Minnesota State Retirement System

State Employees Retirement Fund
GASB Statement Nos. 67 and 68
Accounting and Financial Reporting for Pensions
June 30, 2018

GRS

GRS Retirement Consulting
P: 800.521.0498 | F: 763.432.5842 | www.grsconsulting.com

November 29, 2018

Minnesota State Retirement System
State 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 State Employees Retirement Fund ("SERF"), as amended by Statement No. 82. These calculations have been made on a basis that is consistent with our understanding of these accounting standards.

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 financial reporting and disclosure information that satisfies the requirements of GASB Statements No. 67 and No. 68. 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 Statement No. 67 and No. 68 may produce significantly different results. The information in this report is calculated on a total plan basis. MSRS is responsible for preparing the Schedule of Employer Allocations and the Schedule of Pension Amounts by Employer, as applicable. This report may be provided to parties other than the Minnesota State Retirement System (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.

To the best of our knowledge, the information contained within this report is accurate and fairly represents the actuarial position of the State 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

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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	34,937
- Survivors	4,058
- Disability Retirements	1,826
- Deferred Retirements	17,109
- Terminated other non-vested	8,235
- Active Members	51,223
- Total	117,388
Covered-employee Payroll	$ 3,031,382 (1)
Net Pension Liability	
Total Pension Liability	$ 14,679,489
Plan Fiduciary Net Position	13,293,422
Net Pension Liability	$ 1,386,067
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	90.56%
Net Pension Liability as a Percentage of Covered-employee Payroll	45.72%
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	3.62% (2)
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)	$ (1,661,668)

Deferred Outflows and Deferred Inflows 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	$ 38,278	$ 105,146
Changes in assumptions	3,964,527	6,189,984
Net difference between projected and actual earnings on pension plan investments	443,800	790,779
Totals	$ 4,446,605	$ 7,085,909

(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 SERF subsequent to the measurement date of June 30, 2018.

The pension expense or income 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 State 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 employer normal cost as a percentage of pay is expected to remain approximately level as a percentage of payroll.
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 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 Fidelity "20-Year Municipal GO AA Index"); 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/(Income)	
1. Service Cost	$ 455,709
2. Interest on the Total Pension Liability	1,069,154
3. Current-Period Benefit Changes	(1,711,128)
4. Employee Contributions (made negative for addition here)	(166,726)
5. Projected Earnings on Plan Investments (made negative for addition here)	(918,843)
6. Pension Plan Administrative Expense	9,564
7. Other Changes in Plan Fiduciary Net Position	(20,423)
8. Recognition of Outflow (Inflow) of Resources due to differences between expected and actual experience in the measurement of the Total Pension Liability	
Arising from Current Reporting Period	(1,626)
9. Recognition of Outflow (Inflow) of Resources due to assumption changes	
Arising from Current Reporting Period	(843,815)
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	(71,541)
11. Increases/(Decreases) from Experience in the Current Reporting Period	**$ (2,199,675)**
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	$ (93,269)
13. Recognition of Outflow (Inflow) of Resources due to assumption changes	
Arising from Prior Reporting Periods	748,562
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	(117,286)
15. Total Pension Expense/ (Income)	**$ (1,661,668)**

Benefit changes since the previous measurement date are described on page 25.

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	$ (8,132)
2. Assumption Changes (gains) or losses	(4,219,074)
3. Recognition period for Liabilities: Average of the expected remaining service lives of all employees {in years, rounded to the nearest whole number}	5
4. Outflow (Inflow) of Resources to be recognized in the current pension expense for the difference between expected and actual experience in the measurement of the Total Pension Liability	(1,626)
5. Outflow (Inflow) of Resources to be recognized in the current pension expense for Assumption Changes	(843,815)
6. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Liabilities	$ (845,441)
7. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses for the difference between expected and actual experience of the Total Pension Liability	$ (6,506)
8. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses for Assumption Changes	(3,375,259)
9. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Liabilities	$ (3,381,765)
B. Outflows (Inflows) of Resources due to Assets	
1. Net difference between projected and actual earnings on pension plan investments (gains) or losses	$ (357,707)
2. Recognition period for Assets {in years}	5
3. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Assets	(71,541)
4. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Assets	$ (286,166)

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	$ 1,996,438	$ 2,186,586	$ (190,148)
2. Due to Assets	261,194	450,021	(188,827)
3. Total	$ 2,257,632	$ 2,636,607	$ (378,975)

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	$ 14,174	$ 109,069	$ (94,895)
2. Assumption Changes	1,982,264	2,077,517	(95,253)
3. Net Difference between projected and actual earnings on pension plan investments	261,194	450,021	(188,827)
4. Total	$ 2,257,632	$ 2,636,607	$ (378,975)

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	$ 38,278	$ 105,146	$ (66,868)
2. Assumption Changes	3,964,527	6,189,984	(2,225,457)
3. Net Difference between projected and actual earnings on pension plan investments*	443,800	790,779	(346,979)
4. Total	$ 4,446,605	$ 7,085,909	$ (2,639,304)

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	$ 135,563
2020	155,615
2021	(2,013,499)
2022	(916,983)
2023	-
Thereafter	-
Total	$ (2,639,304)

** 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	$	144,221
Receivables		24,772
Investment Pools (at fair value)		13,117,429
Securities Lending Collateral		1,334,503
Capital Assets		17,082
Total Assets	**$**	**14,638,007**
Total Deferred Outflows of Resources	**$**	**-**
Total Liabilities	**$**	**(1,344,585)**
Total Deferred Inflows of Resources	**$**	**-**
Net Position Restricted for Pensions	**$**	**13,293,422**

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**	**$ 12,485,614**
Additions		
2.	Contributions	
	a. Employee	$ 166,726
	b. Employer	164,233
	c. Other sources	-
	d. Total contributions	$ 330,959
3.	Investment income	
	a. Investment income/(loss)	$ 1,290,523
	b. Investment expenses	(13,973)
	c. Net investment income/(loss)	$ 1,276,550
4.	Other Additions	20,495
5.	**Total Additions (2.d.) + (3.c.) + (4.)**	**$ 1,628,004**
Deductions		
6.	Benefits Paid	
	a. Annuity benefits	$ (797,027)
	b. Refunds	(13,533)
	c. Total benefits paid	$ (810,560)
7.	Expenses	
	a. Other deductions	$ (72)
	b. Administrative	(9,564)
	c. Total expenses	$ (9,636)
8.	**Total deductions (6.c.) + (7.c.)**	**$ (820,196)**
9.	**Net increase/(decrease) in fiduciary net position (5.) + (8.)**	**$ 807,808**
10.	**Net position at market value at end of year (1.) + (9.)**	**$ 13,293,422**
11.	State Board of Investment calculated annual investment return for the State Employees Retirement Fund*	10.5%

** 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	$	455,709
2. Interest on the Total Pension Liability		1,069,154
3. Changes of benefit terms		(1,711,128)
4. Difference between expected and actual experience of the Total Pension Liability		(8,132)
5. Changes of assumptions		(4,219,074)
6. Benefit payments, including refunds of employee contributions		(810,560)
7. Net change in total pension liability	$	(5,224,031)
8. Total pension liability – beginning		19,903,520
9. Total pension liability – ending	**$**	**14,679,489**
B. Plan fiduciary net position		
1. Contributions – employer	$	164,233
2. Contributions – employee		166,726
3. Net investment income		1,276,550
4. Benefit payments, including refunds of employee contributions		(810,560)
5. Pension Plan Administrative Expense		(9,564)
6. Other changes		20,423
7. Net change in plan fiduciary net position	$	807,808
8. Plan fiduciary net position – beginning		12,485,614
9. Plan fiduciary net position – ending	**$**	**13,293,422**
C. Net pension liability, *A.9. - B.9.*	**$**	**1,386,067**
D. Plan fiduciary net position as a percentage of the total pension liability, *B.9. / A.9.*		**90.56%**
E. Covered-employee payroll	**$**	**3,031,382** (1)
F. Net pension liability as a percentage of covered-employee payroll, *C. / E.*		**45.72%**

