GRS Gabriel Roeder Smith & Company
Consultants & Actuaries

PUBLIC EMPLOYEES RETIREMENT ASSOCIATION OF MINNESOTA

PUBLIC EMPLOYEES POLICE & FIRE PLAN

ACTUARIAL VALUATION REPORT AS OF JULY 1, 2016

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December 6, 2016

Public Employees Retirement Association of Minnesota
Trustees of the Public Employees Police & Fire Plan
St. Paul, Minnesota

Dear Trustees of the Public Employees Police & Fire Plan:

The results of the July 1, 2016 annual actuarial valuation of the Public Employees Police & Fire Plan are presented in this report. This report was prepared at the request of the Board and is intended for use by the Board and staff and those designated or approved by the Board. This report may be provided to parties other than the Plan only in its entirety. GRS is not responsible for the consequences of any unauthorized use of this report.

The purpose of the valuation is to measure the Plan's funding progress and to determine the required contribution rate for the fiscal year beginning July 1, 2016. Note that we have not attempted to quantify the impact of GASB Statements No. 67 and No. 68 in this report.

The required contribution rate shown on page one was designed to comply with Minnesota Statutes. Users of this report should be aware that contributions made at that rate do not guarantee benefit security. Given the importance of benefit security to any retirement system, we suggest that contributions to the System in excess of those presented in this report be considered.

The contribution rate in this report is determined using the actuarial assumptions and methods disclosed in the Actuarial Basis of this report. This report includes risk metrics on page five, but does not include a more robust assessment of the risks of future experience differing materially from the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment. We encourage a review and assessment of investment and other significant risks that may have a material effect on the plan's financial condition.

The valuation was based upon information furnished by the Public Employees Retirement Association of Minnesota (PERA), concerning benefits, financial transactions, plan provisions and active members, terminated members, retirees and beneficiaries. We checked for internal and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the information provided by PERA.

Actuarial assumptions, including discount rates, mortality tables and others identified in this report, are prescribed by Minnesota Statutes Section 356.215, the Legislative Commission on Pensions and Retirement (LCPR), and the Trustees. These parties are responsible for selecting the Plan's funding policy, actuarial valuation methods, asset valuation methods, and assumptions. The policies, methods and assumptions used in this valuation are those that have been so prescribed and are described in the Actuarial Basis of this report. PERA is solely responsible for communicating to GRS any changes required thereto.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. Due to the limited scope of our assignment, we did not perform an analysis of the potential range of such future measurements.

This report should not be relied on for any purpose other than the purpose described herein. Determinations of the financial results associated with the benefits described in this report in a manner other than the intended purpose may produce significantly different results.

The signing actuaries are independent of the plan sponsor. We are not aware of any relationship that would impair the objectivity of our work.

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. In addition, Mr. Murphy meets the requirements of "approved actuary" under Minnesota Statutes Section 356.215, Subdivision 1, Paragraph (c).

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. To the best of our knowledge and belief, the information contained in this report is accurate and fairly presents the actuarial position of the Public Employees Police & Fire Plan as of the valuation date and was performed in accordance with the requirements of Minnesota Statutes Section 356.215, and the requirements of the Standards for Actuarial Work established by the LCPR. All calculations have been made in conformity with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board and with applicable statutes.

We are available to answer any questions or provide further details.

Respectfully submitted,

Brian B. Murphy

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

Bonita J. Wurst

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

BBM/BJW:ah

Other Observations

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 there are no changes in benefits or contributions and all actuarial assumptions are met (including the assumption of the plan earning 8.00% on the actuarial value of assets), it is expected that:

(1) The unfunded actuarial accrued liabilities will be fully amortized after approximately 23 years, and
(2) The funded status of the plan will increase gradually towards a 100% funded ratio.

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 actuarial 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 market value of assets were used instead of the actuarial value of assets.

Limitations 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.

