$ 476,330**					
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	**74.80 %**	**47.58 %**	**40.30 %**	**58.15 %**	**64.80 %**					
Covered-Employee Payroll [1]	**$ 257,330**	**$ 248,879**	**$ 241,242**	**$ 231,440**	**$ 219,244**					
Net Pension Liability as a Percentage of Covered-Employee Payroll	**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)
2009						
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

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)
2009	$ 31,738	$ 20,126	$ 11,612	$ 193,445	10.40%
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

* 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, 2018 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, 2017
Actuarial Cost Method	Entry Age Normal
Amortization Method	Level Percentage of Payroll, Closed
Remaining Amortization Period	21 years
Asset Valuation Method	5-Year smoothed market; no corridor
Inflation	2.75%
Payroll Growth	3.50%
Salary Increases	Service based tables ranging from 5.75% with one year of service to 3.50% with 19 or more years of service, including inflation.
Investment Rate of Return	8.00%
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	The post-retirement increase is assumed to stay at 2.0% indefinitely. See separate funding actuarial valuation report as of July 1, 2017 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]
2009	
2010	
2011	
2012	
2013	
2014	18.62 %
2015	4.44
2016	(0.02)
2017	15.23
2018	10.43

[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, 2018, the annual money-weighted rate of return for the Correctional Employees Retirement Fund was 10.43%. 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. Best 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, 2018, these best estimates are summarized in the following table:

Asset Class	Transitional Target Allocation	Final Target Allocation	Long-Term Expected Real Rate of Return (Geometric Mean)
Domestic Equity[1]	33%	36%	5.10%
International Equity[2]	16%	17%	5.30%
Private Markets[3]	25%	25%	5.90%
Fixed Income	16%	20% [4]	0.75%
Treasuries	8%	0%	0.50%
Cash	2%	2%	0.00%
Total	100%	100%	

(1) Domestic Equity includes U.S. Stock Actively Managed and the U.S. Stock Index Fund.

(2) International Equity includes Broad International Stock Fund.

(3) Private Markets includes the Alternative Investment Pool. If a 25 percent allocation uncommitted allocation to Private Markets cannot be achieved, the uncommitted allocation is invested in Public Equities.

(4) The Final Target Allocation will combine Fixed Income investment options.

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 dated September 11, 2017.

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	$ 1,701,556	$ 1,490,521	$ 1,318,394
Net Position Restricted for Pensions	1,114,887	1,114,887	1,114,887
Net Pension Liability	**$ 586,669**	**$ 375,634**	**$ 203,507**

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	**$ 2,151,931**	**$ 1,023,817**	**$ 1,128,114**	**$ 470,455**	**$ 290,413**	
Changes for the Year:						
Service Cost	$ 85,364		$ 85,364			$ 85,364
Interest on Total Pension Liability	108,421		108,421			108,421
Interest on Plan Fiduciary Net Position [(1)]		$ 76,254 [(1)]	(76,254)			(76,254)
Changes in Benefit Terms	(164,182)		(164,182)			(164,182)
Liability Experience Gains and Losses	(3,499)		(3,499)	$ -	$ 2,799	(700)
Changes in Assumptions	(617,840)		(617,840)	-	494,272	(123,568)
Recognition of Deferred Outflows/(Inflows) of Resources Arising from Prior Reporting Periods						
Liability Experience Gains/(Losses)				(3,183)	(153)	3,030
Assumption Changes				(135,043)	(67,143)	67,900
Investment Gains/(Losses)				(20,408)	(29,420)	(9,012)
Contributions - Employer		32,893	(32,893)			
Contributions - Employees		23,417	(23,417)			(23,417)
Asset Gain/(Loss) [(1)]		29,009 [(1)]	(29,009)	-	23,207	(5,802)
Benefit Payment and Refunds	(69,674)	(69,674)				
Administrative Expenses		(827)	827			827
Other Changes		(2)	2			2
Net Changes	**$ (661,410)**	**$ 91,070**	**$ (752,480)**	**$ (158,634)**	**$ 423,562**	**$ (137,391)**
Balance End of Year	**$ 1,490,521**	**$ 1,114,887**	**$ 375,634**	**$ 311,821**	**$ 713,975**	

[(1)] *The sum of these items in column (b) equals the net investment income of $105,263.*

Summary of Population Statistics

		Terminated		Recipients			
	Actives	Deferred Retirement	Other Non-Vested	Service Retirement	Disability Retirement	Survivor	Total
Members on 7/1/2017	**4,579**	**1,310**	**818**	**2,576**	**292**	**216**	**9,791**
New members	554	0	0	0	0	0	**554**
Return to active	33	(15)	(18)	0	0	0	**0**
Terminated non-vested	(170)	0	170	0	0	0	**0**
Service retirements	(148)	(33)	0	181	0	0	**0**
Terminated deferred	(78)	78	0	0	0	0	**0**
Terminated refund/transfer	(114)	(13)	(171)	0	0	0	**(298)**
Deaths	(2)	(1)	(1)	(28)	(5)	(7)	**(44)**
New beneficiary	0	0	0	0	0	17	**17**
Disabled	(4)	0	0	0	4	0	**0**
Unexpected status changes	0	21	45	7	6	0	**79**
Net change	71	37	25	160	5	10	**308**
Members on 6/30/2018	**4,650**	**1,347**	**843**	**2,736**	**297**	**226**	**10,099**

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.

