Minnesota State Retirement System

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

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November 27, 2019

Minnesota State Retirement System
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, 2019 for additional discussion of the nature of actuarial calculations and more information related to participant data, economic and demographic assumptions, and benefit provisions.

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

Bonita J. Wurst

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

BBM/BJW:bd

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SECTION A

EXECUTIVE SUMMARY

Executive Summary
as of June 30, 2019 (Dollars in Thousands)

		2019
Actuarial Valuation Date		June 30, 2019
Measurement Date of the Net Pension Liability		June 30, 2019
Membership		
Number of		
- Service Retirements		863
- Survivors		155
- Disability Retirements		60
- Deferred Retirements		56
- Terminated other non-vested		31
- Active Members		943
- Total		2,108
Covered-employee Payroll (1)	$	80,792
Net Pension Liability		
Total Pension Liability	$	959,964
Plan Fiduciary Net Position		753,144
Net Pension Liability	$	206,820
Plan Fiduciary Net Position as a Percentage of Total Pension Liability		78.46%
Net Pension Liability as a Percentage of Covered-employee Payroll		255.99%
Development of the Single Discount Rate		
Single Discount Rate		7.50%
Long-Term Expected Rate of Investment Return		7.50%
Long-Term Municipal Bond Rate(2)		3.13%
Last year ending June 30 in the 2020 to 2119 projection period for which projected benefit payments are fully funded		2119
Total Pension Expense / (Income)	$	28,189

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	$ 2,297	$ 16,334
Changes in assumptions	94,528	140,940
Net difference between projected and actual earnings on pension plan investments	11,861	30,690
Totals	$ 108,686	$ 187,964

(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 SPRF subsequent to the measurement date of June 30, 2019.

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, Minnesota, 55103 or requested via email at info@msrs.us or telephone at 1.800.657.5757.

Required Supplementary Information

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

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

Measurement of the Net Pension Liability

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

General Implications of Contribution Allocation Procedure or Funding Policy on Future Expected Plan Contributions and Funded Status

Given the plan's contribution allocation procedure, if all actuarial assumptions are met (including the assumption of the plan earning 7.50%), then the following outcomes are expected:

1. The 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 29 years; and
3. The unfunded liability will grow initially as a dollar amount before beginning to decline.

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

Limitations of Funded Status Measurements

Unless otherwise indicated, a funded status measurement presented in this report is based upon the actuarial accrued liability and the market value of assets. Unless otherwise indicated, with regard to any funded status measurements presented in this report:

1. The measurement is inappropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations, in other words, of transferring the obligations to an unrelated third party in an arm's length market value type transaction.
2. The measurement is dependent upon the actuarial cost method which, in combination with the plan's amortization policy, affects the timing and amounts of future contributions. The amounts of future contributions will most certainly differ from those assumed in this report due to future actual experience differing from assumed experience based upon the actuarial assumptions. A funded status measurement in this report of 100% is not synonymous with no required future contributions. If the funded status were 100%, the plan would still require future normal cost contributions (i.e., contributions to cover the cost of the active membership accruing an additional year of service credit).
3. The measurement would produce a different result if the actuarial value of assets were used instead of the market value of assets.

Limitation of Project Scope

Actuarial standards do not require the actuary to evaluate the ability of the plan sponsor or other contributing entity to make required contributions to the plan when due. Such an evaluation was not within the scope of this project and is not within the actuary's domain of expertise. Consequently, the actuary performed no such evaluation.

Timing of the Valuation

GASB Statement Nos. 67 and 68 require that an actuarial valuation to determine the total pension liability be performed at least every two years. The net pension liability and pension expense should be measured as of the pension plan's fiscal year end (measurement date) on a date that is within the employer's prior fiscal year. If the actuarial valuation used to determine the total pension liability is not calculated as of the measurement date, the total pension liability is required to be rolled forward from the actuarial valuation date to the measurement date.

The total pension liability shown in this report is based on an actuarial valuation performed as of June 30, 2019 and a measurement date of June 30, 2019.

Single Discount Rate

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

For the purpose of this valuation, the expected rate of return on pension plan investments is 7.50%; the municipal bond rate is 3.13% (based on the weekly rate closest to but not later than the measurement date of the "20-Year Municipal GO AA Index" as published by Fidelity); and the resulting single discount rate is 7.50%.

SECTION B

FINANCIAL STATEMENTS

Statement of Pension Expense Under GASB Statement No. 68
Fiscal Year Ended June 30, 2019 (Dollars in Thousands)

A. Expense		
1. Service Cost	$	19,375
2. Interest on the Total Pension Liability		68,227
3. Current-Period Benefit Changes		-
4. Employee Contributions (made negative for addition here)		(12,038)
5. Projected Earnings on Plan Investments (made negative for addition here)		(53,667)
6. Pension Plan Administrative Expense		191
7. Other Changes in Plan Fiduciary Net Position		1
8. Recognition of Outflow (Inflow) of Resources due to differences between expected and actual experience in the measurement of the Total Pension Liability		
Arising from Current Reporting Period		460
9. Recognition of Outflow (Inflow) of Resources due to assumption changes		
Arising from Current Reporting Period		-
10. Recognition of Outflow (Inflow) of Resources due to the difference between projected (7.50%) and actual earnings on Pension Plan Investments		
Arising from Current Reporting Period		369
11. Increases/(Decreases) from Experience in the Current Reporting Period	**$**	**22,918**
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	$	(8,606)
13. Recognition of Outflow (Inflow) of Resources due to assumption changes		
Arising from Prior Reporting Periods		12,342
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		1,535
15. Total Pension Expense / (Income)	**$**	**28,189**

Statement of Outflows and Inflows
Arising from Current Reporting Period
Fiscal Year Ended June 30, 2019 (Dollars in Thousands)

A. Outflows (Inflows) of Resources due to Liabilities		
1. Difference between expected and actual experience of the Total Pension Liability (gains) or losses	$	2,757
2. Assumption Changes (gains) or losses		-
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		460
5. Outflow (Inflow) of Resources to be recognized in the current pension expense for Assumption Changes		-
6. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Liabilities	$	460
7. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses for the difference between expected and actual experience of the Total Pension Liability	$	2,297
8. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses for Assumption Changes		-
9. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Liabilities	$	2,297
B. Outflows (Inflows) of Resources due to Assets		
1. Net difference between projected and actual earnings on pension plan investments (gains) or losses	$	1,844
2. Recognition period for Assets {in years}		5
3. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Assets		369
4. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Assets	$	1,475

Statement of Outflows and Inflows
Arising from Current and Prior Reporting Periods
Fiscal Year Ended June 30, 2019 (Dollars in Thousands)