Other Observations

<u>Discount Rate Assumption</u>

In a 2015 analysis of long-term rate of investment return and inflation assumptions, GRS suggested that an investment return assumption in the range of 7.00% to 8.00% would be reasonable. The current assumed rate, which is mandated by Minnesota Statutes, is 8.00% and is at the upper end of the reasonable range. This report also concluded that the probability of exceeding the current 8.00% assumption over 20 years is only 37%. Please see the report, *General Employees Retirement Fund 6-Year Experience Study*, dated June 30, 2015 for additional information.

Professional standards require GRS to evaluate this assumption each year. If an assumption is deemed unreasonable based on current information, we would have to qualify the work that we do for PERA.

In May 2016, the Minnesota State Board of Investment (SBI) affirmed that the 8.00% return rate is attainable in the long-term, while acknowledging short term challenges. Also in May 2016, the LCPR's Actuary supported the reasonableness of the current rate by reviewing historical returns by investment class, projected returns from other investment consultants, and considering the SBI's projections. GRS believes the 8.00% return rate is within the reasonable range for this valuation as of July 1, 2016, but cautions PERA that declining capital market and inflation expectations may result in 8.00% being deemed unreasonable for future valuations. In such an instance, we would still comply with statutes and produce the valuation based upon 8.00%, but Actuarial Standards would require us to issue a "qualified" report.

If a discount rate of 7.50% were used in this valuation instead of 8.00%, we estimate that the unfunded liability would be approximately $400 million higher than estimated herein. This estimate incorporates lower salary scale rates due to lower inflation expectations as well as a delay in the assumed payment of 2.50% postretirement benefit increases.

Contents

Summary of Valuation Results

Contributions

The following table summarizes important contribution information as described in the Development of Costs section.

Contributions	Actuarial Valuation as of July 1, 2016	Actuarial Valuation as of July 1, 2015
Statutory Contributions - Chapter 353 (% of Payroll)	29.48%	29.59%
Required Contributions - Chapter 356 (% of Payroll)	28.30%	32.29%
Sufficiency / (Deficiency)	1.18%	(2.70)%

The contribution status improved from a deficiency of (2.70)% of payroll to a sufficiency of 1.18% of payroll. The primary reason for the improvement is the delay in the assumed 2.50% postretirement benefit increase date, from 2035 to 2051, which is due to market value investment losses in the past year. On a market value of assets basis, contributions are deficient by 0.90% of payroll.

The Plan Assets section provides detail on the plan assets used for the valuation including a development of the Actuarial Value of Assets (AVA). The Market Value of Assets (MVA) earned approximately -0.1% for the plan year ending June 30, 2016. The AVA earned approximately 7.9% for the plan year ending June 30, 2016 as compared to the assumed rate of 8.00%. The assumed rate is mandated by Minnesota Statutes, and is at the very upper end of the reasonable range. According to the NASRA survey, the most common assumption for statewide plans is currently 7.50%. Use of a 7.50% return assumption would produce a deficiency greater than shown above.

Participant reconciliation and statistics are detailed in the Membership Data section. The Actuarial Basis section includes a summary of plan provisions and actuarial methods and assumptions used for the calculations in this report.

Accounting information prepared according to the Governmental Accounting Standards Board (GASB) Statements No. 67 and No. 68 will be provided in a separate report.

Summary of Valuation Results

A summary of principal valuation results from the current valuation and the prior valuation follows. Any changes in plan provisions, actuarial assumptions or valuation methods and procedures between the two valuations are described after the summary.