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

Allowable service	Service during which member contributions were made. May also include certain leave of absence, military service and periods while temporary Worker’s Compensation is paid.
Salary	Includes wages, allowances and fees. Excludes lump sum payments of separation and reduced salary while receiving Worker’s Compensation benefits.
Average salary	Average of the five highest successive years of Salary. Average Salary is based on all Allowable Service if less than five years.
Vesting	Hired before July 1, 2010: 100% vested after 3 years of Allowable Service. Hired after June 30, 2010: 50% vested after 5 years of Allowable Service; 60% vested after 6 years of Allowable Service; 70% vested after 7 years of Allowable Service; 80% vested after 8 years of Allowable Service; 90% vested after 9 years of Allowable Service; 100% vested after 10 years of Allowable Service.

Summary of Plan Provisions (Continued)

Retirement	
<u>**Normal retirement benefit**</u>	
Age/Service requirement	Age 55 and vested. Proportionate Retirement Annuity is available at age 65 and one year of Allowable Service.
Amount	2.40% (2.20% if first hired after June 30, 2010) of Average Salary for each year of Allowable Service, pro-rata for completed months.
<u>**Early retirement**</u>	
Age/Service requirement	Age 50 and vested.
Amount	Normal Retirement Benefit based on Allowable Service and Average Salary at retirement date reduced by 2/10% (5/12% if first hired after June 30, 2010, or if hired before July 1, 2010, and retire after June 30, 2015) per month for each month that the member is under age 55.
<u>**Form of payment**</u>	Life annuity. Actuarially equivalent options are: 50%, 75%, or 100% Joint and Survivor, or 15-year certain. If a Joint and Survivor benefit is elected and the beneficiary predeceases the annuitant, the annuitant's benefit increases to the Life Annuity amount. This "bounce back" is subsidized by the plan.
<u>**Benefit increases**</u>	Through December 31, 2018: 2.00% January 1, 2019 and after: 1.50% A benefit recipient who has been receiving a benefit for at least 12 full months as of the June 30 of the calendar year immediately before the adjustment will receive a full increase. Members receiving benefits for at least one month but less than 12 full months as of the June 30 of the calendar year immediately before the adjustment will receive a pro rata increase.
Disability	
<u>**Duty Disability**</u>	
Age/Service requirement	Physically or mentally unable to perform normal job duties as a direct result of a disability relating to an incident while performing the duties of the job which present inherent dangers to the employee. Members who become disabled after June 30, 2009, will have disability benefits converted to retirement benefits at age 55 instead of age 65.
Amount	50.00% of Average Salary plus 2.40% (2.20% if first hired after June 30, 2010) of Average Salary for each year in excess of 20 years and 10 months of Allowable Service (pro rata for completed months).

Summary of Plan Provisions (Continued)

Disability (Continued)

Duty Disability Continued

Amount (Continued)	Payment begins at disability and ends at age 55 (age 65 if disabled prior to July 1, 2009) or the five-year anniversary of the effective date of the disability benefit, whichever is later. Payments stop earlier if disability ceases or death occurs. Benefits may be paid upon re-employment but salary plus benefit cannot exceed current salary of position held at time of disability. Member is reclassified from disabled to retired at age 55 (age 65 if disabled prior to July 1, 2009). Optional amount continues. Otherwise, normal retirement benefit equal to the disability benefit paid, or an actuarially equivalent option.

Regular Disability

Age/Service requirement	At least one year of covered Correctional service for employees hired before July 1, 2009, or a vested Correctional employee hired after June 30, 2009, and the employee is determined to have a regular disability not related to an incident while performing the duties of the job.
Amount	Normal retirement benefit based on covered Correctional Service (minimum of 15 years if hired prior to July 1, 2009) and Average Salary at disability. Payment begins at disability and ends at age 55 (age 65 if disabled prior to July 1, 2009) or the five-year anniversary of the effective date of the disability benefit, whichever is later. Payments stop earlier if disability ceases or death occurs. Benefits may be paid upon re-employment but salary plus benefit cannot exceed current salary of position held at time of disability. Member is reclassified from disabled to retired at age 55 (age 65 if disabled prior to July 1, 2009). Optional amount continues. Otherwise, normal retirement benefit equal to the disability benefit paid, or an actuarially equivalent option.
Benefit Increases	Same as for retirement.