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

	Outflows of Resources	Inflows of Resources	Net Outflows/(Inflows) of Resources
1. Due to Liabilities	$ 52,732	$ 48,536	$ 4,196
2. Due to Assets	15,269	13,365	1,904
3. Total	$ 68,001	$ 61,901	$ 6,100

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	$ 460	$ 8,606	$ (8,146)
2. Assumption Changes	52,272	39,930	12,342
3. Net Difference between projected and actual earnings on pension plan investments	15,269	13,365	1,904
4. Total	$ 68,001	$ 61,901	$ 6,100

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	$ 2,297	$ 16,334	$ (14,037)
2. Assumption Changes	94,528	140,940	(46,412)
3. Net Difference between projected and actual earnings on pension plan investments*	11,861	30,690	(18,829)
4. Total	$ 108,686	$ 187,964	$ (79,278)

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

Year Ending June 30	Net Deferred Outflows/ (Inflows) of Resources
2020	$ (2,458)
2021	(10,700)
2022	(44,864)
2023	(21,715)
2024	459
Thereafter	-
Total	$ (79,278)

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

Recognition of Deferred Outflows and Inflows of Resources
Fiscal Year Ended June 30, 2019 (Dollars in Thousands)

Year Established	Initial Amount	Initial Recognition Period	Current Year Recognition	Remaining Recognition	Remaining Recognition Period
Deferred Outflow (Inflow) Due to Differences Between Expected and Actual Experience on Liabilities					
2014	$ (5,771)	6.0000	$ (961)	$ 0	0.0000
2015	(12,855)	6.0000	(2,143)	(2,140)	1.0000
2016	(22,222)	6.0000	(3,704)	(7,406)	2.0000
2017	(2,418)	6.0000	(403)	(1,209)	3.0000
2018	(8,369)	6.0000	(1,395)	(5,579)	4.0000
2019	2,757	6.0000	460	2,297	5.0000
Total			**$ (8,146)**	**$ (14,037)**	
Deferred Outflow (Inflow) Due to Assumption Changes					
2014	$ 30,058	6.0000	$ 5,008	$ 0	0.0000
2015	0	6.0000	0	0	1.0000
2016	283,584	6.0000	47,264	94,528	2.0000
2017	(112,694)	6.0000	(18,782)	(56,348)	3.0000
2018	(126,888)	6.0000	(21,148)	(84,592)	4.0000
2019	0	6.0000	0	0	5.0000
Total			**$ 12,342**	**$ (46,412)**	
Deferred Outflow (Inflow) Due to Differences Between Projected and Actual Earnings on Plan Investments					
2015	$ 22,564	5.0000	$ 4,512	$ 0	0.0000
2016	51,938	5.0000	10,388	10,386	1.0000
2017	(47,008)	5.0000	(9,402)	(18,802)	2.0000
2018	(19,814)	5.0000	(3,963)	(11,888)	3.0000
2019	1,844	5.0000	369	1,475	4.0000
Total			**$ 1,904**	**$ (18,829)**	

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

Assets		June 30, 2019
Cash & Short-term Investments	$	23,416
Receivables		1,653
Investment Pools (at fair value)		728,418
Securities Lending Collateral		55,780
Capital Assets		-
Total Assets	**$**	**809,267**
Total Deferred Outflows of Resources	**$**	**-**
Total Liabilities	**$**	**(56,123)**
Total Deferred Inflows of Resources	**$**	**-**
Net Position Restricted for Pensions	**$**	**753,144**

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

1.	**Net Position at market value at beginning of year**	**$**	**729,799**
Additions			
2.	Contributions		
	a. Employee	$	12,038
	b. Employer		19,479
	c. Other sources - Supplemental State Aid		1,000
	d. Total contributions	$	32,517
3.	Investment income		
	a. Investment income/(loss)	$	52,541
	b. Investment expenses		(718)
	c. Net investment income/(loss)	$	51,823
4.	Other Additions	$	-
5.	**Total Additions** *(2.d.) + (3.c.) + (4.)*	**$**	**84,340**
Deductions			
6.	Benefits Paid		
	a. Annuity benefits	$	(60,375)
	b. Refunds		(428)
	c. Total benefits paid	$	(60,803)
7.	Expenses		
	a. Other deductions	$	(1)
	b. Administrative		(191)
	c. Total expenses	$	(192)
8.	**Total Deductions** *(6.c.) + (7.c.)*	**$**	**(60,995)**
9.	**Net increase/(decrease) in fiduciary net position** *(5.) + (8.)*	**$**	**23,345**
10.	**Net position at market value at end of year** *(1.) + (9.)*	**$**	**753,144**
11.	State Board of Investment calculated annual investment return for the State Patrol Retirement Fund*		7.3%

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

SECTION C

REQUIRED SUPPLEMENTARY INFORMATION

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

A. Total pension liability		
1. Service Cost	$	19,375
2. Interest on the Total Pension Liability		68,227
3. Changes of benefit terms		-
4. Difference between expected and actual experience of the Total Pension Liability		2,757
5. Changes of assumptions		-
6. Benefit payments, including refunds of employee contributions		(60,803)
7. Net change in total pension liability	$	29,556
8. Total pension liability – beginning		930,408
9. Total pension liability – ending	**$**	**959,964**
B. Plan fiduciary net position		
1. Contributions – employer (1)	$	20,479
2. Contributions – employee		12,038
3. Net investment income		51,823
4. Benefit payments, including refunds of employee contributions		(60,803)
5. Pension Plan Administrative Expense		(191)
6. Other changes		(1)
7. Net change in plan fiduciary net position	$	23,345
8. Plan fiduciary net position – beginning		729,799
9. Plan fiduciary net position – ending	**$**	**753,144**
C. Net pension liability, *A.9. - B.9.*	**$**	**206,820**
D. Plan fiduciary net position as a percentage of the total pension liability, *B.9. / A.9.*		**78.46%**
E. Covered-employee payroll (2)	**$**	**80,792**
F. Net pension liability as a percentage of covered-employee payroll, *C. / E.*		**255.99%**

