Minnesota State Retirement System

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

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November 29, 2018

Minnesota State Retirement System
State Patrol 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 Patrol Retirement Fund ("SPRF"), 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 Net Pension Liability is not an appropriate measure for measuring the sufficiency of plan assets to cover the estimated cost of settling the employer's benefit obligation. The Net Pension Liability is not an appropriate measure for assessing the need for or amount of future employer contributions. The calculation of the plan's liability for this report may not be applicable for purposes of funding the plan. A calculation of the plan's liability for purposes other than satisfying the requirements of GASB Statements No. 67 and No. 68 may produce significantly different results. The information in this report is calculated on a total plan basis. 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 Patrol Retirement Fund as of the measurement date. All calculations have been made in conformity with generally accepted actuarial principles and practices as well as with the Actuarial Standards of Practice issued by the Actuarial Standards Board.

The signing actuaries are independent of the plan sponsor.

Brian B. Murphy and Bonita J. Wurst are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

Respectfully submitted,

Brian B. Murphy

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

Bonita J. Wurst

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

BBM/BJW:rmn

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SECTION A

EXECUTIVE SUMMARY

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

	2018
Actuarial Valuation Date	June 30, 2018
Measurement Date of the Net Pension Liability	June 30, 2018
Membership	
Number of	
- Service Retirements	862
- Survivors	150
- Disability Retirements	59
- Deferred Retirements	56
- Terminated other non-vested	22
- Active Members	921
- Total	2,070
Covered-employee Payroll (1)	$ 74,007
Net Pension Liability	
Total Pension Liability	$ 930,408
Plan Fiduciary Net Position	729,799
Net Pension Liability	$ 200,609
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	78.44%
Net Pension Liability as a Percentage of Covered-employee Payroll	271.07%
Development of the Single Discount Rate	
Single Discount Rate	7.50%
Long-Term Expected Rate of Investment Return	7.50%
Long-Term Municipal Bond Rate(2)	3.62%
Last year ending June 30 in the 2019 to 2118 projection period for which projected benefit payments are fully funded	2118
Total Pension Expense / (Income)	$ 19,262

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

	Deferred Outflows of Resources	Deferred Inflows of Resources
Difference between expected and actual experience in the measurement of Total Pension Liability	$ -	$ 24,940
Changes in assumptions	146,800	180,870
Net difference between projected and actual earnings on pension plan investments	25,286	44,055
Totals	$ 172,086	$ 249,865

(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 closes 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 SPRF 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 Patrol 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

1.	Service Cost	$	24,935
2.	Interest on the Total Pension Liability		65,110
3.	Current-Period Benefit Changes		(2,604)
4.	Employee Contributions (made negative for addition here)		(10,657)
5.	Projected Earnings on Plan Investments (made negative for addition here)		(50,660)
6.	Pension Plan Administrative Expense		184
7.	Other Changes in Plan Fiduciary Net Position		7
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		(1,395)
9.	Recognition of Outflow (Inflow) of Resources due to assumption changes		
	Arising from Current Reporting Period		(21,148)
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		(3,963)
11.	**Increases/(Decreases) from Experience in the Current Reporting Period**	**$**	**(191)**
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	$	(7,212)
13.	Recognition of Outflow (Inflow) of Resources due to assumption changes		
	Arising from Prior Reporting Periods		33,492
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		(6,827)
15.	**Total Pension Expense / (Income)**	**$**	**19,262**

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	$	(8,369)
2. Assumption Changes (gains) or losses		(126,888)
3. Recognition period for Liabilities: Average of the expected remaining service lives of all employees {in years, rounded to the nearest whole number}		6
4. Outflow (Inflow) of Resources to be recognized in the current pension expense for the difference between expected and actual experience of the Total Pension Liability		(1,395)
5. Outflow (Inflow) of Resources to be recognized in the current pension expense for Assumption Changes		(21,148)
6. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Liabilities	$	(22,543)
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	$	(6,974)
8. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses for Assumption Changes		(105,740)
9. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Liabilities	$	(112,714)
B. Outflows (Inflows) of Resources due to Assets		
1. Net difference between projected and actual earnings on pension plan investments (gains) or losses	$	(19,814)
2. Recognition period for Assets {in years}		5
3. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Assets		(3,963)
4. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Assets	$	(15,851)

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	$ 52,274	$ 48,537	$ 3,737
2. Due to Assets	14,901	25,691	(10,790)
3. Total	$ 67,175	$ 74,228	$ (7,053)

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	$ -	$ 8,607	$ (8,607)
2. Assumption Changes	52,274	39,930	12,344
3. Net Difference between projected and actual earnings on pension plan investments	14,901	25,691	(10,790)
4. Total	$ 67,175	$ 74,228	$ (7,053)

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	$ -	$ 24,940	$ (24,940)
2. Assumption Changes	146,800	180,870	(34,070)
3. Net Difference between projected and actual earnings on pension plan investments*	25,286	44,055	(18,769)
4. Total	$ 172,086	$ 249,865	$ (77,779)

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	$ 5,271
2020	(3,287)
2021	(11,529)
2022	(45,692)
2023	(22,542)
Thereafter	-
Total	$ (77,779)

** 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	$	9,241
Receivables		1,412
Investment Pools (at fair value)		719,503
Securities Lending Collateral		73,199
Capital Assets		-
Total Assets	**$**	**803,355**
Total Deferred Outflows of Resources	**$**	**-**
Total Liabilities	**$**	**(73,556)**
Total Deferred Inflows of Resources	**$**	**-**
Net Position Restricted for Pensions	**$**	**729,799**

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**	**$**	**691,599**
Additions			
2.	Contributions		
	a. Employee	$	10,657
	b. Employer		15,952
	c. Other sources - Supplemental State Aid		1,000
	d. Total contributions	$	27,609
3.	Investment income		
	a. Investment income/(loss)	$	71,244
	b. Investment expenses		(770)
	c. Net investment income/(loss)	$	70,474
4.	Other Additions	$	-
5.	**Total Additions** *(2.d.) + (3.c.) + (4.)*	**$**	**98,083**
Deductions			
6.	Benefits Paid		
	a. Annuity benefits	$	(59,653)
	b. Refunds		(39)
	c. Total benefits paid	$	(59,692)
7.	Expenses		
	a. Other deductions	$	(7)
	b. Administrative		(184)
	c. Total expenses	$	(191)
8.	**Total Deductions** *(6.c.) + (7.c.)*	**$**	**(59,883)**
9.	**Net increase/(decrease) in fiduciary net position** *(5.) + (8.)*	**$**	**38,200**
10.	**Net position at market value at end of year** *(1.) + (9.)*	**$**	**729,799**
11.	State Board of Investment calculated annual investment return for the State Patrol 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	$	24,935
2. Interest on the Total Pension Liability		65,110
3. Changes of benefit terms		(2,604)
4. Difference between expected and actual experience of the Total Pension Liability		(8,369)
5. Changes of assumptions		(126,888)
6. Benefit payments, including refunds of employee contributions		(59,692)
7. Net change in total pension liability	$	(107,508)
8. Total pension liability – beginning		1,037,916
9. Total pension liability – ending	**$**	**930,408**
B. Plan fiduciary net position		
1. Contributions – employer [1]	$	16,952
2. Contributions – employee		10,657
3. Net investment income		70,474
4. Benefit payments, including refunds of employee contributions		(59,692)
5. Pension Plan Administrative Expense		(184)
6. Other changes		(7)
7. Net change in plan fiduciary net position	$	38,200
8. Plan fiduciary net position – beginning		691,599
9. Plan fiduciary net position – ending	**$**	**729,799**
C. Net pension liability, *A.9. - B.9.*	**$**	**200,609**
D. Plan fiduciary net position as a percentage of the total pension liability, *B.9. / A.9.*		**78.44%**
E. Covered-employee payroll [2]	**$**	**74,007**
F. Net pension liability as a percentage of covered-employee payroll, *C. / E.*		**271.07%**