(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	$ 455,709	$ 619,666	$ 211,491	$ 210,545	$ 256,155					
Interest on the Total Pension Liability	1,069,154	982,066	1,020,925	1,018,035	922,181					
Benefit Changes	(1,711,128)	83,490	-	-	-					
Difference between Expected and Actual Experience	(8,132)	49,659	21,209	(493,197)	(44,023)					
Assumption Changes	(4,219,074)	(4,691,209)	9,911,319	-	(1,477,308)					
Benefit Payments	(797,027)	(750,526)	(707,361)	(665,821)	(623,942)					
Refunds	(13,533)	(11,576)	(13,345)	(12,026)	(11,986)					
Net Change in Total Pension Liability	$ (5,224,031)	$ (3,718,430)	$10,444,238	$ 57,536	$ (978,923)					
Total Pension Liability - Beginning	19,903,520	23,621,950	13,177,712	13,120,176	14,099,099					
Total Pension Liability - Ending (a)	**$14,679,489**	**$19,903,520**	**$23,621,950**	**$13,177,712**	**$13,120,176**					
Plan Fiduciary Net Position										
Employer Contributions	$ 164,233	$ 158,352	$ 151,168	$ 146,333	$ 128,037					
Employee Contributions	166,726	161,670	153,854	149,293	131,033					
Pension Plan Net Investment Income	1,276,550	1,667,562	(9,633)	501,185	1,829,621					
Benefit Payments	(797,027)	(750,526)	(707,361)	(665,821)	(623,942)					
Refunds	(13,533)	(11,576)	(13,345)	(12,026)	(11,986)					
Pension Plan Administrative Expense	(9,564)	(10,165)	(10,196)	(8,719)	(8,125)					
Other Changes	20,423	47,232	20,259	29,470	20,528					
Net Change in Plan Fiduciary Net Position	$ 807,808	$ 1,262,549	$ (415,254)	$ 139,715	$ 1,465,166					
Plan Fiduciary Net Position - Beginning	12,485,614	11,223,065	11,638,319	11,498,604	10,033,438					
Plan Fiduciary Net Position - Ending (b)	**$13,293,422**	**$12,485,614**	**$11,223,065**	**$11,638,319**	**$11,498,604**					
Net Pension Liability - Ending (a) - (b)	**$ 1,386,067**	**$ 7,417,906**	**$12,398,885**	**$ 1,539,393**	**$ 1,621,572**					
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	**90.56 %**	**62.73 %**	**47.51 %**	**88.32 %**	**87.64 %**					
Covered-Employee Payroll [1]	**$ 3,031,382**	**$ 2,939,455**	**$ 2,797,345**	**$ 2,714,418**	**$ 2,620,660**					
Net Pension Liability as a Percentage of Covered-Employee Payroll	**45.72 %**	**252.36 %**	**443.24 %**	**56.71 %**	**61.88 %**					

Notes to Schedule:

(1) Assumed equal to actual member contribution 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) / (a)	(d)	(c) / (d)
2009						
2010						
2011						
2012						
2013						
2014	$ 13,120,176	$ 11,498,604	$ 1,621,572	87.64%	$ 2,620,660	61.88%
2015	13,177,712	11,638,319	1,539,393	88.32	2,714,418	56.71
2016	23,621,950	11,223,065	12,398,885	47.51	2,797,345	443.24
2017	19,903,520	12,485,614	7,417,906	62.73	2,939,455	252.36
2018	14,679,489	13,293,422	1,386,067	90.56	3,031,382	45.72

Schedule of Contributions Multiyear (Dollars in Thousands)

Last 10 Fiscal Years

Fiscal Year Ending June 30,	Actuarially Determined Contribution [1]	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	$ 179,759	$ 107,211	$ 72,548	$ 2,329,499	4.60%
2010	230,439	113,716	116,723	2,327,398	4.89
2011	146,191	118,563	27,628	2,440,580	4.86
2012	142,740	115,159	27,581	2,367,160 (2)	4.86
2013	181,756	121,673	60,083	2,483,000 (2)	4.90
2014	195,239	128,037	67,202	2,620,660 (2)	4.89
2015	198,695	146,333	52,362	2,714,418 (2)	5.39
2016	194,136	151,168	42,968	2,797,345 (2)	5.40
2017	264,257	158,352	105,905	2,939,455 (2)	5.39
2018	234,629	164,233	70,396	3,031,382 (2)	5.42

Notes to Schedule of Contributions

Methods and Assumptions Used to Determine Fiscal Year Ending June 30, 2018 Contribution Rates Reported in this Schedule:

Notes	(1) 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. (2) Assumed equal to actual member contributions divided by employee contribution rate.
Valuation Date	June 30, 2017
Actuarial Cost Method	Entry Age Normal
Amortization Method	Level Percentage of Payroll, Closed
Remaining Amortization Period	25 years
Asset Valuation Method	5-Year smoothed market; no corridor
Inflation	2.75%
Payroll Growth	3.50%
Salary Increases	Service based table of rates ranging from 14.00% with one year of service to 3.50% with 25 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.
Healthy Post-retirement Mortality	RP-2014 annuitant generational mortality table, projected with mortality improvement scale MP-2015 from a base year of 2014, white collar adjustment, set forward 2-years for males and no age adjustment for females.
Other Information	
Benefit Increases After Retirement	The post-retirement increase is assumed to remain at 2.00% indefinitely. See separate funding actuarial valuation report as of July 1, 2017 for additional detail. To obtain this report, contact MSRS at 60 Empire Drive, Suite 300, St. Paul, MN, 55103 or request via email at info@msrs.us or telephone at 1-800-651-5757. This report can be found 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	18.67%
2015	4.45
2016	(0.08)
2017	15.24
2018	10.49

[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 State Employees Retirement Fund was 10.49%. 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.

Ten-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 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.

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 employee and employer 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. As a result, 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 (8.50%) 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	$ 16,497,171	$ 14,679,489	$ 13,170,712
Net Position Restricted for Pensions	13,293,422	13,293,422	13,293,422
Net Pension Liability	**$ 3,203,749**	**$ 1,386,067**	**$ (122,710)**

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	**$ 19,903,520**	**$ 12,485,614**	**$ 7,417,906**	**$ 6,704,237**	**$ 5,137,603**	
Changes for the Year:						
Service Cost	$ 455,709		$ 455,709			$ 455,709
Interest on Total Pension Liability	1,069,154		1,069,154			1,069,154
Interest on Fiduciary Net Position		$ 918,843 [1]	(918,843)			(918,843)
Changes in Benefit Terms	(1,711,128)		(1,711,128)			(1,711,128)
Liability Experience Gains and Losses	(8,132)		(8,132)	$ -	$ 6,506	(1,626)
Changes in Assumptions	(4,219,074)		(4,219,074)	-	3,375,259	(843,815)
Recognition of Deferred Outflows/(Inflows) of Resources Arising from Prior Reporting Periods						
Liability Experience Gains/(Losses)				(14,174)	(107,443)	(93,269)
Assumption Changes				(1,982,264)	(1,233,702)	748,562
Investment Gains/(Losses)				(261,194)	(378,480)	(117,286)
Contributions - Employer		164,233	(164,233)			
Contributions - Employees		166,726	(166,726)			(166,726)
Asset Gain/(Loss)		357,707 [1]	(357,707)	-	286,166	(71,541)
Benefit Payments and Refunds	(810,560)	(810,560)	-			
Administrative Expenses		(9,564)	9,564			9,564
Other changes		20,423	(20,423)			(20,423)
Net Changes	**$ (5,224,031)**	**$ 807,808**	**$ (6,031,839)**	**$ (2,257,632)**	**$ 1,948,306**	**$ (1,661,668)**
Balance End of Year	**$ 14,679,489**	**$ 13,293,422**	**$ 1,386,067**	**$ 4,446,605**	**$ 7,085,909**	

(1) The sum of these items in column (b) equals the net investment income of $1,276,550.