(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,	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010
Total Pension Liability										
Service Cost	$ 19,375	$ 24,935	$ 29,758	$ 16,555	$ 16,144	$ 14,514				
Interest on the Total Pension Liability	68,227	65,110	58,865	64,592	63,753	60,183				
Benefit Changes	-	(2,604)	-	-	-	-				
Difference between Expected and Actual Experience	2,757	(8,369)	(2,418)	(22,222)	(12,855)	(5,771)				
Assumption Changes	-	(126,888)	(112,694)	283,584	-	30,058				
Benefit Payments	(60,375)	(59,653)	(58,560)	(57,695)	(55,465)	(53,697)				
Refunds	(428)	(39)	(5)	(79)	(15)	(25)				
Net Change in Total Pension Liability	$ 29,556	$ (107,508)	$ (85,054)	$ 284,735	$ 11,562	$ 45,262				
Total Pension Liability - Beginning	930,408	1,037,916	1,122,970	838,235	826,673	781,411				
Total Pension Liability - Ending (a)	**$ 959,964**	**$ 930,408**	**$ 1,037,916**	**$ 1,122,970**	**$ 838,235**	**$ 826,673**				
Plan Fiduciary Net Position										
Employer Contributions (1)	$ 20,479	$ 16,952	$ 16,783	$ 14,938	$ 14,763	$ 12,894				
Employee Contributions	12,038	10,657	10,520	9,292	9,174	7,930				
Pension Plan Net Investment Income	51,823	70,474	93,077	(774)	28,903	107,187				
Benefit Payments	(60,375)	(59,653)	(58,560)	(57,695)	(55,465)	(53,697)				
Refunds	(428)	(39)	(5)	(79)	(15)	(25)				
Pension Plan Administrative Expense	(191)	(184)	(208)	(220)	(170)	(150)				
Other	(1)	(7)	-	-	-	-				
Net Change in Plan Fiduciary Net Position	**$ 23,345**	**$ 38,200**	**$ 61,607**	**$ (34,538)**	**$ (2,810)**	**$ 74,139**				
Plan Fiduciary Net Position - Beginning	**729,799**	**691,599**	**629,992**	**664,530**	**667,340**	**593,201**				
Plan Fiduciary Net Position - Ending (b)	**$ 753,144**	**$ 729,799**	**$ 691,599**	**$ 629,992**	**$ 664,530**	**$ 667,340**				
Net Pension Liability - Ending (a) - (b)	**$ 206,820**	**$ 200,609**	**$ 346,317**	**$ 492,978**	**$ 173,705**	**$ 159,333**				
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	**78.46 %**	**78.44 %**	**66.63 %**	**56.10 %**	**79.28 %**	**80.73 %**				
Covered-Employee Payroll (2)	**$ 80,792**	**$ 74,007**	**$ 73,056**	**$ 69,343**	**$ 68,463**	**$ 63,952**				
Net Pension Liability as a Percentage of Covered-Employee Payroll	**255.99 %**	**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 (a)	Plan Net Position (b)	Net Pension Liability (a) - (b) = (c)	Plan Net Position as a % of Total Pension Liability (b) / (c)	Covered-Employee Payroll (d)	Net Pension Liability as a % of Covered-Employee Payroll (c) / (d)
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
2019	959,964	753,144	206,820	78.46	80,792	255.99

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)
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
2019	21,281	20,479 (3)	802	80,792 (2)	25.35

Notes to Schedule of Contributions

Methods and Assumptions Used to Determine Fiscal Year Ending June 30, 2019 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, 2018
Actuarial Cost Method	Entry Age Normal
Amortization Method	Level Percentage of Payroll, Closed
Remaining Amortization Period	30 years
Asset Valuation Method	5-Year smoothed market; no corridor
Inflation	2.50%
Payroll Growth	3.25%
Salary Increases	Service based tables ranging from 15.25% with one year of service to 3.25% with 25 or more years of service, including inflation
Investment Rate of Return	7.50%
Retirement Age	Experience-based table of rates that are specific to the type of eligibility condition. Last updated for the 2017 valuation pursuant to an experience study of the period 2011 - 2015.
Healthy Post-retirement Mortality	RP-2014 annuitant generational mortality table, projected with mortality improvement scale MP-2015, white collar adjustment.

Other Information:

Benefit Increases After Retirement	The post-retirement benefit increase is assumed to be 1.00% for all future years. See separate funding actuarial valuation report as of July 1, 2018 for additional detail. To obtain this report, contact MSRS as noted on page 3. 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]
2010	
2011	
2012	
2013	
2014	18.7 %
2015	4.5
2016	(0.1)
2017	15.2
2018	10.5
2019	7.3

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

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

Rate of Return

For the fiscal year ended June 30, 2019, the annual money-weighted rate of return for the State Patrol Retirement Fund was 7.3%. The money-weighted rate of return is a method of calculating period-by-period returns on pension plan investments that adjusts for the changing amounts actually invested. For purposes of this schedule, the money-weighted rate of return is calculated as the internal rate of return on pension plan investments, net of pension plan investment expense.

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. 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, 2019, these estimates are summarized in the following table:

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

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

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

Sensitivity of Net Pension Liability to the Single Discount Rate Assumption

Single Discount Rate

A Single Discount Rate of 7.5% 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	$1,076,147	$959,964	$863,706
Net Position Restricted for Pensions	753,144	753,144	753,144
Net Pension Liability	**$ 323,003**	**$206,820**	**$110,562**

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	**$ 930,408**	**$ 729,799**	**$ 200,609**	**$ 172,086**	**$ 249,865**	
Changes for the Year:						
Service Cost	$ 19,375		$ 19,375			$ 19,375
Interest on Total Pension Liability	68,227		68,227			68,227
Interest on Fiduciary Net Position		$ 53,667 (1)	(53,667)			(53,667)
Changes in Benefit Terms	-		-			-
Liability Experience Gains and Losses	2,757		2,757	$ 2,297	$ -	460
Changes in Assumptions	-		-	-	-	-
Recognition of Deferred Outflows/(Inflows) of Resources Arising from Prior Reporting Periods						
Liability Experience Gains/(Losses)				-	(8,606)	(8,606)
Assumption Changes				(52,272)	(39,930)	12,342
Investment Gains/(Losses)				(14,900)	(13,365)	1,535
Contributions - Employer		20,479 (2)	(20,479)			
Contributions - Employees		12,038	(12,038)			(12,038)
Asset Gain/(Loss)		(1,844) (1)	1,844	1,475	-	369
Benefit Payments and Refunds	(60,803)	(60,803)	-			
Administrative Expenses		(191)	191			191
Other changes		(1)	1			1
Net Changes	**$ 29,556**	**$ 23,345**	**$ 6,211**	**$ (63,400)**	**$ (61,901)**	**$ 28,189**
Balance End of Year	**$ 959,964**	**$ 753,144**	**$ 206,820**	**$ 108,686**	**$ 187,964**	

(1) *The sum of these items in column (b) equals the net investment income of $51,823.*

(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 7/1/2018	**921**	**56**	**22**	**862**	**59**	**150**	**2,070**
New members	64	0	0	0	0	0	**64**
Return to active	0	0	0	0	0	0	**0**
Terminated non-vested	(9)	0	9	0	0	0	**0**
Service retirements	(19)	(3)	0	22	0	0	**0**
Terminated deferred	(4)	4	0	0	0	0	**0**
Terminated refund/transfer	(4)	(2)	0	0	0	0	**(6)**
Deaths	(4)	0	0	(25)	(2)	(7)	**(38)**
New beneficiary	0	0	0	0	0	14	**14**
Disabled	(2)	0	0	0	2	0	**0**
Unexpected status change	0	1	0	4	1	(2)	**4**
Net change	22	0	9	1	1	5	**38**
Members on 6/30/2019	**943**	**56**	**31**	**863**	**60**	**155**	**2,108**

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 on a market value of assets basis.