(1) Includes $1 million supplemental state aid.
(2) 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	$ 24,935	$ 29,758	$ 16,555	$ 16,144	$ 14,514					
Interest on the Total Pension Liability	65,110	58,865	64,592	63,753	60,183					
Benefit Changes	(2,604)	-	-	-	0					
Difference between Expected and Actual Experience	(8,369)	(2,418)	(22,222)	(12,855)	(5,771)					
Assumption Changes	(126,888)	(112,694)	283,584	-	30,058					
Benefit Payments	(59,653)	(58,560)	(57,695)	(55,465)	(53,697)					
Refunds	(39)	(5)	(79)	(15)	(25)					
Net Change in Total Pension Liability	$ (107,508)	$ (85,054)	$ 284,735	$ 11,562	$ 45,262					
Total Pension Liability - Beginning	1,037,916	1,122,970	838,235	826,673	781,411					
Total Pension Liability - Ending (a)	**$ 930,408**	**$ 1,037,916**	**$ 1,122,970**	**$ 838,235**	**$ 826,673**					
Plan Fiduciary Net Position										
Employer Contributions [1]	$ 16,952	$ 16,783	$ 14,938	$ 14,763	$ 12,894					
Employee Contributions	10,657	10,520	9,292	9,174	7,930					
Pension Plan Net Investment Income	70,474	93,077	(774)	28,903	107,187					
Benefit Payments	(59,653)	(58,560)	(57,695)	(55,465)	(53,697)					
Refunds	(39)	(5)	(79)	(15)	(25)					
Pension Plan Administrative Expense	(184)	(208)	(220)	(170)	(150)					
Other	(7)	-	-	-	0					
Net Change in Plan Fiduciary Net Position	**$ 38,200**	**$ 61,607**	**$ (34,538)**	**$ (2,810)**	**$ 74,139**					
Plan Fiduciary Net Position - Beginning	**691,599**	**629,992**	**664,530**	**667,340**	**593,201**					
Plan Fiduciary Net Position - Ending (b)	**$ 729,799**	**$ 691,599**	**$ 629,992**	**$ 664,530**	**$ 667,340**					
Net Pension Liability - Ending (a) - (b)	**$ 200,609**	**$ 346,317**	**$ 492,978**	**$ 173,705**	**$ 159,333**					
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	**78.44 %**	**66.63 %**	**56.10 %**	**79.28 %**	**80.73 %**					
Covered-Employee Payroll [2]	**$ 74,007**	**$ 73,056**	**$ 69,343**	**$ 68,463**	**$ 63,952**					
Net Pension Liability as a Percentage of Covered-Employee Payroll	**271.07 %**	**474.04 %**	**710.93 %**	**253.72 %**	**249.15 %**					

Notes to Schedule:

(1) Includes $1 million supplemental state aid.

(2) Assumed equal to actual member contributions divided by employee contribution rate.

Schedule of Net Pension Liability Multiyear
(Dollars in Thousands)

Last 10 Fiscal Years (which will be built prospectively)

Fiscal Year Ending June 30,	Total Pension Liability	Plan Net Position	Net Pension Liability	Plan Net Position as a % of Total Pension Liability	Covered-Employee Payroll	Net Pension Liability as a % of Covered-Employee Payroll
	(a)	(b)	(a) - (b) = (c)	(b) / (c)	(d)	(c) / (d)
2009						
2010						
2011						
2012						
2013						
2014	$ 826,673	$ 667,340	$ 159,333	80.73%	$ 63,952	249.14%
2015	838,235	664,530	173,705	79.28	68,463	253.72
2016	1,122,970	629,992	492,978	56.10	69,343	710.93
2017	1,037,916	691,599	346,317	66.63	73,056	474.04
2018	930,408	729,799	200,609	78.44	74,007	271.07

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	$ 14,999	$ 9,178	$ 5,821	$ 61,511	14.92%
2010	17,410	10,104	7,306	63,250	15.97
2011	14,826	9,873	4,953	63,250	15.61
2012	14,912	11,620	3,292	62,524 (2)	18.58
2013	18,711	11,482	7,229	62,121 (2)	18.48
2014	18,444	12,894 (3)	5,550	63,952 (2)	20.16
2015	20,648	14,763 (3)	5,885	68,463 (2)	21.56
2016	20,463	14,938 (3)	5,525	69,343 (2)	21.54
2017	19,031	16,783 (3)	2,248	73,056 (2)	22.97
2018	20,900	16,952 (3)	3,948	74,007 (2)	22.91

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. (3) Includes supplemental state aid of $1,000.
Valuation Date	June 30, 2017
Actuarial Cost Method	Entry Age Normal
Amortization Method	Level Percentage of Payroll, Closed
Remaining Amortization Period	21 years
Asset Valuation Method	5-Year smoothed market; no corridor
Inflation	2.75%
Payroll Growth	3.50%
Salary Increases	Service based tables ranging from 7.75% with one year of service to 3.75% with 21 or more years of service, including inflation
Investment Rate of Return	8.00%
Retirement Age	Experience-based table of rates that are specific to the type of eligibility condition. Last updated for the 2017 valuation pursuant to an experience study of the period 2011 - 2015.
Healthy Post-retirement Mortality	RP-2014 annuitant generational mortality table, projected with mortality improvement scale MP-2015, white collar adjustment.

Other Information:

Benefit Increases After Retirement	The post-retirement benefit increase is assumed to be 1.00% through 2034, 1.50% from 2035 through 2053 and 2.50% thereafter. See separate funding actuarial valuation report as of July 1, 2017 for additional detail. To obtain this report, contact MSRS as noted on page 3. The report is also available online at www.msrs.state.mn.us/actuarial-reports.