Death

Surviving spouse benefit

Age/Service requirement	Member at any age or former member age 50 or older who dies before retirement or disability benefit commences and was vested. If a former member dies before age 55 and has less than 30 years of Allowable Service, benefits commence when the former member would have been age 55. If an active member dies, benefits may commence immediately, regardless of age.

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 (Continued)

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	Actuarially equivalent factors based on the RP-2000 mortality for healthy annuitants, white collar adjustment, projected to 2027 using scale AA, set forward one year for males and set back one year for females, blended 70% males, and 6.50% post-retirement interest. The actuarially equivalent factors are currently being updated to reflect changes adopted during the 2018 legislative session.
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.

Summary of Plan Provisions (Concluded)

Changes in plan provisions	Member contributions were increased from 9.10% of pay to 9.60% of pay, effective July 1, 2018. Regular employer contributions were increased from 12.85% of pay to 14.40% of pay, effective July 1, 2018. Supplemental employer contributions totaling 4.45% of pay will be phased-in through fiscal year 2022; supplemental employer contributions remain in effect until the plan is 100% funded. Interest credited on member contributions will decrease from 4.0% to 3.0%, beginning July 1, 2018. Deferred augmentation was changed to 0.00% for future accruing benefits, effective January 1, 2019. Augmentation that has already accrued for deferred members will still apply. Contribution stabilizer provisions were repealed. Post-retirement benefit increases were changed from 2.0% per year, increasing to 2.5% per year upon achieving a 90% funding ratio to a fixed rate of 1.5% per year.

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, dated September 11, 2017.

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:

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

Disability	Age-related rates based on experience; see table of sample rates. All incidences are assumed to be duty-related.
Allowance for combined service annuity	Liabilities for former members are increased by 17.0% for vested members and 6.0% for non-vested members to account for the effect of some participants having eligibility for a Combined Service Annuity.
Administrative expenses	In the valuation year, equal to prior year administrative expenses expressed as a percentage of prior year projected payroll. In each subsequent year, equal to the initial administrative expense percentage applied to payroll for the closed group.
Refund of contributions	Account balances accumulate interest until normal retirement date and are discounted back to the valuation date. All employees withdrawing after becoming eligible for a deferred benefit take the larger of their contributions accumulated with interest or the value of their deferred benefit.
Commencement of deferred benefits	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 55.
Percentage married	75% of active members are assumed to be married. Actual marital status is used for members in payment status.
Age of spouse	Females are assumed to be two years younger than their male spouses.
Form of payment	Married members retiring from active status are assumed to elect subsidized joint and survivor form of annuity as follows:

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

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

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

Summary of Actuarial Assumptions (Continued)

Eligibility testing	Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.
Decrement operation	Withdrawal decrements do not operate during retirement eligibility. Decrements are assumed to occur mid-fiscal year.
Service credit accruals	It is assumed that members accrue one year of service credit per year.
Pay increases	Pay increases are assumed to happen at the beginning of the fiscal year. This is equivalent to assuming that reported earnings are pensionable earnings for the year ending on the valuation date.
Unknown data for certain members	To prepare this report, GRS has used and relied on participant data supplied by 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: Data for active members: There were 13 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 (5 members), if available, otherwise, high five salary with a 10% load to account for salary increases (1 member). If neither pay or high five salary was available, we assumed a value of $30,000 (2 members). There was 1 member reported with zero service. Due to the small number of members with zero service, and based on direction from MSRS, we used service of 0 years for this member.

Summary of Actuarial Assumptions (Continued)

Unknown data for certain members	Data for terminated members: Benefits were reported with full augmentation to Normal Retirement age. Based on direction from MSRS, we adjusted benefits by removing augmentation on a prospective basis beginning January 1, 2019. There were no members reported with missing or invalid gender or birth dates. There were 48 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 (20 members), we assumed a value of $30,000. There were no members reported without a Termination Date or Credited Service. There were 52 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. Data for members receiving benefits: There were 3 members reported with a missing gender. We assumed male gender. 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 no retirees reported with a bounce back annuity and an unreasonable reduction factor. There was one retiree reported with an accelerated benefit election and a missing 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 (360 members) and/or survivor date of birth (296 members). We used the valuation assumptions if the survivor gender or date of birth was missing or invalid.
Changes in actuarial assumptions	The single discount rate changed from 5.02% per annum to 7.50% per annum.