Summary of Population Statistics

		Terminated*		Recipients**			
	Actives	Deferred Retirement	Other Non-Vested	Service Retirement	Disability Retirement	Survivor	Total
Members on July 1, 2017	**50,578**	**17,006**	**9,468**	**33,563**	**1,830**	**3,940**	**116,385**
New members	5,649	0	0	0	0	0	**5,649**
Return to active	347	(156)	(191)	0	0	0	**0**
Terminated non-vested	(1,944)	0	1,944	0	0	0	**0**
Service retirements	(1,450)	(709)	0	2,159	0	0	**0**
Unclassified retirements	0	0	0	62	0	0	**62**
Terminated deferred	(1,005)	1,005	0	0	0	0	**0**
Terminated refund/transfer	(823)	(164)	(3,278)	0	0	0	**(4,265)**
Deaths	(88)	(37)	(15)	(911)	(68)	(185)	**(1,304)**
New beneficiary	0	0	0	0	0	325	**325**
Disabled	(41)	0	0	0	41	0	**0**
Data adjustments	0	164	307	64	23	(22)	**536**
Net change	645	103	(1,233)	1,374	(4)	118	**1,003**
Members on July 1, 2018	**51,223**	**17,109**	**8,235**	**34,937**	**1,826**	**4,058**	**117,388**

* *Includes members in the General or Military Affairs Plans.*

** *Includes members in the General, Military Affairs or Unclassified Plans.*

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, non-academic staff of the University of Minnesota and employees of certain Metro level government units, unless excluded by law.

Contributions — Shown as a percent of salary:

Effective as of	Member	Employer
Prior to July 1, 2018	5.50%	5.50%
July 1, 2018	5.75%	5.875%
July 1, 2019	6.00%	6.25%

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 leaves of absence, military service and periods while temporary Worker's Compensation is paid. Excludes lump sum vacation and severance pay at termination.

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

Salary — Includes wages, allowances and fees. Excludes lump sum payments at separation, employer contributions to deferred compensation and tax-sheltered annuity plans and benevolent vacation and sick leave donation programs.

Retirement

Normal retirement benefit

Age/Service requirement — First hired before July 1, 1989:

(a.) Age 65 and three years of Allowable Service.

(b.) Proportionate Retirement Annuity is available at age 65 and one year of Allowable Service.

First hired after June 30, 1989:

(a.) The greater of age 65 or the age eligible for full Social Security retirement benefits (but not higher than age 66) and three years of Allowable Service (five years if hired after June 30, 2010).

(b.) Proportionate Retirement Annuity is available at normal retirement age and one year of Allowable Service.

Amount — 1.70% of Average Salary for each year of Allowable Service.

Summary of Plan Provisions (Continued)

Retirement (Continued)	
Early retirement	
Age/Service requirement	First hired before July 1, 1989: (a.) Age 55 and three years of Allowable Service. (b.) Any age with 30 years of Allowable Service. (c.) Rule of 90: Age plus Allowable Service totals 90. First hired after June 30, 1989: (a.) Age 55 and three years (five years if hired after June 30, 2010) of Allowable Service.
Amount	First hired before July 1, 1989: The greater of (a) or (b): (a.) 1.20% of Average Salary for each of the first ten years of Allowable Service and 1.70% of Average Salary for each subsequent year with reduction of 0.25% for each month the member is under age 65 at time of retirement or under age 62 if 30 or more years of Allowable Service. No reduction if age plus years of Allowable Service totals 90. (b.) 1.70% of Average Salary for each year of Allowable Service assuming augmentation to age 65 at 3.00% per year and actuarial reduction for each month the member is under age 65. Augmentation adjustment is phased out over a five-year period starting July 1, 2019, resulting in no augmentation adjustment after June 30, 2024. First hired after June 30, 1989: 1.70% of Average Salary for each year of Allowable Service assuming augmentation to the age eligible for full Social Security retirement benefit (but not higher than age 66) at 3.00% (2.50% if hired after June 30, 2006) per year and actuarial reduction for each month the member is under the normal retirement age. Augmentation adjustment is phased out over a five-year period starting July 1, 2019, resulting in no augmentation adjustment after June 30, 2024.
Form of payment	Life annuity with return on death of any balance of member contributions over aggregate monthly payments. Actuarially equivalent options are: (a.) 50%, 75%, or 100% Joint and Survivor with bounce back feature without additional reduction. (b.) 15-year Certain and Life.
Benefit increases	Through December 31, 2018: 2.0% January 1, 2019 – December 31, 2023: 1.0% January 1, 2024 and after: 1.5% For retirements on or after January 1, 2024, the first benefit increase is delayed until the retiree reaches Normal Retirement Age (not applicable to Rule of 90 retirees, disability benefit recipients, or survivors).

Summary of Plan Provisions (Continued)

Retirement (Continued)	
<u>Benefit increases (Continued)</u>	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. Prior to 2002, members who retired under the laws in effect before July 1, 1973, received an additional lump sum payment each year. In 1989, this lump sum payment was the greater of $25 times each full year of Allowable Service or $400 per full year of service less any Social Security benefits received or annuity from a Minnesota public employee pension plan. In each following year, the lump sum payment was increased by the same percentage increase that was applied to regular annuities paid from the Minnesota Post Retirement Investment Fund. Effective January 1, 2002, the annual lump sum payment was divided by 12 and paid as a monthly life annuity in the annuity form elected.
Disability	
<u>Disability benefit</u>	
Age/Service requirement	Total and permanent disability before normal retirement age with three years of Allowable Service (five years if hired after June 30, 2010).
Amount	Normal Retirement benefit based on Allowable Service and Average Salary at disability without reduction for commencement before normal retirement age. Payments stop if disability ceases or death occurs. Payments revert to a retirement annuity at normal retirement age. Benefits may be reduced on resumption of partial employment.
<u>Retirement after disability</u>	
Age/Service requirement	Normal retirement age with continued disability.
Amount	Any optional annuity continues. Otherwise, a normal retirement benefit equal to the disability benefit paid before normal retirement age, or an actuarially equivalent optional annuity.
<u>Form of payment</u>	Same as for retirement.
<u>Benefit Increases</u>	Same as for retirement, except benefit increases are paid prior to Normal Retirement.

Summary of Plan Provisions (Continued)

Death

Surviving spouse optional benefit

Age/Service requirement	Member or former member who dies before retirement or disability benefits commence with three years of Allowable Service (five years if hired after June 30, 2010). 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.
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 55 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. If a member dies prior to July 1, 1997, and the beneficiary was not eligible to commence a survivor benefit as of July 1, 1997, an actuarial increase shall be made for the change in the post-retirement interest rates from 5.00% to 6.00%.
Benefit increases	Same as for retirement, except benefit increases are paid prior to Normal Retirement.