Schedule of Investment Returns Multiyear

Last 10 Fiscal Years

Fiscal Year Ending June 30,	Annual Return[1]
2009	
2010	
2011	
2012	
2013	
2014	18.69 %
2015	4.46
2016	(0.12)
2017	15.24
2018	10.51

[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 Patrol Retirement Fund was 10.51%. 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 7.5% was used to measure the total pension liability. This Single Discount Rate was based on the 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 member, employer, and state contributions will be made at the current statutory contribution rates. Based on these assumptions, the pension plan's fiduciary net position and future contributions were sufficient to finance all projected future benefit payments of current plan members. Therefore, the long-term expected rate of return on pension plan investments was applied to all periods of projected benefit payments to determine the total pension liability.

Regarding the sensitivity of the net pension liability to changes in the Single Discount Rate, the following presents the plan's net pension liability, calculated using a Single Discount Rate of 7.5%, as well as what the plan's net pension liability would be if it were calculated using a Single Discount Rate that is one percent lower (6.50%) or one percent 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	$1,042,337	$930,408	$837,625
Net Position Restricted for Pensions	729,799	729,799	729,799
Net Pension Liability	**$ 312,538**	**$ 200,609**	**$107,826**

For more information on the calculation of the single discount rate, refer to Section G of this report.

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

GASB Statement No. 68 Reconciliation (Dollars in Thousands)

	Total Pension Liability (a)	Plan Fiduciary Net Position (b)	Net Pension Liability (a) - (b)	Deferred Outflows	Deferred Inflows	Total Pension Expense
Balance Beginning of Year	**$ 1,037,916**	**$ 691,599**	**$ 346,317**	**$ 239,261**	**$ 169,022**	
Changes for the Year:						
Service Cost	$ 24,935		$ 24,935			$ 24,935
Interest on Total Pension Liability	65,110		65,110			65,110
Interest on Fiduciary Net Position		$ 50,660 [1]	(50,660)			(50,660)
Changes in Benefit Terms	(2,604)		(2,604)			(2,604)
Liability Experience Gains and Losses	(8,369)		(8,369)	$ -	$ 6,974	(1,395)
Changes in Assumptions	(126,888)		(126,888)	-	105,740	(21,148)
Recognition of Deferred Outflows/(Inflows) of Resources Arising from Prior Reporting Periods						
Liability Experience Gains/(Losses)				-	(7,212)	(7,212)
Assumption Changes				(52,274)	(18,782)	33,492
Investment Gains/(Losses)				(14,901)	(21,728)	(6,827)
Contributions - Employer		16,952 [2]	(16,952)			
Contributions - Employees		10,657	(10,657)			(10,657)
Asset Gain/(Loss)		19,814 [1]	(19,814)	-	15,851	(3,963)
Benefit Payments and Refunds	(59,692)	(59,692)	-			
Administrative Expenses		(184)	184			184
Other changes		(7)	7			7
Net Changes	**$ (107,508)**	**$ 38,200**	**$ (145,708)**	**$ (67,175)**	**$ 80,843**	**$ 19,262**
Balance End of Year	**$ 930,408**	**$ 729,799**	**$ 200,609**	**$ 172,086**	**$ 249,865**	

[1] *The sum of these items in column (b) equals the net investment income of $70,474.*

[2] *Includes supplemental state aid of $1,000.*

Summary of Population Statistics

		Terminated		Recipients			
	Actives	Deferred Retirement	Other Non-Vested	Service Retirement	Disability Retirement	Survivor	Total
Members on 7/1/2017	**902**	**59**	**28**	**847**	**57**	**148**	**2,041**
New members	60	0	0	0	0	0	**60**
Return to active	1	0	(1)	0	0	0	**0**
Terminated non-vested	(4)	0	4	0	0	0	**0**
Service retirements	(28)	(3)	0	31	0	0	**0**
Terminated deferred	(4)	4	0	0	0	0	**0**
Terminated refund/transfer	(1)	(3)	(9)	0	0	0	**(13)**
Deaths	(2)	0	0	(19)	0	(8)	**(29)**
New beneficiary	0	0	0	0	0	11	**11**
Disabled	(3)	0	0	0	3	0	**0**
Unexpected status change	0	(1)	0	3	(1)	(1)	**0**
Net change	19	(3)	(6)	15	2	2	**29**
Members on 6/30/2018	**921**	**56**	**22**	**862**	**59**	**150**	**2,070**

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 troopers, conservation officers, certain crime bureau and gambling enforcement officers, and certain other persons listed in Minnesota Statutes 352B.011 subdivision 10.

Contributions

Percent of Salary:

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

Supplemental employer contributions remain in effect until the plan is 100% funded.

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

State Contributions

$1 million paid annually on October 1 until the earlier of 1) both the Public Employees Retirement Association Police and Fire Plan and the State Patrol Retirement Fund attaining 90% funded status (on a Market Value of Assets basis), or 2) July 1, 2048.

Allowable service

Service during which member contributions were deducted. Includes period receiving temporary Worker's Compensation and reduced salary from employer. See Normal Retirement benefit definition below for information about service limits.

Salary

Salaries excluding lump sum payments at separation.

Average salary

Average of the five highest years of Salary. Average Salary is based on all Allowable Service if less than five years. Average Salary is based on all years without regard to any service limits.

Summary of Plan Provisions (Continued)

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

Disability (continued)

Occupational disability benefit (Continued)

Amount	60% of Average Salary plus 3.00% of Average Salary for each year in excess of 20 years of Allowable Service (pro rata for completed months). Payments cease at age 65 (age 55 if disabled after June 30, 2015) or the 5-year anniversary of the effective date of the disability benefit, whichever is later. Payments stop earlier if disability ceases or death occurs. Benefits may be paid upon re-employment but salary plus benefit cannot exceed current salary of position held at time of disability.

Non-duty disability benefit

Age/Service requirement	At least one year of Allowable Service and disability not related to covered employment.
Amount	Normal Retirement Benefit based on Allowable Service (minimum of 15 years) and Average Salary at disability without reduction for commencement before age 55. Payments cease at age 65 (age 55 if disabled after June 30, 2015) or earlier if disability ceases or death occurs. Benefits may be paid upon re-employment but salary plus benefit cannot exceed current salary of position held at time of disability.

Retirement after disability

Age/Service requirement	Age 65 (age 55 if disabled after June 30, 2015) with continued disability.
Amount	Optional annuity continues. Otherwise, normal retirement benefit equal to the disability benefit paid, or an actuarially equivalent option.

Form of payment	Same as for retirement.
Benefit increases	Same as for retirement.