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 an actuarial 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	
<u>Normal retirement benefit</u>	
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.
<u>Early retirement benefit</u>	
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.
<u>Form of payment</u>	Life annuity. Actuarially equivalent options are: 50%, 75%, or 100% Joint and Survivor, or 15-year certain. If a Joint and Survivor benefit is elected and the beneficiary predeceases the annuitant, the annuitant's benefit increases to the Life Annuity amount. This "bounce back" is subsidized by the plan.
<u>Benefit increases</u>	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	
<u>Occupational disability benefit</u>	
Age/Service requirement	Member who cannot perform his duties as a direct result of a disability relating to an act of duty.

Summary of Plan Provisions (Continued)

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 (Concluded)

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	Effective July 1, 2019 and phased in over a 24-month period, actuarially equivalent factors based on the RP-2014 mortality table for healthy annuitants for a member turning age 55 in 2021, reflecting projected mortality improvements using Scale MP-2017, white collar adjustment, blended 90% males, 6.44% post-retirement interest, and 7.50% pre-retirement interest. Reflecting statutory requirements, joint and survivor factors are based on an interest assumption of 6.50%.
Combined service annuity	Members are eligible for combined service benefits if they: (a.) Have sufficient allowable service in total that equals or exceeds the applicable service credit vesting requirement of the retirement plan with the longest applicable service credit vesting requirement; 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.
Changes in plan provisions	There have been no changes in plan provisions since the prior valuation.

SECTION F

ACTUARIAL COST METHOD AND ACTUARIAL ASSUMPTIONS

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

Actuarial Cost Method

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

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

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

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

Asset Valuation Method

Fair value of assets.

Summary of Actuarial Assumptions Used 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 in the last experience study for the State Employees Retirement Fund, dated June 27, 2019.

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 was one member reported with missing salary and no members reported with missing service. We used prior year salary (0 members), if available, otherwise, high five average salary with a 10% load to account for salary increases (1 member). If neither pay nor high five average salary was available, we assumed a value of $65,000 (0 members). There were no members reported with a missing date of birth or gender. **Data for terminated members:** 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 $45,000. There were no members reported with a missing date of birth or gender. Benefits were estimated for 15 members at the direction of MSRS. **Data for members receiving benefits:** There were three members reported with a missing gender and no members reported with an invalid date of birth. We assumed male gender for retirees and female gender for survivors. There were no members reported without a benefit. There were no survivors reported with an expired benefit. There were five retirees reported with a bounceback annuity and an unreasonable reduction factor. A factor of 0.80, 0.85 and 0.90 was assumed for the 100%, 75% and 50% joint and survivor annuity, respectively. There was one retiree 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 “pop-up,” if any. For retirees who elected a survivor benefit option, we used the valuation assumptions if the survivor date of birth was missing (177 members) and/or the survivor gender was missing (194 members).
Changes in actuarial assumptions	There have been no changes in actuarial assumptions since the prior valuation.

Summary of Actuarial Assumptions (Continued)

	Percentage of Members Dying each Year*					
	Healthy Post-Retirement Mortality**		Healthy Pre-Retirement Mortality**		Disability Mortality**	
Age in 2019	Male	Female	Male	Female	Male	Female
20	0.02%	0.01%	0.02%	0.01%	0.02%	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	0.07	0.08	0.03	0.03	0.07	0.08
40	0.11	0.11	0.04	0.03	0.11	0.11
45	0.16	0.14	0.06	0.05	0.16	0.14
50	0.24	0.19	0.10	0.08	0.24	0.19
55	0.36	0.27	0.18	0.14	0.36	0.27
60	0.50	0.39	0.32	0.21	0.50	0.39
65	0.73	0.63	0.56	0.30	0.73	0.63
70	1.18	1.00	0.98	0.52	1.18	1.00
75	2.06	1.69	1.76	0.91	2.06	1.69
80	3.66	3.00	3.16	1.63	3.66	3.00
85	6.73	5.50	6.57	4.35	6.73	5.50
90	12.34	10.05	12.48	9.73	12.34	10.05

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

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

	Percent of Members Decrementing Each Year			
	Termination (Withdrawal) Rates After Third Year		Disability Retirement	
Age	Male	Female	Male	Female
20	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 3.13% (based on the weekly rate closest to but not later than the measurement date of the “20-Year Municipal GO Index” as published by Fidelity) and **the resulting single discount rate as of June 30, 2019 is 7.50%**. In describing this index, Fidelity notes that the municipal curves are constructed using option-adjusted analytics of a diverse population of over 10,000 tax-exempt securities.