Summary of Actuarial Assumptions (Continued)

Age in 2018	Percentage of Members Dying Each Year*					
	Healthy Post-Retirement Mortality**		Healthy Pre-Retirement Mortality**		Disability Mortality**	
	Male	Female	Male	Female	Male	Female
20	0.03%	0.01%	0.02%	0.01%	0.04%	0.02%
25	0.04	0.03	0.03	0.01	0.17	0.08
30	0.06	0.05	0.03	0.02	0.42	0.22
35	0.09	0.09	0.03	0.03	0.78	0.44
40	0.13	0.12	0.04	0.03	1.13	0.66
45	0.19	0.15	0.06	0.05	1.46	0.84
50	0.28	0.20	0.11	0.09	1.83	1.10
55	0.40	0.29	0.18	0.14	2.21	1.45
60	0.60	0.45	0.32	0.21	2.59	1.71
65	0.90	0.70	0.56	0.30	3.06	2.02
70	1.50	1.12	0.99	0.52	3.89	2.71
75	2.60	1.91	1.79	0.93	5.33	4.01
80	4.67	3.41	3.20	1.65	7.61	6.10
85	8.66	6.29	6.66	4.41	11.29	9.22
90	15.43	11.40	12.64	9.84	17.12	13.45

* *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.*

Age	Percent of Members Decrementing Each Year			
	Termination (Withdrawal) Rates After Third Year		Disability Retirement	
	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		Salary Scale Year	Salary Scale Increase
50	5%		1	12.25%
51	3		2	8.75
52	3		3	5.75
53	3		4	5.25
54	5		5	5.00
55	45		6	4.75
56	20		7	4.75
57	15		8	4.75
58	15		9	4.75
59	15		10	4.75
60	15		11	4.75
61	15		12	4.50
62	25		13	4.25
63	25		14	4.25
64	25		15	4.00
65	30		16	4.00
66	30		17	4.00
67	25		18	3.75
68	25		19	3.75
69	40		20	3.75
70+	100		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 3.62% (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, 2018 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)
2018	$ 257,330		$ 257,330				
2019	267,975		267,975	$ 25,726	$ 38,588		$ 64,314
2020	257,992	$ 18,692	276,684	24,767	40,892	$ 1,565	67,224
2021	247,649	38,028	285,677	23,774	42,967	3,753	70,494
2022	237,495	57,466	294,961	22,800	44,768	6,534	74,102
2023	227,253	77,294	304,547	21,816	42,837	8,788	73,441
2024	217,314	97,131	314,445	20,862	40,964	11,044	72,870
2025	208,096	116,568	324,664	19,977	39,226	13,254	72,457
2026	198,740	136,476	335,216	19,079	37,463	15,517	72,059
2027	189,292	156,819	346,111	18,172	35,682	17,830	71,684
2028	180,585	176,774	357,359	17,336	34,040	20,099	71,475
2029	172,322	196,651	368,973	16,543	32,483	22,359	71,385
2030	163,974	216,991	380,965	15,742	30,909	24,672	71,323
2031	155,579	237,767	393,346	14,936	29,327	27,034	71,297
2032	147,213	258,917	406,130	14,132	27,750	29,439	71,321
2033	138,903	280,426	419,329	13,335	26,183	31,884	71,402
2034	130,561	302,397	432,958	12,534	24,611	34,382	71,527
2035	122,191	324,838	447,029	11,730	23,033	36,934	71,697
2036	113,493	348,064	461,557	10,895	21,393	39,575	71,863
2037	104,411	372,147	476,558	10,023	19,681	42,313	72,017
2038	95,584	396,462	492,046	9,176	18,018	45,078	72,272
2039	87,087	420,950	508,037	8,360	16,416	47,862	72,638
2040	78,499	446,050	524,549	7,536	14,797	50,716	73,049
2041	69,882	471,714	541,596	6,709	13,173	53,634	73,516
2042	61,781	497,417	559,198	5,931	11,646	56,556	74,133
2043	54,384	522,988	577,372	5,221	10,251	59,464	74,936
2044	47,537	548,600	596,137	4,564	8,961	62,376	75,901
2045	41,069	574,442	615,511	3,943	7,742	65,314	76,999
2046	34,923	600,592	635,515	3,353	6,583	68,287	78,223
2047	29,265	626,905	656,170	2,809	5,516	71,279	79,604
2048	24,253	653,242	677,495	2,328	4,572	74,274	81,174
2049	19,926	679,588	699,514	1,913	3,756	77,269	82,938
2050	16,133	706,115	722,248	1,549	3,041	80,285	84,875
2051	12,890	732,831	745,721	1,237	2,430	83,323	86,990
2052	10,246	759,711	769,957	984	1,931	86,379	89,294
2053	8,083	786,897	794,980	776	1,524	89,470	91,770
2054	6,305	814,512	820,817	605	1,188	92,610	94,403
2055	4,851	842,643	847,494	466	914	95,808	97,188
2056	3,669	871,368	875,037	352	692	99,075	100,119
2057	2,724	900,752	903,476	262	514	102,416	103,192
2058	1,985	930,854	932,839	191	374	105,838	106,403
2059	1,418	961,738	963,156	136	267	109,350	109,753
2060	981	993,478	994,459	94	185	112,958	113,237
2061	650	1,026,129	1,026,779	62	123	116,671	116,856
2062	413	1,059,736	1,060,149	40	78	120,492	120,610
2063	253	1,094,351	1,094,604	24	48	124,428	124,500
2064	148	1,130,031	1,130,179	14	28	128,484	128,526
2065	77	1,166,833	1,166,910	7	15	132,669	132,691
2066	35	1,204,799	1,204,834	3	7	136,986	136,996
2067	15	1,243,976	1,243,991	1	3	141,440	141,444
2068	5	1,284,416	1,284,421	-	1	146,038	146,039