Summary of Plan Provisions (Continued)

Death

Surviving spouse benefit

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

Surviving dependent children's benefit

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

Refund of contributions

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

Termination

Refund of contributions

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

Summary of Plan Provisions (Continued)

Termination (Continued)	
Deferred benefit	
Age/service requirement	Three years (ten years if first hired after June 30, 2013) of Allowable Service.
Amount	Benefit is computed under law in effect at termination and increased by the following annual augmentation percentage: (a.) 0.00% before July 1, 1971; (b.) 5.00% from July 1, 1971, to January 1, 1981; (c.) 3.00% thereafter (2.50% if hired after June 30, 2006) until January 1, 2012; (d.) 2.00% after December 31, 2011, through December 31, 2018; and (e.) 0.00% thereafter. Amount is payable at normal or early retirement. If a member terminated employment prior to July 1, 1997, but was not eligible to commence their pension before July 1, 1997, an actuarial increase shall be made for the change in the post-retirement interest rates from 5.00% to 6.00%.
Optional form conversion factors	Actuarially equivalent factors based on RP-2000 for healthy annuitants, white collar adjustment, projected to 2027 using scale AA, set back two years for males and set forward one year for females, blended 95% males, 6.50% post-retirement interest, and 8.50% pre-retirement interest. The actuarially equivalent factors are currently being updated to reflect changes adopted during the 2018 legislative session.
Combined service annuity	Members are eligible for combined service benefits if they: (a.) Have sufficient allowable service in total that equals or exceeds the applicable service credit vesting requirement of the retirement plan with the longest applicable service credit vesting requirement; and (b.) Have at least six months of allowable service credit in each plan worked under; and (c.) Are not in receipt of a benefit from another plan, or have applied for benefits with an effective date within one year. Members who meet the above requirements must have their benefit based on the following: (a.) Allowable service in all covered plans are combined in order to determine eligibility for early retirement. (b.) Average salary is based on the high five consecutive years during their entire service in all covered plans.

Summary of Plan Provisions (Concluded)

Changes in plan provisions	Member contributions were increased from 14.4% of pay to 15.4% of pay over three years, effective July 1, 2018. Regular employer contributions were increased from 21.6% of pay to 23.1% of pay over two years, effective July 1, 2018. Supplemental employer contributions totaling 7.0% of pay will be phased-in through fiscal year 2022; the supplemental employer contributions remain in effect until the plan is 100% funded. Interest credited on member contributions will decrease from 4.0% to 3.0%, beginning July 1, 2018. Deferred augmentation was changed to 0.00% for future accruing benefits, effective January 1, 2019. Augmentation that has already accrued for deferred members will still apply. Contribution stabilizer provisions were repealed. Post-retirement benefit increases were changed from 1.0% per year, increasing to 2.5% per year upon achieving a 90% funding ratio to a fixed rate of 1.0% per year. An end date of July 1, 2048 was added for the $1 million state contribution.

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 July 26, 2016 and a review of inflation and investment return assumptions, dated September 11, 2017.

The Allowance for Combined Service Annuity was 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 2006, white collar adjustment.
Healthy post-retirement	RP-2014 annuitant generational mortality table projected with mortality improvement Scale MP-2015 from a base year of 2006, white collar adjustment.
Disabled	RP-2014 annuitant generational mortality table projected with mortality improvement Scale MP-2015 from a base year of 2006, white collar adjustment.
Notes	The RP-2014 employee mortality table as published by the Society of Actuaries (SOA) contains mortality rates for ages 18 to 80 and the annuitant mortality table contains mortality rates for ages 50 to 120. We have extended the annuitant mortality table as needed for members younger than age 50 who are receiving a benefit by deriving rates based on the employee table and the juvenile table. Similarly, we have extended the employee table as needed for members older than age 80 by deriving rates based on the annuitant table.
Retirement	Members retiring from active status are assumed to retire according to the age related rates shown in the rate table. Members who have attained the highest assumed retirement age are assumed to retire in one year. Note that plan changes reflected in this report may ultimately result in behavior changes not anticipated in these actuarial assumptions.

Summary of Actuarial Assumptions (Continued)

Withdrawal	Select and Ultimate rates based on actual experience. Ultimate rates after the third year are shown in rate table. Select rates in the first three years are: **Year** / **Select Withdrawal Rates** 1 / 2.50% 2 / 2.00% 3 / 1.50%
Disability	Age-related rates based on experience; see table of sample rates. All incidences are assumed to be duty-related.
Allowance for combined service annuity	Liabilities for former, vested members are increased by 13.00% to account for the effect of some participants having eligibility for a Combined Service Annuity.
Administrative expenses	In the valuation year, equal to prior year administrative expenses expressed as percentage of prior year projected payroll. In each subsequent year, equal to the initial administrative expense percentage applied to payroll for the closed group.
Refund of contributions	All employees withdrawing after becoming eligible for a deferred benefit take the larger of their contributions accumulated with interest or the value of their deferred benefit. Account balances for deferred members accumulate interest until normal retirement date and are discounted back to the valuation date.
Commencement of deferred benefits	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 55.
Percentage married	85% of active members are assumed to be married. Actual marital status is used for members in payment status.
Age of spouse	Females are assumed to be two years younger than their spouses, and males are assumed to be two years older than their spouses.
Eligible children	Each member may have two dependent children depending on member's age. Assumed first child is born at member's age 28 and second child at member's age 31.
Form of payment	Married members retiring from active status are assumed to elect subsidized joint and survivor form of annuity as follows: 20% elect 50% Joint & Survivor option 10% elect 75% Joint & Survivor option 55% elect 100% Joint & Survivor option Remaining married and unmarried members are assumed to elect the Straight Life option.
Eligibility testing	Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.
Decrement operation	Withdrawal decrements do not operate during retirement eligibility. Decrements are assumed to occur mid-fiscal year.
Service credit accruals	It is assumed that members accrue one year of service credit per year.
Pay increases	Pay increases are assumed to happen at the beginning of the fiscal year. This is equivalent to assuming that reported earnings are pensionable earnings for the year ending on the valuation date.

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: **Data for active members:** There were two members reported with missing salary and no members reported with missing service. We used prior year reported salary. There were no members reported with a missing or invalid date of birth or gender. **Data for terminated members:** Benefits were reported with full augmentation to Normal Retirement Age. Based on direction from MSRS, we adjusted benefits by removing augmentation on a prospective basis beginning January 1, 2019. There was one member reported without a benefit. We calculated benefits for this member using the reported Credited Service and Termination Date. Average Salary was not reported, so we assumed a value of $35,000. **Data for members receiving benefits:** There was one member reported with a missing gender and no members reported with an invalid date of birth. We assumed male gender. There were no members reported without a benefit. There were no survivors reported with an expired benefit. There were no retirees reported with a bounce back annuity and an unreasonable reduction factor. There were no retirees reported with a survivor option and a survivor date of death. For retirees who elected a survivor benefit option, we used the valuation assumptions if the survivor date of birth was missing or invalid (184 members) and/or the survivor gender was missing or invalid (201 members).
Changes in actuarial assumptions	The Single Discount Rate changed from 6.38% per annum to 7.50% per annum.