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

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

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

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

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

	Projected Covered-Employee Payroll			Projected Contributions				
Fiscal Year Ending	Payroll for Current Employees	Payroll for New Employees	Total Employee Payroll	Contributions from Current Employees	Employer Contributions for Current Employees	Contributions on Future Payroll toward Current UAL*	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)
2019	$ 80,792		$ 80,792					
2020	85,543		85,543	$ 12,746	$ 22,326		$ 1,000	$ 36,072
2021	85,761	$ 2,562	88,323	13,207	24,099	$ 476	1,000	38,782
2022	85,957	5,237	91,194	13,237	25,873	1,077	1,000	41,187
2023	86,151	8,007	94,158	13,267	25,931	1,646	1,000	41,844
2024	85,680	11,538	97,218	13,195	25,790	2,372	1,000	42,357
2025	84,806	15,571	100,377	13,060	25,527	3,202	1,000	42,789
2026	83,676	19,964	103,640	12,886	25,187	4,104	1,000	43,177
2027	82,422	24,586	107,008	12,693	24,809	5,055	1,000	43,557
2028	80,549	29,937	110,486	12,405	24,245	6,155	1,000	43,805
2029	78,010	36,066	114,076	12,014	23,481	7,415	1,000	43,910
2030	75,433	42,351	117,784	11,617	22,705	8,707	-	43,029
2031	72,855	48,757	121,612	11,220	21,929	10,024	-	43,173
2032	70,048	55,516	125,564	10,787	21,084	11,414	-	43,285
2033	67,154	62,491	129,645	10,342	20,213	12,848	-	43,403
2034	64,463	69,396	133,859	9,927	14,891	9,410	-	34,228
2035	61,646	76,563	138,209	9,494	14,240	10,382	-	34,116
2036	58,532	84,169	142,701	9,014	13,521	11,413	-	33,948
2037	55,197	92,142	147,339	8,500	12,751	12,494	-	33,745
2038	51,891	100,236	152,127	7,991	11,987	13,592	-	33,570
2039	48,526	108,545	157,071	7,473	11,209	14,719	-	33,401
2040	44,665	117,511	162,176	6,878	10,318	15,934	-	33,130
2041	40,810	126,637	167,447	6,285	9,427	17,172	-	32,884
2042	36,642	136,247	172,889	5,643	8,464	18,475	-	32,582
2043	32,084	146,424	178,508	4,941	7,411	19,855	-	32,207
2044	28,013	156,296	184,309	4,314	6,471	21,194	-	31,979
2045	24,118	166,181	190,299	3,714	5,571	22,534	-	31,819
2046	19,969	176,515	196,484	3,075	4,613	23,935	-	31,623
2047	16,164	186,706	202,870	2,489	3,734	25,317	-	31,540
2048	12,389	197,074	209,463	1,908	2,862	26,723	-	31,493
2049	8,946	207,324	216,270	1,378	2,067	28,113	-	31,558
2050	6,295	217,004	223,299	969	1,454	29,426	-	31,849
2051	4,101	226,455	230,556	632	947	30,707	-	32,286
2052	2,490	235,560	238,050	383	575	31,942	-	32,900
2053	1,297	244,489	245,786	200	300	33,153	-	33,653
2054	686	253,088	253,774	106	159	34,319	-	34,584
2055	383	261,639	262,022	59	88	35,478	-	35,625
2056	187	270,351	270,538	29	43	36,660	-	36,732
2057	70	279,260	279,330	11	16	37,868	-	37,895
2058	8	288,400	288,408	1	2	39,107	-	39,110
2059	-	297,782	297,782	-	-	40,379	-	40,379
2060	-	307,459	307,459	-	-	41,692	-	41,692
2061	-	317,452	317,452	-	-	43,046	-	43,046
2062	-	327,769	327,769	-	-	44,445	-	44,445
2063	-	338,422	338,422	-	-	45,890	-	45,890
2064	-	349,420	349,420	-	-	47,381	-	47,381
2065	-	360,776	360,776	-	-	48,921	-	48,921
2066	-	372,502	372,502	-	-	50,511	-	50,511
2067	-	384,608	384,608	-	-	52,153	-	52,153
2068	-	397,108	397,108	-	-	53,848	-	53,848
2069	-	410,014	410,014	-	-	55,598	-	55,598

* *Equal to contributions (ultimately 45.50% of payroll for new employees) net of normal cost and expenses (24.94% of payroll).*

** *Additional state contributions assumed to end after 10 years. Actual end date will depend on the funding status of this plan and the PERA Police and Fire Plan.*

*** *Employee contributions are equal to 14.9% of payroll in the fiscal year ending June 30, 2020. Employer contributions are equal to 26.1% and 28.1% for fiscal years ending June 30, 2020 and 2021, respectively; the supplemental employer contribution is assumed to stop after 15 years.*

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

	Projected Covered-Employee Payroll			Projected Contributions				
Fiscal Year Ending	Payroll for Current Employees	Payroll for New Employees	Total Employee Payroll	Contributions from Current Employees	Employer Contributions for Current Employees	Contributions on Future Payroll toward Current UAL*	Additional State Contributions	Total Contributions
	(a)	(b)	(c) = (a) + (b)	(d)	(e)	(f)	(g)	(h) = (d) + (e) + (f) + (g)
2070	$ -	$ 423,339	$ 423,339	$ -	$ -	$ 57,405	$ -	$ 57,405
2071	-	437,098	437,098	-	-	59,270	-	59,270
2072	-	451,303	451,303	-	-	61,197	-	61,197
2073	-	465,971	465,971	-	-	63,186	-	63,186
2074	-	481,115	481,115	-	-	65,239	-	65,239
2075	-	496,751	496,751	-	-	67,359	-	67,359
2076	-	512,895	512,895	-	-	69,549	-	69,549
2077	-	529,564	529,564	-	-	71,809	-	71,809
2078	-	546,775	546,775	-	-	74,143	-	74,143
2079	-	564,546	564,546	-	-	76,552	-	76,552
2080	-	582,893	582,893	-	-	79,040	-	79,040
2081	-	601,837	601,837	-	-	81,609	-	81,609
2082	-	621,397	621,397	-	-	84,261	-	84,261
2083	-	641,592	641,592	-	-	87,000	-	87,000
2084	-	662,444	662,444	-	-	89,827	-	89,827
2085	-	683,974	683,974	-	-	92,747	-	92,747
2086	-	706,203	706,203	-	-	95,761	-	95,761
2087	-	729,154	729,154	-	-	98,873	-	98,873
2088	-	752,852	752,852	-	-	102,087	-	102,087
2089	-	777,320	777,320	-	-	105,405	-	105,405
2090	-	802,582	802,582	-	-	108,830	-	108,830
2091	-	828,666	828,666	-	-	112,367	-	112,367
2092	-	855,598	855,598	-	-	116,019	-	116,019
2093	-	883,405	883,405	-	-	119,790	-	119,790
2094	-	912,116	912,116	-	-	123,683	-	123,683
2095	-	941,759	941,759	-	-	127,703	-	127,703
2096	-	972,367	972,367	-	-	131,853	-	131,853
2097	-	1,003,968	1,003,968	-	-	136,138	-	136,138
2098	-	1,036,597	1,036,597	-	-	140,563	-	140,563
2099	-	1,070,287	1,070,287	-	-	145,131	-	145,131
2100	-	1,105,071	1,105,071	-	-	149,848	-	149,848
2101	-	1,140,986	1,140,986	-	-	154,718	-	154,718
2102	-	1,178,068	1,178,068	-	-	159,746	-	159,746
2103	-	1,216,355	1,216,355	-	-	164,938	-	164,938
2104	-	1,255,887	1,255,887	-	-	170,298	-	170,298
2105	-	1,296,703	1,296,703	-	-	175,833	-	175,833
2106	-	1,338,846	1,338,846	-	-	181,548	-	181,548
2107	-	1,382,358	1,382,358	-	-	187,448	-	187,448
2108	-	1,427,285	1,427,285	-	-	193,540	-	193,540
2109	-	1,473,672	1,473,672	-	-	199,830	-	199,830
2110	-	1,521,566	1,521,566	-	-	206,324	-	206,324
2111	-	1,571,017	1,571,017	-	-	213,030	-	213,030
2112	-	1,622,075	1,622,075	-	-	219,953	-	219,953
2113	-	1,674,793	1,674,793	-	-	227,102	-	227,102
2114	-	1,729,223	1,729,223	-	-	234,483	-	234,483
2115	-	1,785,423	1,785,423	-	-	242,103	-	242,103
2116	-	1,843,449	1,843,449	-	-	249,972	-	249,972
2117	-	1,903,361	1,903,361	-	-	258,096	-	258,096
2118	-	1,965,221	1,965,221	-	-	266,484	-	266,484
2119	-	2,029,090	2,029,090	-	-	275,145	-	275,145