	Actuarial Valuation as of	
	July 1, 2016	**July 1, 2015**
Contributions (*% of Payroll*)		
Statutory - Chapter 353	29.48%	29.59%
Required - Chapter 356	28.30%	32.29%
Sufficiency / (Deficiency)	1.18%	(2.70)%
Funding Ratios (*dollars in thousands*)		
Assets		
- Current assets (AVA)	$ 7,385,777	$ 7,076,271
- Current assets (MVA)	7,098,090	7,348,704
Accrued Benefit Funding Ratio		
- Current benefit obligations	$ 8,148,749	$ 8,170,932
- Funding ratio (AVA)	90.64%	86.60%
- Funding ratio (MVA)	87.11%	89.94%
Accrued Liability Funding Ratio		
- Actuarial accrued liability	$ 8,417,621	$ 8,460,477
- Funding ratio (AVA)	87.74%	83.64%
- Funding ratio (MVA)	84.32%	86.86%
Projected Benefit Funding Ratio		
- Current and expected future assets	$ 10,314,416	$ 9,866,672
- Current and expected future benefit obligations	10,152,134	10,231,775
- Projected benefit funding ratio (AVA)	101.60%	96.43%
Participant Data		
Active members		
- Number	11,398	11,157
- Annual valuation earnings *(000s)* *	$ 867,808	$ 830,856
- Projected annual earnings *(000s)* *	$ 915,827	$ 876,232
- Average projected annual earnings *	$ 80,413	$ 78,635
- Average age	40.4	40.4
- Average service	12.4	12.4
Service retirements	7,222	7,121
Survivors	1,873	1,894
Disability retirements	1,257	1,194
Deferred retirements	1,490	1,560
Terminated other non-vested	1,059	995
Total	**24,299**	**23,921**

* *These values exclude 9 members (11 in 2015) who were merged into PERA P&F in 2012 from the Minneapolis Police and Minneapolis Fire Retirement Funds whose benefits are not pay related.*

Summary of Valuation Results

Effects of Changes

The following changes in plan provisions, actuarial assumptions, and methods were recognized as of July 1, 2016:

- The assumed post-retirement benefit increase rate was changed from 1.00% per year through 2034 and 2.50% per year thereafter to 1.00% per year through 2050 and 2.50% per year thereafter. See page four (4) for additional detail about this assumption.

Refer to the Actuarial Basis section of this report for a complete description of these changes.

The impact of the above change was to decrease the accrued liability by $270.6 million and decrease the required contribution by 3.20% of pay, as follows:

	Before Assumption Changes	Reflecting Assumption Changes
Normal Cost Rate, % of Pay	22.0%	20.7%
Amortization of Unfunded Accrued Liability, % of pay	9.4%	7.5%
Expenses (% of Pay)	0.1%	0.1%
Total Required Contribution, % of Pay	31.5%	28.3%
Accrued Liability Funding Ratio	85.0%	87.7%
Projected Benefit Funding Ratio	97.3%	101.6%
Unfunded Accrued Liability (in billions)	$1.3	$1.0

Summary of Valuation Results

Valuation of Future Post-Retirement Benefit Increases

Benefit recipients receive a future annual compounding 1.00% post-retirement benefit increase. If the funding ratio reaches 90% (based on a 2.50% post-retirement benefit increase assumption) for two consecutive years, the benefit increase will revert to 2.50%. If, after reverting to a 2.50% benefit increase, the funding ratio declines to less than 80% for one year or less than 85% for two consecutive years, the benefit increase rate will decrease to 1.00%. Benefit increases already granted, however, will not be affected.

To determine an assumption regarding a future change in the post-retirement benefit increase, we performed a projection of liabilities and market value of assets based on the following methods and assumptions:

- Future investment returns and liability discount rates of 8.00%;
- Open group; stable active population (new member profile based on average new members hired in recent years);
- The post-retirement benefit increase rate is assumed to be 1.00% per year until the funding ratio threshold required to pay a 2.50% post-retirement benefit increase is reached; and
- Current statutory contribution levels (i.e., not including potential contribution increases under the contribution stabilizer statutes).