Summary of Actuarial Assumptions (Continued)

Age in 2018	Percentage of Members Dying each Year*					
	Healthy Post-Retirement Mortality**		Healthy Pre-Retirement Mortality**		Disability Mortality**	
	Male	Female	Male	Female	Male	Female
20	0.02%	0.01%	0.02%	0.01%	0.02%	0.01%
25	0.03	0.02	0.03	0.01	0.03	0.02
30	0.05	0.05	0.03	0.02	0.05	0.05
35	0.08	0.08	0.03	0.03	0.08	0.08
40	0.11	0.12	0.04	0.03	0.11	0.12
45	0.16	0.14	0.06	0.05	0.16	0.14
50	0.25	0.19	0.11	0.09	0.25	0.19
55	0.37	0.27	0.18	0.14	0.37	0.27
60	0.51	0.39	0.32	0.21	0.51	0.39
65	0.73	0.63	0.56	0.30	0.73	0.63
70	1.20	1.02	0.99	0.52	1.20	1.02
75	2.09	1.72	1.79	0.93	2.09	1.72
80	3.70	3.04	3.20	1.65	3.70	3.04
85	6.82	5.57	6.66	4.41	6.82	5.57
90	12.49	10.16	12.64	9.84	12.49	10.16

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

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

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

Summary of Actuarial Assumptions (Concluded)

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

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

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 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 plan fiduciary net position is projected to be sufficient to pay benefits) and (2) tax-exempt municipal bond rate based on an index of 20-year general obligation bonds with an average AA credit rating as of the measurement date (to the extent that the contributions for use with the long-term expected rate of return are not met).

For the purpose of this valuation, the expected rate of return on pension plan investments is 7.50%; the municipal bond rate is 3.62% (based on the weekly rate closest to but not later than the measurement date of the "20-Year Municipal GO Index" as published by Fidelity) and **the resulting single discount rate as of June 30, 2018 is 7.50%**. In describing this index, Fidelity notes that the municipal curves are constructed using option-adjusted analytics of a diverse population of over 10,000 tax-exempt securities.

The tables in this section provide background for the development of the single discount rate.

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

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

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

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

	Projected Covered-Employee Payroll			Projected Contributions				
Fiscal Year Ending	Payroll for Current Employees	Payroll for New Employees	Total Employee Payroll	Contributions from Current Employees	Employer Contributions for Current Employees	Contributions on Future Payroll toward Current UAL*	Additional State Contributions	Total Contributions
	(a)	(b)	(c) = (a) + (b)	(d) = (a) x 15.4%**	(e) = (a) x 30.1%**	(f)	(g)	(h) = (d) + (e) + (f) + (g)
2018	$ 74,007		$ 74,007					
2019	77,874		77,874	$ 11,603	$ 18,768		$ 1,000	$ 31,371
2020	78,198	$ 2,207	80,405	11,652	20,410	$ 351	1,000	33,413
2021	78,158	4,861	83,019	12,036	21,962	893	1,000	35,891
2022	78,446	7,271	85,717	12,081	23,612	1,482	1,000	38,175
2023	78,457	10,045	88,502	12,082	23,616	2,047	1,000	38,745
2024	77,867	13,512	91,379	11,992	23,438	2,754	1,000	39,184
2025	76,741	17,608	94,349	11,818	23,099	3,588	1,000	39,505
2026	75,343	22,072	97,415	11,603	22,678	4,498	1,000	39,779
2027	73,873	26,708	100,581	11,376	22,236	5,443	1,000	40,055
2028	71,810	32,040	103,850	11,059	21,615	6,530	1,000	40,204
2029	69,308	37,917	107,225	10,673	20,862	7,727	1,000	40,262
2030	66,744	43,966	110,710	10,279	20,090	8,960	1,000	40,329
2031	64,058	50,250	114,308	9,865	19,281	10,241	1,000	40,387
2032	61,226	56,797	118,023	9,429	18,429	11,575	1,000	40,433
2033	58,297	63,561	121,858	8,978	17,547	12,954	1,000	40,479
2034	55,477	70,342	125,819	8,544	16,699	14,336	1,000	40,579
2035	52,515	77,393	129,908	8,087	15,807	15,773	1,000	40,667
2036	49,456	84,674	134,130	7,616	14,886	17,257	1,000	40,759
2037	46,346	92,143	138,489	7,137	13,950	18,779	1,000	40,866
2038	43,290	99,700	142,990	6,667	13,030	20,319	1,000	41,016
2039	40,148	107,489	147,637	6,183	12,085	21,906	1,000	41,174
2040	36,603	115,832	152,435	5,637	11,018	23,607	1,000	41,262
2041	33,231	124,159	157,390	5,118	10,002	25,304	1,000	41,424
2042	29,591	132,914	162,505	4,557	8,907	27,088	1,000	41,552
2043	25,577	142,209	167,786	3,939	7,699	28,982	1,000	41,620
2044	21,910	151,329	173,239	3,374	6,595	30,841	1,000	41,810
2045	18,379	160,491	178,870	2,830	5,532	32,708	1,000	42,070
2046	14,810	169,873	184,683	2,281	4,458	34,620	1,000	42,359
2047	11,385	179,300	190,685	1,753	3,427	36,541	1,000	42,721
2048	8,040	188,842	196,882	1,238	2,420	38,486	1,000	43,144
2049	5,344	197,937	203,281	823	1,608	40,340	-	42,771
2050	3,447	206,441	209,888	531	1,038	42,073	-	43,642
2051	2,005	214,704	216,709	309	603	43,757	-	44,669
2052	1,148	222,604	223,752	177	345	45,367	-	45,889
2053	585	230,439	231,024	90	176	46,963	-	47,229
2054	291	238,241	238,532	45	88	48,554	-	48,687
2055	137	246,147	246,284	21	41	50,165	-	50,227
2056	44	254,245	254,289	7	13	51,815	-	51,835
2057	13	262,540	262,553	2	4	53,506	-	53,512
2058	-	271,086	271,086	-	-	55,247	-	55,247
2059	-	279,896	279,896	-	-	57,043	-	57,043
2060	-	288,993	288,993	-	-	58,897	-	58,897
2061	-	298,385	298,385	-	-	60,811	-	60,811
2062	-	308,083	308,083	-	-	62,787	-	62,787
2063	-	318,095	318,095	-	-	64,828	-	64,828
2064	-	328,434	328,434	-	-	66,935	-	66,935
2065	-	339,108	339,108	-	-	69,110	-	69,110
2066	-	350,129	350,129	-	-	71,356	-	71,356
2067	-	361,508	361,508	-	-	73,675	-	73,675
2068	-	373,257	373,257	-	-	76,070	-	76,070