* *Equal to contributions (ultimately 45.50% of payroll for new employees) net of normal cost and expenses (24.94% of payroll).*

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

Fiscal Year Ending	Projected Beginning Plan Fiduciary Net Position	Projected Total Contributions	Projected Benefit Payments	Projected Administrative Expenses	Projected Investment Earnings at 7.50%	Projected Ending Plan Net Position
	(a)	(b)	(c)	(d)	(e)	(f)=(a)+(b)-(c)-(d)+(e)
2020	$ 753,144	$ 36,072	$ 61,553	$ 214	$ 55,540	$ 782,989
2021	782,989	38,782	63,317	214	57,813	816,053
2022	816,053	41,187	64,905	215	60,323	852,443
2023	852,443	41,844	66,490	215	63,018	890,600
2024	890,600	42,357	68,323	214	65,831	930,251
2025	930,251	42,789	70,307	212	68,748	971,269
2026	971,269	43,177	72,354	209	71,763	1,013,646
2027	1,013,646	43,557	74,415	206	74,879	1,057,461
2028	1,057,461	43,805	76,751	201	78,089	1,102,403
2029	1,102,403	43,910	79,216	195	81,373	1,148,275
2030	1,148,275	43,029	81,730	189	84,688	1,194,073
2031	1,194,073	43,173	84,229	182	88,037	1,240,872
2032	1,240,872	43,285	86,992	175	91,450	1,288,440
2033	1,288,440	43,403	89,613	168	94,925	1,336,987
2034	1,336,987	34,228	91,945	161	98,143	1,377,252
2035	1,377,252	34,116	94,272	154	101,073	1,418,015
2036	1,418,015	33,948	96,663	146	104,036	1,459,190
2037	1,459,190	33,745	99,064	138	107,029	1,500,762
2038	1,500,762	33,570	101,317	130	110,058	1,542,943
2039	1,542,943	33,401	103,553	121	113,133	1,585,803
2040	1,585,803	33,130	106,053	112	116,246	1,629,014
2041	1,629,014	32,884	108,567	102	119,386	1,672,615
2042	1,672,615	32,582	111,316	92	122,544	1,716,333
2043	1,716,333	32,207	114,228	80	125,702	1,759,934
2044	1,759,934	31,979	116,697	70	128,873	1,804,019
2045	1,804,019	31,819	119,062	60	132,087	1,848,803
2046	1,848,803	31,623	121,591	50	135,346	1,894,131
2047	1,894,131	31,540	123,818	40	138,661	1,940,474
2048	1,940,474	31,493	126,000	31	142,055	1,987,991
2049	1,987,991	31,558	127,803	22	145,555	2,037,279
2050	2,037,279	31,849	128,963	16	149,220	2,089,369
2051	2,089,369	32,286	129,628	10	153,118	2,145,135
2052	2,145,135	32,900	129,737	6	157,319	2,205,611
2053	2,205,611	33,653	129,359	3	161,897	2,271,799
2054	2,271,799	34,584	128,238	2	166,936	2,345,079
2055	2,345,079	35,625	126,895	1	172,520	2,426,328
2056	2,426,328	36,732	125,307	-	178,713	2,516,466
2057	2,516,466	37,895	123,643	-	185,578	2,616,296
2058	2,616,296	39,110	121,779	-	193,178	2,726,805
2059	2,726,805	40,379	119,843	-	201,584	2,848,925
2060	2,848,925	41,692	117,828	-	210,866	2,983,655
2061	2,983,655	43,046	115,724	-	221,098	3,132,075
2062	3,132,075	44,445	113,530	-	232,362	3,295,352
2063	3,295,352	45,890	111,243	-	244,745	3,474,744
2064	3,474,744	47,381	108,861	-	258,342	3,671,606
2065	3,671,606	48,921	106,382	-	273,255	3,887,400
2066	3,887,400	50,511	103,804	-	289,593	4,123,700
2067	4,123,700	52,153	101,124	-	307,474	4,382,203
2068	4,382,203	53,848	98,341	-	327,027	4,664,737
2069	4,664,737	55,598	95,457	-	348,388	4,973,266