Surviving dependent children's benefit

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 100% joint and survivor annuity to surviving spouse payable to the later of age 20 or five years. The amount is proportionally divided among surviving children.
Benefit increases	Same as for retirement, except benefit increases are paid prior to Normal Retirement.

Refund of contributions

Age/Service requirement	Active member dies and survivor benefits are not payable or a former member dies before annuity begins or former member who is not entitled to an annuity dies.
Amount	Member's contributions with 6.00% interest through June 30, 2011, compounded daily. Beginning July 1, 2011, a member's contributions increase at 4.00% interest compounded daily. Beginning July 1, 2018, a member's contributions increase at 3.00% interest compounded daily.

Summary of Plan Provisions (Continued)

Death (Continued)	
<u>**Refund of contributions (Continued)**</u>	
Age/Service requirement	Retired or disabled annuitant who did not select an optional annuity dies, or the remaining recipient of an option dies.
Amount	The excess of the member's contributions over all benefits paid.
Unclassified Plan Provision	Eligible members credited with employee shares in the Unclassified Plan may elect to terminate participation in the Unclassified Plan and be covered by the State Employees Retirement Fund prior to termination of covered employment assuming that the member has acquired at least 10 years of allowable state service (no more than seven years of service if hired after June 30, 2010).
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 at 4.00% interest compounded daily. Beginning July 1, 2018, a member's contributions increase at 3.00% interest compounded daily. If a member is vested, a deferred annuity may be elected in lieu of a refund.
<u>**Deferred benefit**</u>	
Age/Service requirement	Three years of Allowable Service if hired prior to June 30, 2010, five years of Allowable Service if hired after June 30, 2010.
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; (e.) 2.00% from January 1, 2012 through December 31, 2018; and (f.) 0.00% from January 1, 2019, thereafter. Amount is payable at normal or early retirement. If a member terminated employment prior to July 1, 1997, but was not eligible to commence their pension before July 1, 1997, an actuarial increase shall be made for the change in the post-retirement interest rates from 5.00% to 6.00%.

Summary of Plan Provisions (Concluded)

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 is combined in order to determine eligibility for early retirement. (b.) Average salary is based on the high five consecutive years during their entire service in all covered plans.
Actuarial Equivalent Factors	Actuarially equivalent factors based on RP-2014 mortality for healthy annuitants, white collar adjustment, male rates set forward two years, projected to 2019 using Scale MP-2015, blended 50% males, 5.88% post-retirement interest, and 7.50% pre-retirement interest. Based upon statutory requirements; joint and survivor factors are based on an interest assumption of 6.50%. The actuarially equivalent factors are currently being updated to reflect changes adopted during the 2018 legislative session.
Changes in Plan Provisions	The augmentation adjustment in early retirement factors is eliminated over a five-year period starting July 1, 2019, resulting in actuarial equivalence after June 30, 2024. Member contributions were changed from 5.50% to 5.75% of pay, effective July 1, 2018 and 6.00% of pay, effective July 1, 2019. Employer contributions were changed from 5.50% to 5.875% of pay, effective July 1, 2018 and 6.25% of pay, effective July 1, 2019. 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 1.0% for five years (beginning January 1, 2019) and 1.5% per year thereafter. For retirements on or after January 1, 2024, the first benefit increase is delayed until the retiree reaches Normal Retirement Age.

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 for 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 June 30, 2015, and a review of inflation and investment return assumptions, dated September 11, 2017. The Allowance for Combined Service Annuity assumptions are based on an analysis completed by the LCPR actuary and documented in a report dated October 2016.

Investment return	7.50% per annum.
Single Discount Rate	7.50% per annum.
Salary increases	Reported salary at valuation date increased according to the rate table, to current fiscal year and annually for each future year. Prior fiscal year salary is annualized for members with less than one year of service.
Inflation	2.50% per year.
Payroll growth	3.25% per year.
Mortality rates	
Healthy Pre-retirement	RP-2014 employee generational mortality table projected with mortality improvement Scale MP-2015 from a base year of 2014, white collar adjustment, set forward one year for males and no age adjustment for females.
Healthy Post-retirement	RP-2014 annuitant generational mortality table projected with mortality improvement Scale MP-2015 from a base year of 2014, white collar adjustment, set forward two years for males and no age adjustment for females.
Disabled	RP-2014 disabled mortality table projected with mortality improvement Scale MP-2015 from a base year of 2014, set forward two years for males and four years for females.
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 significant plan changes reflected in this report may result in behavior changes that are not anticipated in the current retirement rates.
Withdrawal	Service-related rates based on experience; see table of sample rates.
Disability	Age-related rates based on experience; see table of sample rates.

Summary of Actuarial Assumptions (Continued)

Allowance for combined service annuity	Liabilities for former, vested members are increased by 4.00%, and liabilities for former, non-vested members are increased by 5.00% to account for the effect of some participants having eligibility for a Combined Service Annuity.
Administrative expenses	Prior year administrative expenses expressed as percentage of prior year projected payroll.
Refund of contributions	Account balances accumulate interest until normal retirement date and are discounted back to the valuation date. All employees withdrawing after becoming eligible for a deferred benefit are assumed to take the larger of the contributions accumulated with interest or the value of the deferred benefit.
Commencement of deferred benefits	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at normal retirement age.
Percentage married	80% of active male members and 65% of female members are assumed to be married. Actual marital status is used for members in payment status.
Age of spouse	Male members are assumed to have a beneficiary three years younger and female members are assumed to have a beneficiary two years older.
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: 15% elect 50% Joint & Survivor option 10% elect 75% Joint & Survivor option 30% 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 life annuity.
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.

Summary of Actuarial Assumptions (Continued)

Unknown data for certain members

To prepare this report, GRS has used and relied on participant data supplied by the Fund. Although GRS has reviewed the data in accordance with Actuarial Standards of Practice No. 23, GRS has not verified or audited any of the data or information provided.

In cases where submitted data was missing or incomplete, the following assumptions, based on average results for applicable members at the time of the last experience study, were applied:

<u>Data for active members:</u>

There were 85 members reported with zero or invalid salary (<$100). We used prior year salary (57 members), if available, otherwise, high five salary with a 10% load to account for salary increases (21 members). If neither pay or high five salary was available, we assumed a value of $35,000 (7 members).

There were 11 members reported with zero or negative service. Due to the small number of members with zero service, and based on direction from MSRS, we used service of 0 years for these members.

There were also 111 members reported without a gender and 9 members reported with an invalid date of birth. We assumed the member was hired at age 37 and female gender.

<u>Data for terminated members:</u>

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 372 members reported with a missing or invalid 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 or invalid (357 members), we assumed a value of $30,000. If termination date was not reported (7 members), we assumed the member terminated at age 40 (or current age if younger than 40). If credited service was either not reported or invalid (10 members), we assumed a value of 7.5 years.

There were no members with a missing date of birth, and no members with an invalid gender.

<u>Data for members receiving benefits:</u>

There were 16 members reported without a gender. We assumed female gender for the valuation. No retired members were reported with an invalid date of birth.

There were no members reported without a benefit.

There were 5 survivor members reported with a certain end date prior to the valuation date. These members were excluded from the valuation.

There were 108 retirees reported with a survivor option and a survivor date of death. We assumed no benefit was payable to the survivor, and the member benefit already reflected the increase to the life annuity (i.e. "bounce back,") if applicable.