* *Contributions related to future employees in excess of normal cost and expenses of 25.12% of pay.*

** *Employee contributions are equal to 14.9% of payroll in fiscal years ending June 30, 2019 and 2020. Employer contributions are equal to 24.1%, 26.1% and 28.1% for fiscal years ending June 30, 2019 through 2022, respectively.*

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

	Projected Covered-Employee Payroll			Projected Contributions				
Fiscal Year Ending	Payroll for Current Employees	Payroll for New Employees	Total Employee Payroll	Contributions from Current Employees	Employer Contributions for Current Employees	Contributions on Future Payroll toward Current UAL*	Additional State Contributions	Total Contributions
	(a)	(b)	(c) = (a) + (b)	(d)	(e)	(f)	(g)	(h) = (d) + (e) + (f) + (g)
2069	$ -	$ 385,388	$ 385,388	$ -	$ -	$ 78,542	$ -	$ 78,542
2070	-	397,913	397,913	-	-	81,095	-	81,095
2071	-	410,845	410,845	-	-	83,730	-	83,730
2072	-	424,197	424,197	-	-	86,451	-	86,451
2073	-	437,984	437,984	-	-	89,261	-	89,261
2074	-	452,218	452,218	-	-	92,162	-	92,162
2075	-	466,915	466,915	-	-	95,157	-	95,157
2076	-	482,090	482,090	-	-	98,250	-	98,250
2077	-	497,758	497,758	-	-	101,443	-	101,443
2078	-	513,935	513,935	-	-	104,740	-	104,740
2079	-	530,638	530,638	-	-	108,144	-	108,144
2080	-	547,884	547,884	-	-	111,659	-	111,659
2081	-	565,690	565,690	-	-	115,288	-	115,288
2082	-	584,075	584,075	-	-	119,034	-	119,034
2083	-	603,057	603,057	-	-	122,903	-	122,903
2084	-	622,657	622,657	-	-	126,897	-	126,897
2085	-	642,893	642,893	-	-	131,022	-	131,022
2086	-	663,787	663,787	-	-	135,280	-	135,280
2087	-	685,360	685,360	-	-	139,676	-	139,676
2088	-	707,634	707,634	-	-	144,216	-	144,216
2089	-	730,632	730,632	-	-	148,903	-	148,903
2090	-	754,378	754,378	-	-	153,742	-	153,742
2091	-	778,895	778,895	-	-	158,739	-	158,739
2092	-	804,209	804,209	-	-	163,898	-	163,898
2093	-	830,346	830,346	-	-	169,225	-	169,225
2094	-	857,333	857,333	-	-	174,724	-	174,724
2095	-	885,196	885,196	-	-	180,403	-	180,403
2096	-	913,965	913,965	-	-	186,266	-	186,266
2097	-	943,669	943,669	-	-	192,320	-	192,320
2098	-	974,338	974,338	-	-	198,570	-	198,570
2099	-	1,006,004	1,006,004	-	-	205,024	-	205,024
2100	-	1,038,699	1,038,699	-	-	211,687	-	211,687
2101	-	1,072,457	1,072,457	-	-	218,567	-	218,567
2102	-	1,107,311	1,107,311	-	-	225,670	-	225,670
2103	-	1,143,299	1,143,299	-	-	233,004	-	233,004
2104	-	1,180,456	1,180,456	-	-	240,577	-	240,577
2105	-	1,218,821	1,218,821	-	-	248,396	-	248,396
2106	-	1,258,433	1,258,433	-	-	256,469	-	256,469
2107	-	1,299,332	1,299,332	-	-	264,804	-	264,804
2108	-	1,341,560	1,341,560	-	-	273,410	-	273,410
2109	-	1,385,161	1,385,161	-	-	282,296	-	282,296
2110	-	1,430,179	1,430,179	-	-	291,470	-	291,470
2111	-	1,476,659	1,476,659	-	-	300,943	-	300,943
2112	-	1,524,651	1,524,651	-	-	310,724	-	310,724
2113	-	1,574,202	1,574,202	-	-	320,822	-	320,822
2114	-	1,625,363	1,625,363	-	-	331,249	-	331,249
2115	-	1,678,188	1,678,188	-	-	342,015	-	342,015
2116	-	1,732,729	1,732,729	-	-	353,130	-	353,130
2117	-	1,789,043	1,789,043	-	-	364,607	-	364,607
2118	-	1,847,186	1,847,186	-	-	376,457	-	376,457

***Contributions related to future employees in excess of normal cost and expenses of 25.12% of pay.**

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

Fiscal Year Ending	Projected Beginning Plan Fiduciary Net Position	Projected Total Contributions	Projected Benefit Payments	Projected Administrative Expenses	Projected Investment Earnings at 7.50%	Projected Ending Plan Net Position
	(a)	(b)	(c)	(d)	(e)	(f)=(a)+(b)-(c)-(d)+(e)
2019	$ 729,799	$ 31,371	$ 60,715	$ 187	$ 53,648	$ 753,916
2020	753,916	33,413	62,176	188	55,478	780,443
2021	780,443	35,891	63,767	188	57,500	809,879
2022	809,879	38,175	65,065	188	59,744	842,545
2023	842,545	38,745	66,536	188	62,160	876,726
2024	876,726	39,184	68,197	187	64,679	912,205
2025	912,205	39,505	70,041	184	67,284	948,769
2026	948,769	39,779	71,994	181	69,965	986,338
2027	986,338	40,055	73,959	177	72,720	1,024,977
2028	1,024,977	40,204	76,250	172	75,540	1,064,299
2029	1,064,299	40,262	78,596	166	78,405	1,104,204
2030	1,104,204	40,329	80,992	160	81,312	1,144,693
2031	1,144,693	40,387	83,414	154	84,262	1,185,774
2032	1,185,774	40,433	86,057	147	87,247	1,227,250
2033	1,227,250	40,479	88,529	140	90,269	1,269,329
2034	1,269,329	40,579	90,823	133	93,344	1,312,296
2035	1,312,296	40,667	93,072	126	96,487	1,356,252
2036	1,356,252	40,759	95,295	119	99,706	1,401,303
2037	1,401,303	40,866	97,446	111	103,010	1,447,622
2038	1,447,622	41,016	99,456	104	106,416	1,495,494
2039	1,495,494	41,174	101,449	96	109,939	1,545,062
2040	1,545,062	41,262	103,650	88	113,579	1,596,165
2041	1,596,165	41,424	105,769	80	117,340	1,649,080
2042	1,649,080	41,552	108,077	71	121,228	1,703,712
2043	1,703,712	41,620	110,523	61	125,238	1,759,986
2044	1,759,986	41,810	112,633	53	129,389	1,818,499
2045	1,818,499	42,070	114,650	44	133,713	1,879,588
2046	1,879,588	42,359	116,676	36	138,231	1,943,466
2047	1,943,466	42,721	118,550	27	142,966	2,010,576
2048	2,010,576	43,144	120,308	19	147,951	2,081,344
2049	2,081,344	42,771	121,443	13	153,240	2,155,899
2050	2,155,899	43,642	121,891	8	158,922	2,236,564
2051	2,236,564	44,669	121,838	5	165,087	2,324,477
2052	2,324,477	45,889	121,165	3	171,825	2,421,023
2053	2,421,023	47,229	120,120	1	179,229	2,527,360
2054	2,527,360	48,687	118,690	1	187,385	2,644,741
2055	2,644,741	50,227	117,168	-	196,377	2,774,177
2056	2,774,177	51,835	115,445	-	206,282	2,916,849
2057	2,916,849	53,512	113,655	-	217,185	3,073,891
2058	3,073,891	55,247	111,760	-	229,172	3,246,550
2059	3,246,550	57,043	109,796	-	242,335	3,436,132
2060	3,436,132	58,897	107,752	-	256,772	3,644,049
2061	3,644,049	60,811	105,627	-	272,589	3,871,822
2062	3,871,822	62,787	103,419	-	289,902	4,121,092
2063	4,121,092	64,828	101,125	-	308,831	4,393,626
2064	4,393,626	66,935	98,743	-	329,512	4,691,330
2065	4,691,330	69,110	96,271	-	352,086	5,016,255
2066	5,016,255	71,356	93,708	-	376,707	5,370,610
2067	5,370,610	73,675	91,053	-	403,542	5,756,774
2068	5,756,774	76,070	88,305	-	432,769	6,177,308