** Contributions related to future employees in excess of normal cost and expenses of 17.08% of pay.*
*** Employer contributions are equal to 14.40%, 15.85% and 17.35% for fiscal years ending June 30, 2019, 2020 and 2021 respectively.*

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

	Projected Covered-Employee Payroll			Projected Contributions			
Fiscal Year Ending	Payroll for Current Employees	Payroll for New Employees	Total Employee Payroll	Contributions from Current Employees	Employer Contributions for Current Employees	Contributions on Future Payroll toward Current UAL*	Total Contributions
	(a)	(b)	(c) = (a) + (b)	(d) = (a) x 9.60%	(e) = (a) x 18.85%	(f)	(g) = (d) + (e) + (f)
2069	$ 1	$ 1,326,164	$ 1,326,165	$ -	$ -	$ 150,785	$ 150,785
2070	-	1,369,265	1,369,265	-	-	155,685	155,685
2071	-	1,413,766	1,413,766	-	-	160,745	160,745
2072	-	1,459,713	1,459,713	-	-	165,969	165,969
2073	-	1,507,154	1,507,154	-	-	171,363	171,363
2074	-	1,556,137	1,556,137	-	-	176,933	176,933
2075	-	1,606,711	1,606,711	-	-	182,683	182,683
2076	-	1,658,929	1,658,929	-	-	188,620	188,620
2077	-	1,712,844	1,712,844	-	-	194,750	194,750
2078	-	1,768,512	1,768,512	-	-	201,080	201,080
2079	-	1,825,988	1,825,988	-	-	207,615	207,615
2080	-	1,885,333	1,885,333	-	-	214,362	214,362
2081	-	1,946,606	1,946,606	-	-	221,329	221,329
2082	-	2,009,871	2,009,871	-	-	228,522	228,522
2083	-	2,075,192	2,075,192	-	-	235,949	235,949
2084	-	2,142,636	2,142,636	-	-	243,618	243,618
2085	-	2,212,271	2,212,271	-	-	251,535	251,535
2086	-	2,284,170	2,284,170	-	-	259,710	259,710
2087	-	2,358,406	2,358,406	-	-	268,151	268,151
2088	-	2,435,054	2,435,054	-	-	276,866	276,866
2089	-	2,514,193	2,514,193	-	-	285,864	285,864
2090	-	2,595,904	2,595,904	-	-	295,154	295,154
2091	-	2,680,271	2,680,271	-	-	304,747	304,747
2092	-	2,767,380	2,767,380	-	-	314,651	314,651
2093	-	2,857,320	2,857,320	-	-	324,877	324,877
2094	-	2,950,183	2,950,183	-	-	335,436	335,436
2095	-	3,046,064	3,046,064	-	-	346,337	346,337
2096	-	3,145,061	3,145,061	-	-	357,593	357,593
2097	-	3,247,275	3,247,275	-	-	369,215	369,215
2098	-	3,352,812	3,352,812	-	-	381,215	381,215
2099	-	3,461,778	3,461,778	-	-	393,604	393,604
2100	-	3,574,286	3,574,286	-	-	406,396	406,396
2101	-	3,690,450	3,690,450	-	-	419,604	419,604
2102	-	3,810,390	3,810,390	-	-	433,241	433,241
2103	-	3,934,228	3,934,228	-	-	447,322	447,322
2104	-	4,062,090	4,062,090	-	-	461,860	461,860
2105	-	4,194,108	4,194,108	-	-	476,870	476,870
2106	-	4,330,416	4,330,416	-	-	492,368	492,368
2107	-	4,471,155	4,471,155	-	-	508,370	508,370
2108	-	4,616,467	4,616,467	-	-	524,892	524,892
2109	-	4,766,503	4,766,503	-	-	541,951	541,951
2110	-	4,921,414	4,921,414	-	-	559,565	559,565
2111	-	5,081,360	5,081,360	-	-	577,751	577,751
2112	-	5,246,504	5,246,504	-	-	596,528	596,528
2113	-	5,417,015	5,417,015	-	-	615,915	615,915
2114	-	5,593,068	5,593,068	-	-	635,932	635,932
2115	-	5,774,843	5,774,843	-	-	656,600	656,600
2116	-	5,962,526	5,962,526	-	-	677,939	677,939
2117	-	6,156,308	6,156,308	-	-	699,972	699,972
2118	-	6,356,388	6,356,388	-	-	722,721	722,721