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

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

Fiscal Year Ending	Projected Beginning Plan Fiduciary Net Position	Projected Total Contributions	Projected Benefit Payments	Projected Administrative Expenses	Projected Investment Earnings at 7.50%	Projected Ending Plan Net Position
	(a)	(b)	(c)	(d)	(e)	(f)=(a)+(b)-(c)-(d)+(e)
2070	$ 4,973,266	$ 57,405	$ 92,471	$ -	$ 371,704	$ 5,309,904
2071	5,309,904	59,270	89,388	-	397,134	5,676,920
2072	5,676,920	61,197	86,211	-	424,848	6,076,754
2073	6,076,754	63,186	82,945	-	455,029	6,512,024
2074	6,512,024	65,239	79,598	-	487,873	6,985,538
2075	6,985,538	67,359	76,178	-	523,591	7,500,310
2076	7,500,310	69,549	72,691	-	562,407	8,059,575
2077	8,059,575	71,809	69,149	-	604,566	8,666,801
2078	8,666,801	74,143	65,561	-	650,326	9,325,709
2079	9,325,709	76,552	61,935	-	699,966	10,040,292
2080	10,040,292	79,040	58,285	-	753,786	10,814,833
2081	10,814,833	81,609	54,620	-	812,106	11,653,928
2082	11,653,928	84,261	50,952	-	875,271	12,562,508
2083	12,562,508	87,000	47,295	-	943,650	13,545,863
2084	13,545,863	89,827	43,660	-	1,017,640	14,609,670
2085	14,609,670	92,747	40,062	-	1,097,665	15,760,020
2086	15,760,020	95,761	36,519	-	1,184,183	17,003,445
2087	17,003,445	98,873	33,049	-	1,277,682	18,346,951
2088	18,346,951	102,087	29,672	-	1,378,688	19,798,054
2089	19,798,054	105,405	26,410	-	1,487,763	21,364,812
2090	21,364,812	108,830	23,284	-	1,605,511	23,055,869
2091	23,055,869	112,367	20,315	-	1,732,580	24,880,501
2092	24,880,501	116,019	17,525	-	1,869,664	26,848,659
2093	26,848,659	119,790	14,933	-	2,017,510	28,971,026
2094	28,971,026	123,683	12,555	-	2,176,919	31,259,073
2095	31,259,073	127,703	10,405	-	2,348,749	33,725,120
2096	33,725,120	131,853	8,491	-	2,533,926	36,382,408
2097	36,382,408	136,138	6,816	-	2,733,442	39,245,172
2098	39,245,172	140,563	5,377	-	2,948,366	42,328,724
2099	42,328,724	145,131	4,164	-	3,179,845	45,649,536
2100	45,649,536	149,848	3,163	-	3,429,116	49,225,337
2101	49,225,337	154,718	2,354	-	3,697,510	53,075,211
2102	53,075,211	159,746	1,715	-	3,986,460	57,219,702
2103	57,219,702	164,938	1,223	-	4,297,506	61,680,923
2104	61,680,923	170,298	853	-	4,632,308	66,482,676
2105	66,482,676	175,833	582	-	4,992,653	71,650,580
2106	71,650,580	181,548	389	-	5,380,464	77,212,203
2107	77,212,203	187,448	256	-	5,797,808	83,197,203
2108	83,197,203	193,540	166	-	6,246,910	89,637,487
2109	89,637,487	199,830	107	-	6,730,165	96,567,375
2110	96,567,375	206,324	69	-	7,250,148	104,023,778
2111	104,023,778	213,030	46	-	7,809,625	112,046,387
2112	112,046,387	219,953	31	-	8,411,577	120,677,886
2113	120,677,886	227,102	22	-	9,059,203	129,964,169
2114	129,964,169	234,483	16	-	9,755,946	139,954,582
2115	139,954,582	242,103	12	-	10,505,508	150,702,181
2116	150,702,181	249,972	9	-	11,311,867	162,264,011
2117	162,264,011	258,096	7	-	12,179,304	174,701,404
2118	174,701,404	266,484	6	-	13,112,417	188,080,299
2119	188,080,299	275,145	4	-	14,116,153	202,471,593

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

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

Fiscal Year Ending	Projected Beginning Plan Fiduciary Net Position	Projected Benefit Payments	Funded Portion of Benefit Payments	Unfunded Portion of Benefit Payments	Present Value of Funded Benefit Payments using Expected Return Rate (v)	Present Value of Unfunded Benefit Payments using Municipal Bond Rate (vf)	Present Value of Benefit Payments using Single Discount Rate (sdr)
(a)	(b)	(c)	(d)	(e)	(f)=(d)*v^((a)-.5)	(g)=(e)*vf ^((a)-.5)	(h)=(c)/(1+sdr)^(a-.5)
2020	$ 753,144	$ 61,553	$ 61,553	$ 0	$ 59,367	$ 0	$ 59,367
2021	782,989	63,317	63,317	0	56,808	0	56,808
2022	816,053	64,905	64,905	0	54,170	0	54,170
2023	852,443	66,490	66,490	0	51,621	0	51,621
2024	890,600	68,323	68,323	0	49,344	0	49,344
2025	930,251	70,307	70,307	0	47,234	0	47,234
2026	971,269	72,354	72,354	0	45,218	0	45,218
2027	1,013,646	74,415	74,415	0	43,261	0	43,261
2028	1,057,461	76,751	76,751	0	41,506	0	41,506
2029	1,102,403	79,216	79,216	0	39,850	0	39,850
2030	1,148,275	81,730	81,730	0	38,247	0	38,247
2031	1,194,073	84,229	84,229	0	36,666	0	36,666
2032	1,240,872	86,992	86,992	0	35,227	0	35,227
2033	1,288,440	89,613	89,613	0	33,756	0	33,756
2034	1,336,987	91,945	91,945	0	32,218	0	32,218
2035	1,377,252	94,272	94,272	0	30,729	0	30,729
2036	1,418,015	96,663	96,663	0	29,310	0	29,310
2037	1,459,190	99,064	99,064	0	27,943	0	27,943
2038	1,500,762	101,317	101,317	0	26,584	0	26,584
2039	1,542,943	103,553	103,553	0	25,275	0	25,275
2040	1,585,803	106,053	106,053	0	24,080	0	24,080
2041	1,629,014	108,567	108,567	0	22,931	0	22,931
2042	1,672,615	111,316	111,316	0	21,871	0	21,871
2043	1,716,333	114,228	114,228	0	20,877	0	20,877
2044	1,759,934	116,697	116,697	0	19,841	0	19,841
2045	1,804,019	119,062	119,062	0	18,830	0	18,830
2046	1,848,803	121,591	121,591	0	17,889	0	17,889
2047	1,894,131	123,818	123,818	0	16,945	0	16,945
2048	1,940,474	126,000	126,000	0	16,041	0	16,041
2049	1,987,991	127,803	127,803	0	15,135	0	15,135
2050	2,037,279	128,963	128,963	0	14,207	0	14,207
2051	2,089,369	129,628	129,628	0	13,284	0	13,284
2052	2,145,135	129,737	129,737	0	12,368	0	12,368
2053	2,205,611	129,359	129,359	0	11,471	0	11,471
2054	2,271,799	128,238	128,238	0	10,578	0	10,578
2055	2,345,079	126,895	126,895	0	9,737	0	9,737
2056	2,426,328	125,307	125,307	0	8,945	0	8,945
2057	2,516,466	123,643	123,643	0	8,210	0	8,210
2058	2,616,296	121,779	121,779	0	7,522	0	7,522
2059	2,726,805	119,843	119,843	0	6,886	0	6,886
2060	2,848,925	117,828	117,828	0	6,298	0	6,298
2061	2,983,655	115,724	115,724	0	5,754	0	5,754
2062	3,132,075	113,530	113,530	0	5,251	0	5,251
2063	3,295,352	111,243	111,243	0	4,786	0	4,786
2064	3,474,744	108,861	108,861	0	4,357	0	4,357
2065	3,671,606	106,382	106,382	0	3,961	0	3,961
2066	3,887,400	103,804	103,804	0	3,595	0	3,595
2067	4,123,700	101,124	101,124	0	3,258	0	3,258
2068	4,382,203	98,341	98,341	0	2,947	0	2,947
2069	4,664,737	95,457	95,457	0	2,661	0	2,661