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

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

Fiscal Year Ending	Projected Beginning Plan Fiduciary Net Position	Projected Total Contributions	Projected Benefit Payments	Projected Administrative Expenses	Projected Investment Earnings at 7.50%	Projected Ending Plan Net Position
	(a)	(b)	(c)	(d)	(e)	(f)=(a)+(b)-(c)-(d)+(e)
2069	$ 6,177,308	$ 78,542	$ 85,464	$ -	$ 464,579	$ 6,634,965
2070	6,634,965	81,095	82,534	-	499,180	7,132,706
2071	7,132,706	83,730	79,518	-	536,794	7,673,712
2072	7,673,712	86,451	76,421	-	577,659	8,261,401
2073	8,261,401	89,261	73,250	-	622,031	8,899,443
2074	8,899,443	92,162	70,014	-	670,185	9,591,776
2075	9,591,776	95,157	66,721	-	722,416	10,342,628
2076	10,342,628	98,250	63,382	-	779,042	11,156,538
2077	11,156,538	101,443	60,007	-	840,402	12,038,376
2078	12,038,376	104,740	56,607	-	906,862	12,993,371
2079	12,993,371	108,144	53,193	-	978,812	14,027,134
2080	14,027,134	111,659	49,777	-	1,056,675	15,145,691
2081	15,145,691	115,288	46,372	-	1,140,900	16,355,507
2082	16,355,507	119,034	42,989	-	1,231,974	17,663,526
2083	17,663,526	122,903	39,641	-	1,330,416	19,077,204
2084	19,077,204	126,897	36,340	-	1,436,786	20,604,547
2085	20,604,547	131,022	33,101	-	1,551,683	22,254,151
2086	22,254,151	135,280	29,938	-	1,675,751	24,035,244
2087	24,035,244	139,676	26,867	-	1,809,683	25,957,736
2088	25,957,736	144,216	23,906	-	1,954,221	28,032,267
2089	28,032,267	148,903	21,072	-	2,110,163	30,270,261
2090	30,270,261	153,742	18,381	-	2,278,365	32,683,987
2091	32,683,987	158,739	15,851	-	2,459,746	35,286,621
2092	35,286,621	163,898	13,499	-	2,655,296	38,092,316
2093	38,092,316	169,225	11,340	-	2,866,073	41,116,274
2094	41,116,274	174,724	9,387	-	3,093,220	44,374,831
2095	44,374,831	180,403	7,649	-	3,337,959	47,885,544
2096	47,885,544	186,266	6,127	-	3,601,610	51,667,293
2097	51,667,293	192,320	4,821	-	3,885,587	55,740,379
2098	55,740,379	198,570	3,721	-	4,191,414	60,126,642
2099	60,126,642	205,024	2,815	-	4,520,730	64,849,581
2100	64,849,581	211,687	2,085	-	4,875,298	69,934,481
2101	69,934,481	218,567	1,510	-	5,257,014	75,408,552
2102	75,408,552	225,670	1,069	-	5,667,923	81,301,076
2103	81,301,076	233,004	739	-	6,110,219	87,643,560
2104	87,643,560	240,577	499	-	6,586,268	94,469,906
2105	94,469,906	248,396	329	-	7,098,613	101,816,586
2106	101,816,586	256,469	213	-	7,649,991	109,722,833
2107	109,722,833	264,804	135	-	8,243,344	118,230,846
2108	118,230,846	273,410	85	-	8,881,839	127,386,010
2109	127,386,010	282,296	53	-	9,568,879	137,237,132
2110	137,237,132	291,470	34	-	10,308,127	147,836,695
2111	147,836,695	300,943	22	-	11,103,519	159,241,135
2112	159,241,135	310,724	15	-	11,959,287	171,511,131
2113	171,511,131	320,822	11	-	12,879,984	184,711,926
2114	184,711,926	331,249	8	-	13,870,502	198,913,669
2115	198,913,669	342,015	7	-	14,936,105	214,191,782
2116	214,191,782	353,130	5	-	16,082,447	230,627,354
2117	230,627,354	364,607	4	-	17,315,613	248,307,570
2118	248,307,570	376,457	4	-	18,642,141	267,326,164