Summary of Actuarial Assumptions (Continued)

Unknown data for certain members – (Concluded)	Data for members receiving benefits: There were no retirees reported with a bounce back annuity and an unreasonable reduction factor. There were retired members reported with a survivor option and an invalid or missing survivor gender (3,973 members) and/or survivor date of birth (3,444 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 was changed from 5.42% to 7.50%.

Summary of Actuarial Assumptions (Continued)

	Percent of Members Dying Each Year*					
	Healthy Post-Retirement Mortality**		Healthy Pre-Retirement Mortality**		Disability Mortality**	
Age in 2018	Male	Female	Male	Female	Male	Female
20	0.03%	0.01%	0.03%	0.01%	0.08%	0.06%
25	0.04	0.02	0.03	0.01	0.27	0.18
30	0.06	0.05	0.03	0.02	0.57	0.37
35	0.09	0.08	0.04	0.02	0.95	0.61
40	0.13	0.11	0.04	0.03	1.32	0.84
45	0.20	0.15	0.07	0.05	1.64	1.05
50	0.29	0.19	0.12	0.09	1.94	1.31
55	0.41	0.27	0.20	0.14	2.31	1.61
60	0.58	0.38	0.36	0.20	2.76	1.94
65	0.88	0.62	0.63	0.30	3.34	2.50
70	1.45	0.99	1.09	0.51	4.27	3.55
75	2.50	1.65	1.92	0.89	5.83	5.30
80	4.47	2.89	3.48	1.57	8.41	7.94
85	8.29	5.21	7.29	4.12	12.68	11.72
90	14.99	9.53	13.53	9.22	19.16	17.26

* *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 2014.*

	Percent of Members Decrementing Each Year	
	Disability Retirement	
Age	Male	Female
20	0.00%	0.00%
25	0.01	0.01
30	0.01	0.01
35	0.02	0.02
40	0.06	0.06
45	0.11	0.11
50	0.22	0.22
55	0.32	0.32
60	0.47	0.47
65	0.00	0.00

Summary of Actuarial Assumptions (Continued)

Age	Percent Retiring Each Year: Rule of 90 Eligible	Hired prior to 7/1/1989	Hired after 6/30/1989
55	15.0%	4.0%	4.0%
56	15.0	4.0	4.0
57	12.5	4.0	4.0
58	12.5	4.0	4.0
59	15.0	6.0	5.0
60	15.0	8.0	5.0
61	20.0	10.0	10.0
62	30.0	20.0	15.0
63	25.0	18.0	15.0
64	25.0	18.0	15.0
65	35.0	35.0	20.0
66	30.0	30.0	30.0
67	25.0	25.0	25.0
68	25.0	25.0	25.0
69	22.0	22.0	22.0
70	30.0	30.0	30.0
71+	100.0	100.0	100.0

Summary of Actuarial Assumptions (Concluded)

Salary Scale	
Year	Increase
1	13.75%
2	11.25
3	6.00
4	5.25
5	5.00
6	4.90
7	4.75
8	4.50
9	4.25
10	4.00
11	3.95
12	3.90
13	3.85
14	3.80
15	3.75
16	3.70
17	3.65
18	3.60
19	3.55
20	3.50
21	3.45
22	3.40
23	3.35
24	3.30
25+	3.25

Percent of Members Terminating (Withdrawing) Each Year		
Year	Males	Females
1	20.00%	24.00%
2	15.00	18.00
3	11.00	13.00
4	8.50	11.00
5	7.75	9.00
6	6.50	8.50
7	5.75	7.50
8	5.00	5.75
9	4.00	5.00
10	3.25	4.50
11	3.00	4.00
12	2.75	4.00
13	2.50	3.00
14	2.50	2.75
15	2.50	2.50
16	2.00	2.25
17	2.00	2.25
18	2.00	2.25
19	2.00	2.25
20	1.50	2.25
21	1.50	2.00
22	1.50	2.00
23	1.00	1.50
24	1.00	1.50
25	1.00	1.50
26	1.00	1.50
27	1.00	1.25
28	1.00	1.25
29	1.00	1.25
30+	1.00	1.00

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). **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)

Fiscal Year Ending	Projected Covered-Employee Payroll: Payroll for Current Employees	Payroll for New Employees	Total Employee Payroll	Projected Contributions: Contributions from Current Employees	Employer Contributions for Current Employees	Contributions on Future Payroll toward current UAL*	Total Contributions
	(a)	(b)	(c) = (a) + (b)	(d) = (a) * 6.0%**	(e) = (a) * 6.25%**	(f)	(g) = (d) + (e) + (f)
2018	$ 3,031,382		$ 3,031,382				
2019	3,133,366		3,133,366	$ 180,169	$ 184,085		$ 364,254
2020	2,962,638	$ 272,562	3,235,200	177,758	185,165	$ 10,303	373,226
2021	2,802,091	538,253	3,340,344	168,125	175,131	20,346	363,602
2022	2,666,615	782,291	3,448,906	159,997	166,663	29,571	356,231
2023	2,543,613	1,017,382	3,560,995	152,617	158,976	38,457	350,050
2024	2,430,712	1,246,015	3,676,727	145,843	151,919	47,099	344,861
2025	2,325,792	1,470,429	3,796,221	139,548	145,362	55,582	340,492
2026	2,227,987	1,691,611	3,919,598	133,679	139,249	63,943	336,871
2027	2,136,253	1,910,732	4,046,985	128,175	133,516	72,226	333,917
2028	2,049,943	2,128,569	4,178,512	122,997	128,121	80,460	331,578
2029	1,968,623	2,345,691	4,314,314	118,117	123,039	88,667	329,823
2030	1,890,786	2,563,743	4,454,529	113,447	118,174	96,910	328,531
2031	1,815,300	2,784,001	4,599,301	108,918	113,456	105,235	327,609
2032	1,741,679	3,007,099	4,748,778	104,501	108,855	113,668	327,024
2033	1,669,881	3,233,233	4,903,114	100,193	104,368	122,216	326,777
2034	1,599,485	3,462,980	5,062,465	95,969	99,968	130,901	326,838
2035	1,530,015	3,696,980	5,226,995	91,801	95,626	139,746	327,173
2036	1,461,301	3,935,571	5,396,872	87,678	91,331	148,765	327,774
2037	1,393,464	4,178,807	5,572,271	83,608	87,092	157,959	328,659
2038	1,326,694	4,426,676	5,753,370	79,602	82,918	167,328	329,848
2039	1,260,267	4,680,087	5,940,354	75,616	78,767	176,907	331,290
2040	1,193,300	4,940,116	6,133,416	71,598	74,581	186,736	332,915
2041	1,124,933	5,207,819	6,332,752	67,496	70,308	196,856	334,660
2042	1,055,269	5,483,297	6,538,566	63,316	65,954	207,269	336,539
2043	985,265	5,765,804	6,751,069	59,116	61,579	217,947	338,642
2044	914,940	6,055,539	6,970,479	54,896	57,184	228,899	340,979
2045	843,964	6,353,056	7,197,020	50,638	52,748	240,146	343,532
2046	772,195	6,658,728	7,430,923	46,332	48,262	251,700	346,294
2047	700,333	6,972,095	7,672,428	42,020	43,771	263,545	349,336
2048	629,785	7,291,997	7,921,782	37,787	39,362	275,637	352,786
2049	560,946	7,618,294	8,179,240	33,657	35,059	287,971	356,687
2050	494,059	7,951,006	8,445,065	29,644	30,879	300,548	361,071
2051	429,951	8,289,579	8,719,530	25,797	26,872	313,346	366,015
2052	369,490	8,633,424	9,002,914	22,169	23,093	326,343	371,605
2053	313,265	8,982,244	9,295,509	18,796	19,579	339,529	377,904
2054	261,714	9,335,899	9,597,613	15,703	16,357	352,897	384,957
2055	214,962	9,694,574	9,909,536	12,898	13,435	366,455	392,788
2056	173,040	10,058,555	10,231,595	10,382	10,815	380,213	401,410
2057	136,288	10,427,834	10,564,122	8,177	8,518	394,172	410,867
2058	105,054	10,802,402	10,907,456	6,303	6,566	408,331	421,200
2059	79,107	11,182,842	11,261,949	4,746	4,944	422,711	432,401
2060	57,949	11,570,013	11,627,962	3,477	3,622	437,346	444,445
2061	40,986	11,964,885	12,005,871	2,459	2,562	452,273	457,294
2062	27,826	12,368,235	12,396,061	1,670	1,739	467,519	470,928
2063	18,181	12,780,752	12,798,933	1,091	1,136	483,112	485,339
2064	11,305	13,203,594	13,214,899	678	707	499,096	500,481
2065	6,437	13,637,946	13,644,383	386	402	515,514	516,302
2066	3,157	14,084,668	14,087,825	189	197	532,400	532,786
2067	1,341	14,544,339	14,545,680	80	84	549,776	549,940
2068	529	15,017,885	15,018,414	32	33	567,676	567,741