* *Contributions related to future employees in excess of normal cost and expenses of 17.08% 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)
2019	$ 1,114,887	$ 64,314	$ 75,368	$ 858	$ 83,178	$ 1,186,153
2020	1,186,153	67,224	78,771	826	88,506	1,262,286
2021	1,262,286	70,494	82,881	792	94,186	1,343,293
2022	1,343,293	74,102	87,296	760	100,233	1,429,572
2023	1,429,572	73,441	91,860	727	106,513	1,516,939
2024	1,516,939	72,870	96,780	695	112,864	1,605,198
2025	1,605,198	72,457	101,722	666	119,288	1,694,555
2026	1,694,555	72,059	107,076	636	125,779	1,784,681
2027	1,784,681	71,684	113,012	606	132,307	1,875,054
2028	1,875,054	71,475	118,855	578	138,863	1,965,959
2029	1,965,959	71,385	124,680	551	145,464	2,057,577
2030	2,057,577	71,323	130,806	525	152,109	2,149,678
2031	2,149,678	71,297	137,158	498	158,782	2,242,101
2032	2,242,101	71,321	143,375	471	165,487	2,335,063
2033	2,335,063	71,402	149,813	444	172,226	2,428,434
2034	2,428,434	71,527	156,257	418	178,997	2,522,283
2035	2,522,283	71,697	162,964	391	185,796	2,616,421
2036	2,616,421	71,863	169,996	363	192,605	2,710,530
2037	2,710,530	72,017	177,471	334	199,395	2,804,137
2038	2,804,137	72,272	184,682	306	206,160	2,897,581
2039	2,897,581	72,638	191,576	279	212,929	2,991,293
2040	2,991,293	73,049	198,478	251	219,719	3,085,332
2041	3,085,332	73,516	205,158	224	226,545	3,180,011
2042	3,180,011	74,133	211,101	198	233,450	3,276,295
2043	3,276,295	74,936	216,412	174	240,507	3,375,152
2044	3,375,152	75,901	221,085	152	247,785	3,477,601
2045	3,477,601	76,999	225,302	131	255,354	3,584,521
2046	3,584,521	78,223	229,153	112	263,277	3,696,756
2047	3,696,756	79,604	232,435	94	271,626	3,815,457
2048	3,815,457	81,174	234,862	78	280,498	3,942,189
2049	3,942,189	82,938	236,463	64	290,009	4,078,609
2050	4,078,609	84,875	237,413	52	300,277	4,226,296
2051	4,226,296	86,990	237,545	41	311,427	4,387,127
2052	4,387,127	89,294	236,774	33	323,603	4,563,217
2053	4,563,217	91,770	235,307	26	336,955	4,756,609
2054	4,756,609	94,403	233,224	20	351,634	4,969,402
2055	4,969,402	97,188	230,555	16	367,794	5,203,813
2056	5,203,813	100,119	227,389	12	385,600	5,462,131
2057	5,462,131	103,192	223,790	9	405,219	5,746,743
2058	5,746,743	106,403	219,791	6	426,831	6,060,180
2059	6,060,180	109,753	215,426	5	450,623	6,405,125
2060	6,405,125	113,237	210,734	3	476,795	6,784,420
2061	6,784,420	116,856	205,744	2	505,559	7,201,089
2062	7,201,089	120,610	200,472	1	537,141	7,658,367
2063	7,658,367	124,500	194,940	1	571,784	8,159,710
2064	8,159,710	128,526	189,172	-	609,745	8,708,809
2065	8,708,809	132,691	183,190	-	651,301	9,309,611
2066	9,309,611	136,996	177,005	-	696,748	9,966,350
2067	9,966,350	141,444	170,630	-	746,402	10,683,566
2068	10,683,566	146,039	164,082	-	800,603	11,466,126