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	$ 729,799	$ 60,715	$ 60,715	$ 0	$ 58,559	$ 0	$ 58,559
2020	753,916	62,176	62,176	0	55,784	0	55,784
2021	780,443	63,767	63,767	0	53,220	0	53,220
2022	809,879	65,065	65,065	0	50,515	0	50,515
2023	842,545	66,536	66,536	0	48,053	0	48,053
2024	876,726	68,197	68,197	0	45,816	0	45,816
2025	912,205	70,041	70,041	0	43,772	0	43,772
2026	948,769	71,994	71,994	0	41,853	0	41,853
2027	986,338	73,959	73,959	0	39,996	0	39,996
2028	1,024,977	76,250	76,250	0	38,358	0	38,358
2029	1,064,299	78,596	78,596	0	36,780	0	36,780
2030	1,104,204	80,992	80,992	0	35,257	0	35,257
2031	1,144,693	83,414	83,414	0	33,778	0	33,778
2032	1,185,774	86,057	86,057	0	32,417	0	32,417
2033	1,227,250	88,529	88,529	0	31,022	0	31,022
2034	1,269,329	90,823	90,823	0	29,605	0	29,605
2035	1,312,296	93,072	93,072	0	28,221	0	28,221
2036	1,356,252	95,295	95,295	0	26,879	0	26,879
2037	1,401,303	97,446	97,446	0	25,569	0	25,569
2038	1,447,622	99,456	99,456	0	24,275	0	24,275
2039	1,495,494	101,449	101,449	0	23,034	0	23,034
2040	1,545,062	103,650	103,650	0	21,892	0	21,892
2041	1,596,165	105,769	105,769	0	20,781	0	20,781
2042	1,649,080	108,077	108,077	0	19,753	0	19,753
2043	1,703,712	110,523	110,523	0	18,791	0	18,791
2044	1,759,986	112,633	112,633	0	17,813	0	17,813
2045	1,818,499	114,650	114,650	0	16,867	0	16,867
2046	1,879,588	116,676	116,676	0	15,968	0	15,968
2047	1,943,466	118,550	118,550	0	15,092	0	15,092
2048	2,010,576	120,308	120,308	0	14,248	0	14,248
2049	2,081,344	121,443	121,443	0	13,379	0	13,379
2050	2,155,899	121,891	121,891	0	12,491	0	12,491
2051	2,236,564	121,838	121,838	0	11,615	0	11,615
2052	2,324,477	121,165	121,165	0	10,745	0	10,745
2053	2,421,023	120,120	120,120	0	9,909	0	9,909
2054	2,527,360	118,690	118,690	0	9,108	0	9,108
2055	2,644,741	117,168	117,168	0	8,364	0	8,364
2056	2,774,177	115,445	115,445	0	7,666	0	7,666
2057	2,916,849	113,655	113,655	0	7,020	0	7,020
2058	3,073,891	111,760	111,760	0	6,422	0	6,422
2059	3,246,550	109,796	109,796	0	5,869	0	5,869
2060	3,436,132	107,752	107,752	0	5,358	0	5,358
2061	3,644,049	105,627	105,627	0	4,886	0	4,886
2062	3,871,822	103,419	103,419	0	4,450	0	4,450
2063	4,121,092	101,125	101,125	0	4,047	0	4,047
2064	4,393,626	98,743	98,743	0	3,676	0	3,676
2065	4,691,330	96,271	96,271	0	3,334	0	3,334
2066	5,016,255	93,708	93,708	0	3,019	0	3,019
2067	5,370,610	91,053	91,053	0	2,729	0	2,729
2068	5,756,774	88,305	88,305	0	2,462	0	2,462

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	$ 6,177,308	$ 85,464	$ 85,464	$ -	$ 2,216	$ -	$ 2,216
2070	6,634,965	82,534	82,534	-	1,991	-	1,991
2071	7,132,706	79,518	79,518	-	1,785	-	1,785
2072	7,673,712	76,421	76,421	-	1,595	-	1,595
2073	8,261,401	73,250	73,250	-	1,422	-	1,422
2074	8,899,443	70,014	70,014	-	1,265	-	1,265
2075	9,591,776	66,721	66,721	-	1,121	-	1,121
2076	10,342,628	63,382	63,382	-	991	-	991
2077	11,156,538	60,007	60,007	-	873	-	873
2078	12,038,376	56,607	56,607	-	766	-	766
2079	12,993,371	53,193	53,193	-	669	-	669
2080	14,027,134	49,777	49,777	-	583	-	583
2081	15,145,691	46,372	46,372	-	505	-	505
2082	16,355,507	42,989	42,989	-	435	-	435
2083	17,663,526	39,641	39,641	-	374	-	374
2084	19,077,204	36,340	36,340	-	319	-	319
2085	20,604,547	33,101	33,101	-	270	-	270
2086	22,254,151	29,938	29,938	-	227	-	227
2087	24,035,244	26,867	26,867	-	190	-	190
2088	25,957,736	23,906	23,906	-	157	-	157
2089	28,032,267	21,072	21,072	-	129	-	129
2090	30,270,261	18,381	18,381	-	104	-	104
2091	32,683,987	15,851	15,851	-	84	-	84
2092	35,286,621	13,499	13,499	-	66	-	66
2093	38,092,316	11,340	11,340	-	52	-	52
2094	41,116,274	9,387	9,387	-	40	-	40
2095	44,374,831	7,649	7,649	-	30	-	30
2096	47,885,544	6,127	6,127	-	23	-	23
2097	51,667,293	4,821	4,821	-	17	-	17
2098	55,740,379	3,721	3,721	-	12	-	12
2099	60,126,642	2,815	2,815	-	8	-	8
2100	64,849,581	2,085	2,085	-	6	-	6
2101	69,934,481	1,510	1,510	-	4	-	4
2102	75,408,552	1,069	1,069	-	3	-	3
2103	81,301,076	739	739	-	2	-	2
2104	87,643,560	499	499	-	1	-	1
2105	94,469,906	329	329	-	1	-	1
2106	101,816,586	213	213	-	-	-	-
2107	109,722,833	135	135	-	-	-	-
2108	118,230,846	85	85	-	-	-	-
2109	127,386,010	53	53	-	-	-	-
2110	137,237,132	34	34	-	-	-	-
2111	147,836,695	22	22	-	-	-	-
2112	159,241,135	15	15	-	-	-	-
2113	171,511,131	11	11	-	-	-	-
2114	184,711,926	8	8	-	-	-	-
2115	198,913,669	7	7	-	-	-	-
2116	214,191,782	5	5	-	-	-	-
2117	230,627,354	4	4	-	-	-	-
2118	248,307,570	4	4	-	-	-	-
				Totals	$ 1,118,851	$ -	$ 1,118,851

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 contributing to a pension plan that is used to provide pensions to the employees of other entities. For purposes of the GASB Accounting Statements No. 67 and No. 68 plan members are not considered non-employer contributing entities.
Normal Cost	The actuarial present value of the pension trust benefits allocated to the current year by the actuarial cost method.
Other Postemployment Benefits (OPEB)	All postemployment benefits other than retirement income (such as death benefits, life insurance, disability, and long-term care) that are provided separately from a pension plan, as well as postemployment healthcare benefits regardless of the manner in which they are provided. Other post-employment benefits do not include termination benefits.
Real Rate of Return	The real rate of return is the rate of return on an investment after adjustment to eliminate inflation.
Service Cost	The service cost is the portion of the actuarial present value of projected benefit payments that is attributed to a valuation year.

Glossary of Terms

Total Pension Expense

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

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

Total Pension Liability (TPL)

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

Unfunded Actuarial Accrued Liability (UAAL)

The UAAL is the difference between actuarial accrued liability and valuation assets.

Valuation Assets

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