* *Contributions related to future employees in excess of normal cost and expenses of 8.47% of pay.*

** *5.75% Employee/5.875% Employer for fiscal year ending 2019.*

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) * 6.0%**	(e) = (a) * 6.25%**	(f)	(g) = (d) + (e) + (f)
2069	$ 209	$ 15,506,304	$ 15,506,513	$ 13	$ 13	$ 586,138	$ 586,164
2070	78	16,010,397	16,010,475	5	5	605,193	605,203
2071	19	16,530,796	16,530,815	1	1	624,864	624,866
2072	4	17,068,062	17,068,066	-	-	645,173	645,173
2073	-	17,622,779	17,622,779	-	-	666,141	666,141
2074	-	18,195,519	18,195,519	-	-	687,791	687,791
2075	-	18,786,873	18,786,873	-	-	710,144	710,144
2076	-	19,397,447	19,397,447	-	-	733,223	733,223
2077	-	20,027,864	20,027,864	-	-	757,053	757,053
2078	-	20,678,769	20,678,769	-	-	781,657	781,657
2079	-	21,350,829	21,350,829	-	-	807,061	807,061
2080	-	22,044,731	22,044,731	-	-	833,291	833,291
2081	-	22,761,185	22,761,185	-	-	860,373	860,373
2082	-	23,500,923	23,500,923	-	-	888,335	888,335
2083	-	24,264,704	24,264,704	-	-	917,206	917,206
2084	-	25,053,306	25,053,306	-	-	947,015	947,015
2085	-	25,867,539	25,867,539	-	-	977,793	977,793
2086	-	26,708,234	26,708,234	-	-	1,009,571	1,009,571
2087	-	27,576,251	27,576,251	-	-	1,042,382	1,042,382
2088	-	28,472,480	28,472,480	-	-	1,076,260	1,076,260
2089	-	29,397,835	29,397,835	-	-	1,111,238	1,111,238
2090	-	30,353,265	30,353,265	-	-	1,147,353	1,147,353
2091	-	31,339,746	31,339,746	-	-	1,184,642	1,184,642
2092	-	32,358,288	32,358,288	-	-	1,223,143	1,223,143
2093	-	33,409,932	33,409,932	-	-	1,262,895	1,262,895
2094	-	34,495,755	34,495,755	-	-	1,303,940	1,303,940
2095	-	35,616,867	35,616,867	-	-	1,346,318	1,346,318
2096	-	36,774,415	36,774,415	-	-	1,390,073	1,390,073
2097	-	37,969,584	37,969,584	-	-	1,435,250	1,435,250
2098	-	39,203,595	39,203,595	-	-	1,481,896	1,481,896
2099	-	40,477,712	40,477,712	-	-	1,530,058	1,530,058
2100	-	41,793,237	41,793,237	-	-	1,579,784	1,579,784
2101	-	43,151,518	43,151,518	-	-	1,631,127	1,631,127
2102	-	44,553,942	44,553,942	-	-	1,684,139	1,684,139
2103	-	46,001,945	46,001,945	-	-	1,738,874	1,738,874
2104	-	47,497,008	47,497,008	-	-	1,795,387	1,795,387
2105	-	49,040,661	49,040,661	-	-	1,853,737	1,853,737
2106	-	50,634,483	50,634,483	-	-	1,913,983	1,913,983
2107	-	52,280,103	52,280,103	-	-	1,976,188	1,976,188
2108	-	53,979,207	53,979,207	-	-	2,040,414	2,040,414
2109	-	55,733,531	55,733,531	-	-	2,106,727	2,106,727
2110	-	57,544,871	57,544,871	-	-	2,175,196	2,175,196
2111	-	59,415,079	59,415,079	-	-	2,245,890	2,245,890
2112	-	61,346,069	61,346,069	-	-	2,318,881	2,318,881
2113	-	63,339,816	63,339,816	-	-	2,394,245	2,394,245
2114	-	65,398,360	65,398,360	-	-	2,472,058	2,472,058
2115	-	67,523,807	67,523,807	-	-	2,552,400	2,552,400
2116	-	69,718,331	69,718,331	-	-	2,635,353	2,635,353
2117	-	71,984,176	71,984,176	-	-	2,721,002	2,721,002
2118	-	74,323,662	74,323,662	-	-	2,809,434	2,809,434