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)
2069	$ 11,466,126	$ 150,785	$ 157,371	$ -	$ 859,717	$ 12,319,257
2070	12,319,257	155,685	150,511	-	924,135	13,248,566
2071	13,248,566	160,745	143,516	-	994,277	14,260,072
2072	14,260,072	165,969	136,402	-	1,070,595	15,360,234
2073	15,360,234	171,363	129,186	-	1,153,571	16,555,982
2074	16,555,982	176,933	121,891	-	1,243,726	17,854,750
2075	17,854,750	182,683	114,542	-	1,341,616	19,264,507
2076	19,264,507	188,620	107,167	-	1,447,838	20,793,798
2077	20,793,798	194,750	99,798	-	1,563,032	22,451,782
2078	22,451,782	201,080	92,469	-	1,687,883	24,248,276
2079	24,248,276	207,615	85,219	-	1,823,128	26,193,800
2080	26,193,800	214,362	78,085	-	1,969,553	28,299,630
2081	28,299,630	221,329	71,111	-	2,128,004	30,577,852
2082	30,577,852	228,522	64,339	-	2,299,385	33,041,420
2083	33,041,420	235,949	57,812	-	2,484,666	35,704,223
2084	35,704,223	243,618	51,570	-	2,684,889	38,581,160
2085	38,581,160	251,535	45,651	-	2,901,168	41,688,212
2086	41,688,212	259,710	40,088	-	3,134,703	45,042,537
2087	45,042,537	268,151	34,909	-	3,386,779	48,662,558
2088	48,662,558	276,866	30,129	-	3,658,778	52,568,073
2089	52,568,073	285,864	25,762	-	3,952,183	56,780,358
2090	56,780,358	295,154	21,810	-	4,268,592	61,322,294
2091	61,322,294	304,747	18,271	-	4,609,721	66,218,491
2092	66,218,491	314,651	15,137	-	4,977,416	71,495,421
2093	71,495,421	324,877	12,392	-	5,373,663	77,181,569
2094	77,181,569	335,436	10,017	-	5,800,601	83,307,589
2095	83,307,589	346,337	7,989	-	6,260,528	89,906,465
2096	89,906,465	357,593	6,281	-	6,755,922	97,013,699
2097	97,013,699	369,215	4,864	-	7,289,444	104,667,494
2098	104,667,494	381,215	3,707	-	7,863,963	112,908,965
2099	112,908,965	393,604	2,778	-	8,482,564	121,782,355
2100	121,782,355	406,396	2,046	-	9,148,566	131,335,271
2101	131,335,271	419,604	1,479	-	9,865,542	141,618,938
2102	141,618,938	433,241	1,049	-	10,637,335	152,688,465
2103	152,688,465	447,322	730	-	11,468,080	164,603,137
2104	164,603,137	461,860	498	-	12,362,224	177,426,723
2105	177,426,723	476,870	334	-	13,324,552	191,227,811
2106	191,227,811	492,368	220	-	14,360,208	206,080,167
2107	206,080,167	508,370	142	-	15,474,727	222,063,122
2108	222,063,122	524,892	91	-	16,674,059	239,261,982
2109	239,261,982	541,951	58	-	17,964,603	257,768,478
2110	257,768,478	559,565	37	-	19,353,240	277,681,246
2111	277,681,246	577,751	23	-	20,847,367	299,106,341
2112	299,106,341	596,528	15	-	22,454,941	322,157,795
2113	322,157,795	615,915	10	-	24,184,514	346,958,214
2114	346,958,214	635,932	7	-	26,045,283	373,639,422
2115	373,639,422	656,600	4	-	28,047,134	402,343,152
2116	402,343,152	677,939	3	-	30,200,700	433,221,788
2117	433,221,788	699,972	2	-	32,517,409	466,439,167
2118	466,439,167	722,721	1	-	35,009,550	502,171,437

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)
2019	$ 1,114,887	$ 75,368	$ 75,368	$ -	$ 72,691	$ -	$ 72,691
2020	1,186,153	78,771	78,771	-	70,673	-	70,673
2021	1,262,286	82,881	82,881	-	69,173	-	69,173
2022	1,343,293	87,296	87,296	-	67,774	-	67,774
2023	1,429,572	91,860	91,860	-	66,342	-	66,342
2024	1,516,939	96,780	96,780	-	65,019	-	65,019
2025	1,605,198	101,722	101,722	-	63,571	-	63,571
2026	1,694,555	107,076	107,076	-	62,249	-	62,249
2027	1,784,681	113,012	113,012	-	61,116	-	61,116
2028	1,875,054	118,855	118,855	-	59,791	-	59,791
2029	1,965,959	124,680	124,680	-	58,345	-	58,345
2030	2,057,577	130,806	130,806	-	56,942	-	56,942
2031	2,149,678	137,158	137,158	-	55,541	-	55,541
2032	2,242,101	143,375	143,375	-	54,008	-	54,008
2033	2,335,063	149,813	149,813	-	52,496	-	52,496
2034	2,428,434	156,257	156,257	-	50,934	-	50,934
2035	2,522,283	162,964	162,964	-	49,414	-	49,414
2036	2,616,421	169,996	169,996	-	47,950	-	47,950
2037	2,710,530	177,471	177,471	-	46,566	-	46,566
2038	2,804,137	184,682	184,682	-	45,077	-	45,077
2039	2,897,581	191,576	191,576	-	43,498	-	43,498
2040	2,991,293	198,478	198,478	-	41,921	-	41,921
2041	3,085,332	205,158	205,158	-	40,309	-	40,309
2042	3,180,011	211,101	211,101	-	38,583	-	38,583
2043	3,276,295	216,412	216,412	-	36,794	-	36,794
2044	3,375,152	221,085	221,085	-	34,966	-	34,966
2045	3,477,601	225,302	225,302	-	33,147	-	33,147
2046	3,584,521	229,153	229,153	-	31,361	-	31,361
2047	3,696,756	232,435	232,435	-	29,591	-	29,591
2048	3,815,457	234,862	234,862	-	27,814	-	27,814
2049	3,942,189	236,463	236,463	-	26,050	-	26,050
2050	4,078,609	237,413	237,413	-	24,330	-	24,330
2051	4,226,296	237,545	237,545	-	22,645	-	22,645
2052	4,387,127	236,774	236,774	-	20,997	-	20,997
2053	4,563,217	235,307	235,307	-	19,411	-	19,411
2054	4,756,609	233,224	233,224	-	17,897	-	17,897
2055	4,969,402	230,555	230,555	-	16,458	-	16,458
2056	5,203,813	227,389	227,389	-	15,099	-	15,099
2057	5,462,131	223,790	223,790	-	13,823	-	13,823
2058	5,746,743	219,791	219,791	-	12,629	-	12,629
2059	6,060,180	215,426	215,426	-	11,515	-	11,515
2060	6,405,125	210,734	210,734	-	10,478	-	10,478
2061	6,784,420	205,744	205,744	-	9,516	-	9,516
2062	7,201,089	200,472	200,472	-	8,626	-	8,626
2063	7,658,367	194,940	194,940	-	7,802	-	7,802
2064	8,159,710	189,172	189,172	-	7,043	-	7,043
2065	8,708,809	183,190	183,190	-	6,345	-	6,345
2066	9,309,611	177,005	177,005	-	5,703	-	5,703
2067	9,966,350	170,630	170,630	-	5,114	-	5,114
2068	10,683,566	164,082	164,082	-	4,574	-	4,574