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

Fiscal Year Ending	Projected Beginning Plan Fiduciary Net Position	Projected Benefit Payments	Funded Portion of Benefit Payments	Unfunded Portion of Benefit Payments	Present Value of Funded Benefit Payments using Expected Return Rate (v)	Present Value of Unfunded Benefit Payments using Municipal Bond Rate (vf)	Present Value of Benefit Payments using Single Discount Rate (sdr)
(a)	(b)	(c)	(d)	(e)	(f)=(d)*v^((a)-.5)	(g)=(e)*vf ^((a)-.5)	(h)=(c)/(1+sdr)^(a-.5)
2070	$ 4,973,266	$ 92,471	$ 92,471	$ -	$ 2,398	$ -	$ 2,398
2071	5,309,904	89,388	89,388	-	2,156	-	2,156
2072	5,676,920	86,211	86,211	-	1,935	-	1,935
2073	6,076,754	82,945	82,945	-	1,732	-	1,732
2074	6,512,024	79,598	79,598	-	1,546	-	1,546
2075	6,985,538	76,178	76,178	-	1,376	-	1,376
2076	7,500,310	72,691	72,691	-	1,222	-	1,222
2077	8,059,575	69,149	69,149	-	1,081	-	1,081
2078	8,666,801	65,561	65,561	-	953	-	953
2079	9,325,709	61,935	61,935	-	838	-	838
2080	10,040,292	58,285	58,285	-	733	-	733
2081	10,814,833	54,620	54,620	-	639	-	639
2082	11,653,928	50,952	50,952	-	555	-	555
2083	12,562,508	47,295	47,295	-	479	-	479
2084	13,545,863	43,660	43,660	-	411	-	411
2085	14,609,670	40,062	40,062	-	351	-	351
2086	15,760,020	36,519	36,519	-	298	-	298
2087	17,003,445	33,049	33,049	-	251	-	251
2088	18,346,951	29,672	29,672	-	209	-	209
2089	19,798,054	26,410	26,410	-	173	-	173
2090	21,364,812	23,284	23,284	-	142	-	142
2091	23,055,869	20,315	20,315	-	115	-	115
2092	24,880,501	17,525	17,525	-	93	-	93
2093	26,848,659	14,933	14,933	-	73	-	73
2094	28,971,026	12,555	12,555	-	57	-	57
2095	31,259,073	10,405	10,405	-	44	-	44
2096	33,725,120	8,491	8,491	-	34	-	34
2097	36,382,408	6,816	6,816	-	25	-	25
2098	39,245,172	5,377	5,377	-	18	-	18
2099	42,328,724	4,164	4,164	-	13	-	13
2100	45,649,536	3,163	3,163	-	9	-	9
2101	49,225,337	2,354	2,354	-	6	-	6
2102	53,075,211	1,715	1,715	-	4	-	4
2103	57,219,702	1,223	1,223	-	3	-	3
2104	61,680,923	853	853	-	2	-	2
2105	66,482,676	582	582	-	1	-	1
2106	71,650,580	389	389	-	1	-	1
2107	77,212,203	256	256	-	-	-	-
2108	83,197,203	166	166	-	-	-	-
2109	89,637,487	107	107	-	-	-	-
2110	96,567,375	69	69	-	-	-	-
2111	104,023,778	46	46	-	-	-	-
2112	112,046,387	31	31	-	-	-	-
2113	120,677,886	22	22	-	-	-	-
2114	129,964,169	16	16	-	-	-	-
2115	139,954,582	12	12	-	-	-	-
2116	150,702,181	9	9	-	-	-	-
2117	162,264,011	7	7	-	-	-	-
2118	174,701,404	6	6	-	-	-	-
2119	188,080,299	4	4	-	-	-	-
				Totals	$ 1,164,831	$ -	$ 1,164,831

SECTION H

GLOSSARY OF TERMS

Glossary of Terms

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

Glossary of Terms

Amortization Payment	The amortization payment is the periodic payment required to pay off an interest-discounted amount with payments of interest and principal.
Amortization Method	The method used to determine the periodic amortization payment may be a level dollar amount, or a level percent of pay amount. The period will typically be expressed in years, and the method will either be "open" (meaning, reset each year) or "closed" (the number of years remaining will decline each year).
Cost-of-Living Adjustments	Postemployment benefit changes intended to adjust benefit payments for the effects of inflation.
Cost-Sharing Multiple-Employer Defined Benefit Pension Plan (cost-sharing pension plan)	A multiple-employer defined benefit pension plan in which the pension obligations to the employees of more than one employer are pooled and pension plan assets can be used to pay the benefits of the employees of any employer that provides pensions through the pension plan.
Covered-Employee Payroll	The payroll of covered employees, which is typically only the pensionable pay (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 age(s). The portion of the actuarial present value allocated to a valuation year is the normal cost. The portion of this actuarial present value not provided for at a valuation date by the actuarial present value of future normal costs is the actuarial accrued liability. The sum of the accrued liability plus the present value of all future normal costs is the present value of all benefits.

Glossary of Terms

Fiduciary Net Position	The fiduciary net position is the value of the net assets of the trust restricted for pension benefits.
GASB	The Governmental Accounting Standards Board is an organization that exists with authority to promulgate accounting standards for state and local governmental entities.
Long-Term Expected Rate of Return	The long-term rate of return is the expected return to be earned over the entire trust portfolio based on the asset allocation of the portfolio.
Money-Weighted Rate of Return	The money-weighted rate of return is a method of calculating the returns that adjusts for the changing amounts actually invested. For purposes of GASB Statement No. 67, money-weighted rate of return is calculated as the internal rate of return on pension plan investments, net of pension plan investment expense.
Multiple-Employer Defined Benefit Pension Plan	A multiple-employer plan is a defined benefit pension plan that is used to provide pensions to the employees of more than one employer.
Municipal Bond Rate	The Municipal Bond Rate is the discount rate to be used for those benefit payments that occur after the assets of the trust have been depleted.
Net Pension Liability (NPL)	The NPL is the liability of employers and non-employer contributing entities to plan members for benefits provided through a defined benefit pension plan.
Non-Employer Contributing Entities	Non-employer contributing entities are entities that make 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.