** Contributions related to future employees in excess of normal cost and expenses of 8.47% of pay.*

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

Fiscal Year Ending	Projected Beginning Plan Net Fiduciary Position	Projected Total Contributions	Projected Benefit Payments	Projected Administrative Expenses	Projected Investment Earnings at 7.50%	Projected Ending Plan Fiduciary Net Position
	(a)	(b)	(c)	(d)	(e)	(f)=(a)+(b)-(c)-(d)+(e)
2019	$ 13,293,422	$ 364,254	$ 860,794	$ 10,027	$ 978,354	$ 13,765,209
2020	13,765,209	373,226	910,768	9,480	1,012,248	14,230,435
2021	14,230,435	363,602	957,404	8,967	1,045,087	14,672,754
2022	14,672,754	356,231	998,783	8,533	1,076,482	15,098,151
2023	15,098,151	350,050	1,037,590	8,140	1,106,745	15,509,216
2024	15,509,216	344,861	1,080,999	7,778	1,135,799	15,901,099
2025	15,901,099	340,492	1,124,572	7,443	1,163,437	16,273,013
2026	16,273,013	336,871	1,166,020	7,130	1,189,682	16,626,417
2027	16,626,417	333,917	1,204,521	6,836	1,214,672	16,963,649
2028	16,963,649	331,578	1,240,260	6,560	1,238,573	17,286,979
2029	17,286,979	329,823	1,273,226	6,300	1,261,553	17,598,830
2030	17,598,830	328,531	1,303,826	6,051	1,283,777	17,901,261
2031	17,901,261	327,609	1,331,922	5,809	1,305,400	18,196,539
2032	18,196,539	327,024	1,358,553	5,573	1,326,552	18,485,989
2033	18,485,989	326,777	1,382,644	5,344	1,347,373	18,772,151
2034	18,772,151	326,838	1,405,003	5,118	1,368,023	19,056,890
2035	19,056,890	327,173	1,425,924	4,896	1,388,628	19,341,871
2036	19,341,871	327,774	1,445,508	4,676	1,409,311	19,628,772
2037	19,628,772	328,659	1,463,102	4,459	1,430,221	19,920,091
2038	19,920,091	329,848	1,478,034	4,245	1,451,572	20,219,231
2039	20,219,231	331,290	1,490,073	4,033	1,473,625	20,530,040
2040	20,530,040	332,915	1,500,212	3,819	1,496,630	20,855,556
2041	20,855,556	334,660	1,509,341	3,600	1,520,780	21,198,055
2042	21,198,055	336,539	1,517,241	3,377	1,546,254	21,560,231
2043	21,560,231	338,642	1,523,235	3,153	1,573,282	21,945,767
2044	21,945,767	340,979	1,527,659	2,928	1,602,129	22,358,288
2045	22,358,288	343,532	1,531,269	2,701	1,633,037	22,800,886
2046	22,800,886	346,294	1,534,457	2,471	1,666,225	23,276,476
2047	23,276,476	349,336	1,537,164	2,241	1,701,915	23,788,322
2048	23,788,322	352,786	1,538,221	2,015	1,740,400	24,341,271
2049	24,341,271	356,687	1,537,963	1,795	1,782,032	24,940,233
2050	24,940,233	361,071	1,536,535	1,581	1,827,176	25,590,364
2051	25,590,364	366,015	1,533,444	1,376	1,876,239	26,297,799
2052	26,297,799	371,605	1,528,561	1,182	1,929,690	27,069,351
2053	27,069,351	377,904	1,521,171	1,002	1,988,067	27,913,148
2054	27,913,148	384,957	1,511,174	837	2,051,986	28,838,079
2055	28,838,079	392,788	1,498,664	688	2,122,110	29,853,625
2056	29,853,625	401,410	1,483,784	554	2,199,146	30,969,844
2057	30,969,844	410,867	1,466,360	436	2,283,857	32,197,772
2058	32,197,772	421,200	1,445,658	336	2,377,098	33,550,076
2059	33,550,076	432,401	1,421,475	253	2,479,827	35,040,576
2060	35,040,576	444,445	1,394,266	185	2,593,062	36,683,632
2061	36,683,632	457,294	1,364,124	131	2,717,876	38,494,547
2062	38,494,547	470,928	1,330,403	89	2,855,440	40,490,422
2063	40,490,422	485,339	1,293,379	58	3,007,026	42,689,351
2064	42,689,351	500,481	1,254,078	36	3,173,951	45,109,669
2065	45,109,669	516,302	1,213,417	21	3,357,555	47,770,089
2066	47,770,089	532,786	1,171,758	10	3,559,228	50,690,336
2067	50,690,336	549,940	1,129,113	4	3,780,449	53,891,608
2068	53,891,608	567,741	1,085,773	2	4,022,796	57,396,370

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 Net Fiduciary Position	Projected Total Contributions	Projected Benefit Payments	Projected Administrative Expenses	Projected Investment Earnings at 7.50%	Projected Ending Plan Fiduciary Net Position
	(a)	(b)	(c)	(d)	(e)	(f)=(a)+(b)-(c)-(d)+(e)
2069	$ 57,396,370	$ 586,164	$ 1,042,027	$ 1	$ 4,287,942	$ 61,228,448
2070	61,228,448	605,203	998,021	-	4,577,669	65,413,298
2071	65,413,298	624,866	953,777	-	4,893,886	69,978,273
2072	69,978,273	645,173	909,273	-	5,238,646	74,952,819
2073	74,952,819	666,141	864,511	-	5,614,157	80,368,606
2074	80,368,606	687,791	819,500	-	6,022,796	86,259,693
2075	86,259,693	710,144	774,275	-	6,467,116	92,662,677
2076	92,662,677	733,223	728,897	-	6,949,860	99,616,864
2077	99,616,864	757,053	683,456	-	7,473,975	107,164,436
2078	107,164,436	781,657	638,077	-	8,042,620	115,350,636
2079	115,350,636	807,061	592,913	-	8,659,183	124,223,967
2080	124,223,967	833,291	548,150	-	9,327,297	133,836,405
2081	133,836,405	860,373	503,993	-	10,050,853	144,243,638
2082	144,243,638	888,335	460,670	-	10,834,020	155,505,323
2083	155,505,323	917,206	418,420	-	11,681,266	167,685,374
2084	167,685,374	947,015	377,492	-	12,597,374	180,852,271
2085	180,852,271	977,793	338,129	-	13,587,474	195,079,409
2086	195,079,409	1,009,571	300,563	-	14,657,063	210,445,480
2087	210,445,480	1,042,382	265,003	-	15,812,036	227,034,895
2088	227,034,895	1,076,260	231,632	-	17,058,718	244,938,241
2089	244,938,241	1,111,238	200,601	-	18,403,900	264,252,778
2090	264,252,778	1,147,353	172,021	-	19,854,872	285,082,982
2091	285,082,982	1,184,642	145,966	-	21,419,470	307,541,128
2092	307,541,128	1,223,143	122,470	-	23,106,114	331,747,915
2093	331,747,915	1,262,895	101,529	-	24,923,858	357,833,139
2094	357,833,139	1,303,940	83,097	-	26,882,439	385,936,421
2095	385,936,421	1,346,318	67,093	-	28,992,335	416,207,981
2096	416,207,981	1,390,073	53,394	-	31,264,818	448,809,478
2097	448,809,478	1,435,250	41,846	-	33,712,019	483,914,901
2098	483,914,901	1,481,896	32,267	-	36,346,996	521,711,527
2099	521,711,527	1,530,058	24,456	-	39,183,804	562,400,932
2100	562,400,932	1,579,784	18,203	-	42,237,571	606,200,084
2101	606,200,084	1,631,127	13,291	-	45,524,578	653,342,498
2102	653,342,498	1,684,139	9,511	-	49,062,351	704,079,477
2103	704,079,477	1,738,874	6,662	-	52,869,744	758,681,433
2104	758,681,433	1,795,387	4,564	-	56,967,049	817,439,305
2105	817,439,305	1,853,737	3,055	-	61,376,094	880,666,082
2106	880,666,082	1,913,983	1,995	-	66,120,359	948,698,430
2107	948,698,430	1,976,188	1,270	-	71,225,103	1,021,898,450
2108	1,021,898,450	2,040,414	787	-	76,717,487	1,100,655,564
2109	1,100,655,564	2,106,727	475	-	82,626,724	1,185,388,540
2110	1,185,388,540	2,175,196	278	-	88,984,225	1,276,547,684
2111	1,276,547,684	2,245,890	158	-	95,823,769	1,374,617,184
2112	1,374,617,184	2,318,881	87	-	103,181,672	1,480,117,650
2113	1,480,117,650	2,394,245	47	-	111,096,983	1,593,608,831
2114	1,593,608,831	2,472,058	24	-	119,611,688	1,715,692,553
2115	1,715,692,553	2,552,400	12	-	128,770,926	1,847,015,867
2116	1,847,015,867	2,635,353	6	-	138,623,229	1,988,274,443
2117	1,988,274,443	2,721,002	3	-	149,220,776	2,140,216,218
2118	2,140,216,218	2,809,434	2	-	160,619,666	2,303,645,317