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)
2069	$ 11,466,126	$ 157,371	$ 157,371	$ -	$ 4,081	$ -	$ 4,081
2070	12,319,257	150,511	150,511	-	3,631	-	3,631
2071	13,248,566	143,516	143,516	-	3,221	-	3,221
2072	14,260,072	136,402	136,402	-	2,848	-	2,848
2073	15,360,234	129,186	129,186	-	2,509	-	2,509
2074	16,555,982	121,891	121,891	-	2,202	-	2,202
2075	17,854,750	114,542	114,542	-	1,925	-	1,925
2076	19,264,507	107,167	107,167	-	1,675	-	1,675
2077	20,793,798	99,798	99,798	-	1,451	-	1,451
2078	22,451,782	92,469	92,469	-	1,251	-	1,251
2079	24,248,276	85,219	85,219	-	1,072	-	1,072
2080	26,193,800	78,085	78,085	-	914	-	914
2081	28,299,630	71,111	71,111	-	774	-	774
2082	30,577,852	64,339	64,339	-	652	-	652
2083	33,041,420	57,812	57,812	-	545	-	545
2084	35,704,223	51,570	51,570	-	452	-	452
2085	38,581,160	45,651	45,651	-	372	-	372
2086	41,688,212	40,088	40,088	-	304	-	304
2087	45,042,537	34,909	34,909	-	246	-	246
2088	48,662,558	30,129	30,129	-	198	-	198
2089	52,568,073	25,762	25,762	-	157	-	157
2090	56,780,358	21,810	21,810	-	124	-	124
2091	61,322,294	18,271	18,271	-	97	-	97
2092	66,218,491	15,137	15,137	-	74	-	74
2093	71,495,421	12,392	12,392	-	57	-	57
2094	77,181,569	10,017	10,017	-	43	-	43
2095	83,307,589	7,989	7,989	-	32	-	32
2096	89,906,465	6,281	6,281	-	23	-	23
2097	97,013,699	4,864	4,864	-	17	-	17
2098	104,667,494	3,707	3,707	-	12	-	12
2099	112,908,965	2,778	2,778	-	8	-	8
2100	121,782,355	2,046	2,046	-	6	-	6
2101	131,335,271	1,479	1,479	-	4	-	4
2102	141,618,938	1,049	1,049	-	3	-	3
2103	152,688,465	730	730	-	2	-	2
2104	164,603,137	498	498	-	1	-	1
2105	177,426,723	334	334	-	1	-	1
2106	191,227,811	220	220	-	-	-	-
2107	206,080,167	142	142	-	-	-	-
2108	222,063,122	91	91	-	-	-	-
2109	239,261,982	58	58	-	-	-	-
2110	257,768,478	37	37	-	-	-	-
2111	277,681,246	23	23	-	-	-	-
2112	299,106,341	15	15	-	-	-	-
2113	322,157,795	10	10	-	-	-	-
2114	346,958,214	7	7	-	-	-	-
2115	373,639,422	4	4	-	-	-	-
2116	402,343,152	3	3	-	-	-	-
2117	433,221,788	2	2	-	-	-	-
2118	466,439,167	1	1	-	-	-	-
				Totals	$ 1,830,691	$ -	$ 1,830,691

SECTION H

GLOSSARY OF TERMS

Glossary of Terms

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.
Accrued Service	Service credited under the system which was rendered before the date of the actuarial valuation.
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 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 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 ages(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 post-employment 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.