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	$ 13,293,422	$ 860,794	$ 860,794	$ -	$ 830,224	$ -	$ 830,224
2020	13,765,209	910,768	910,768	-	817,137	-	817,137
2021	14,230,435	957,404	957,404	-	799,050	-	799,050
2022	14,672,754	998,783	998,783	-	775,428	-	775,428
2023	15,098,151	1,037,590	1,037,590	-	749,355	-	749,355
2024	15,509,216	1,080,999	1,080,999	-	726,238	-	726,238
2025	15,901,099	1,124,572	1,124,572	-	702,801	-	702,801
2026	16,273,013	1,166,020	1,166,020	-	677,864	-	677,864
2027	16,626,417	1,204,521	1,204,521	-	651,392	-	651,392
2028	16,963,649	1,240,260	1,240,260	-	623,925	-	623,925
2029	17,286,979	1,273,226	1,273,226	-	595,822	-	595,822
2030	17,598,830	1,303,826	1,303,826	-	567,574	-	567,574
2031	17,901,261	1,331,922	1,331,922	-	539,353	-	539,353
2032	18,196,539	1,358,553	1,358,553	-	511,755	-	511,755
2033	18,485,989	1,382,644	1,382,644	-	484,493	-	484,493
2034	18,772,151	1,405,003	1,405,003	-	457,979	-	457,979
2035	19,056,890	1,425,924	1,425,924	-	432,371	-	432,371
2036	19,341,871	1,445,508	1,445,508	-	407,730	-	407,730
2037	19,628,772	1,463,102	1,463,102	-	383,900	-	383,900
2038	19,920,091	1,478,034	1,478,034	-	360,761	-	360,761
2039	20,219,231	1,490,073	1,490,073	-	338,325	-	338,325
2040	20,530,040	1,500,212	1,500,212	-	316,862	-	316,862
2041	20,855,556	1,509,341	1,509,341	-	296,549	-	296,549
2042	21,198,055	1,517,241	1,517,241	-	277,304	-	277,304
2043	21,560,231	1,523,235	1,523,235	-	258,976	-	258,976
2044	21,945,767	1,527,659	1,527,659	-	241,608	-	241,608
2045	22,358,288	1,531,269	1,531,269	-	225,282	-	225,282
2046	22,800,886	1,534,457	1,534,457	-	210,001	-	210,001
2047	23,276,476	1,537,164	1,537,164	-	195,695	-	195,695
2048	23,788,322	1,538,221	1,538,221	-	182,167	-	182,167
2049	24,341,271	1,537,963	1,537,963	-	169,429	-	169,429
2050	24,940,233	1,536,535	1,536,535	-	157,462	-	157,462
2051	25,590,364	1,533,444	1,533,444	-	146,182	-	146,182
2052	26,297,799	1,528,561	1,528,561	-	135,550	-	135,550
2053	27,069,351	1,521,171	1,521,171	-	125,483	-	125,483
2054	27,913,148	1,511,174	1,511,174	-	115,962	-	115,962
2055	28,838,079	1,498,664	1,498,664	-	106,978	-	106,978
2056	29,853,625	1,483,784	1,483,784	-	98,527	-	98,527
2057	30,969,844	1,466,360	1,466,360	-	90,576	-	90,576
2058	32,197,772	1,445,658	1,445,658	-	83,068	-	83,068
2059	33,550,076	1,421,475	1,421,475	-	75,979	-	75,979
2060	35,040,576	1,394,266	1,394,266	-	69,326	-	69,326
2061	36,683,632	1,364,124	1,364,124	-	63,095	-	63,095
2062	38,494,547	1,330,403	1,330,403	-	57,242	-	57,242
2063	40,490,422	1,293,379	1,293,379	-	51,767	-	51,767
2064	42,689,351	1,254,078	1,254,078	-	46,692	-	46,692
2065	45,109,669	1,213,417	1,213,417	-	42,026	-	42,026
2066	47,770,089	1,171,758	1,171,758	-	37,752	-	37,752
2067	50,690,336	1,129,113	1,129,113	-	33,840	-	33,840
2068	53,891,608	1,085,773	1,085,773	-	30,271	-	30,271

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	$ 57,396,370	$ 1,042,027	$ 1,042,027	$ -	$ 27,024	$ -	$ 27,024
2070	61,228,448	998,021	998,021	-	24,077	-	24,077
2071	65,413,298	953,777	953,777	-	21,404	-	21,404
2072	69,978,273	909,273	909,273	-	18,982	-	18,982
2073	74,952,819	864,511	864,511	-	16,788	-	16,788
2074	80,368,606	819,500	819,500	-	14,804	-	14,804
2075	86,259,693	774,275	774,275	-	13,011	-	13,011
2076	92,662,677	728,897	728,897	-	11,394	-	11,394
2077	99,616,864	683,456	683,456	-	9,938	-	9,938
2078	107,164,436	638,077	638,077	-	8,631	-	8,631
2079	115,350,636	592,913	592,913	-	7,461	-	7,461
2080	124,223,967	548,150	548,150	-	6,416	-	6,416
2081	133,836,405	503,993	503,993	-	5,488	-	5,488
2082	144,243,638	460,670	460,670	-	4,666	-	4,666
2083	155,505,323	418,420	418,420	-	3,942	-	3,942
2084	167,685,374	377,492	377,492	-	3,309	-	3,309
2085	180,852,271	338,129	338,129	-	2,757	-	2,757
2086	195,079,409	300,563	300,563	-	2,280	-	2,280
2087	210,445,480	265,003	265,003	-	1,870	-	1,870
2088	227,034,895	231,632	231,632	-	1,520	-	1,520
2089	244,938,241	200,601	200,601	-	1,225	-	1,225
2090	264,252,778	172,021	172,021	-	977	-	977
2091	285,082,982	145,966	145,966	-	771	-	771
2092	307,541,128	122,470	122,470	-	602	-	602
2093	331,747,915	101,529	101,529	-	464	-	464
2094	357,833,139	83,097	83,097	-	353	-	353
2095	385,936,421	67,093	67,093	-	265	-	265
2096	416,207,981	53,394	53,394	-	196	-	196
2097	448,809,478	41,846	41,846	-	143	-	143
2098	483,914,901	32,267	32,267	-	103	-	103
2099	521,711,527	24,456	24,456	-	72	-	72
2100	562,400,932	18,203	18,203	-	50	-	50
2101	606,200,084	13,291	13,291	-	34	-	34
2102	653,342,498	9,511	9,511	-	23	-	23
2103	704,079,477	6,662	6,662	-	15	-	15
2104	758,681,433	4,564	4,564	-	9	-	9
2105	817,439,305	3,055	3,055	-	6	-	6
2106	880,666,082	1,995	1,995	-	4	-	4
2107	948,698,430	1,270	1,270	-	2	-	2
2108	1,021,898,450	787	787	-	1	-	1
2109	1,100,655,564	475	475	-	1	-	1
2110	1,185,388,540	278	278	-	-	-	-
2111	1,276,547,684	158	158	-	-	-	-
2112	1,374,617,184	87	87	-	-	-	-
2113	1,480,117,650	47	47	-	-	-	-
2114	1,593,608,831	24	24	-	-	-	-
2115	1,715,692,553	12	12	-	-	-	-
2116	1,847,015,867	6	6	-	-	-	-
2117	1,988,274,443	3	3	-	-	-	-
2118	2,140,216,218	2	2	-	-	-	-
				Totals	$ 16,586,206	$ -	$ 16,586,206

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 (meets the statutory salary definition) 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 or Entry Age Normal (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 experience 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 pension liability of the fund. For purposes of the GASB Statement No. 67, the asset valuation method is equal to the market value of assets.