Based on these assumptions and methods, the projection indicates that this plan is expected to attain the funding ratio threshold required to pay a 2.50% post-retirement benefit increase in the year 2050, and that the plan would begin paying 2.50% benefit increases on January 1, 2051. This assumption is reflected in our calculations. This is only an assumption; actual timing will depend on actual experience.

Summary of Valuation Results

Risk Measures Summary *(Dollars in Thousands)*

Valuation Date (6/30)	(1) Accrued Liabilities (AAL)	(2) Market Value of Assets	(3) Market Value Unfunded AAL	(4) Valuation Payroll	(5) Market Value Funded Ratio (2)/(1)	(6) Retiree Liabilities	(7) RetLiab/ AAL (6)/(1)	(8) AAL/ Payroll (1)/(4)	(9) Assets/ Payroll (2)/(4)
2010	$5,963,672	$4,453,757	$1,509,915	$740,101	74.7%	$3,299,576	55.3%	805.8%	601.8%
2011	6,363,546	5,317,032	1,046,514	775,806	83.6%	3,529,604	55.5%	820.2%	685.4%
2012	7,403,295	5,772,047	1,631,248	794,417	78.0%	4,366,115	59.0%	931.9%	726.6%
2013	7,304,032	6,346,741	957,291	796,188	86.9%	4,333,475	59.3%	917.4%	797.1%
2014	8,151,328	7,273,100	878,228	820,333	89.2%	4,888,411	60.0%	993.7%	886.6%
2014	8,460,477	7,348,704	1,111,773	845,076	86.9%	5,000,871	59.1%	1001.1%	869.6%
2016	8,417,621	7,098,090	1,319,531	881,222	84.3%	5,066,605	60.2%	955.2%	805.5%

Valuation Date (6/30)	(10) Portfolio StdDev	(11) Std Dev % of Pay (9) x (10)	(12) Unfunded/ Payroll	(13) Non-Investment Cash Flow (NICF)	(14) NICF/ Assets (13)/(2)	(15) Market Rate of Return	(16) 5-Year Trailing Average
2010			204.0%	$(149,485)	-3.4%	15.7%	N/A
2011			134.9%	(161,687)	-3.0%	23.0%	N/A
2012			205.3%	(190,432)	-3.3%	2.3%	2.3%
2013			120.2%	(230,072)	-3.6%	14.2%	6.2%
2014			107.1%	(232,048)	-3.2%	18.5%	14.5%
2015	14.1%	122.6%	131.6%	(242,036)	-3.3%	4.4%	12.2%
2016	14.1%	113.6%	149.7%	(241,668)	-3.4%	-0.1%	7.6%

(5) The Funded ratio is the most widely known measure of a plan's financial strength, but the trend in the funded ratio is much more important than the absolute ratio. The funded ratio should trend to 100%. As it approaches 100%, it is important to re-evaluate the level of investment risk in the portfolio and potentially to re-evaluate the assumed rate of return.
(6) and (7) The ratio of Retiree liabilities to total accrued liabilities gives an indication of the maturity of the system. As the ratio increases, cash flow needs increase, and the liquidity needs of the portfolio change. A ratio on the order of 50% indicates a maturing system.
(8) and (9) The ratios of liabilities and assets to payroll gives an indication of both maturity and volatility. Many systems have ratios between 500% and 700%. Ratios significantly above that range may indicate difficulty in supporting the benefit level as a level % of payroll.
(10) and (11) The portfolio standard deviation measures the volatility of investment return. When multiplied by the ratio of assets to payroll it gives the effect of a one standard deviation asset move as a percent of payroll. This figure helps users understand the difficulty of dealing with investment volatility and the challenges volatility brings to sustainability.
(12) The ratio of unfunded liability to payroll gives an indication of the plan sponsor's ability to actually pay off the unfunded liability. A ratio above approximately 300% or 400% may indicate difficulty in discharging the unfunded liability within a reasonable time frame.
(13) and (14) The ratio of Non-Investment Cash Flow to assets is an important measure of sustainability. Negative ratios are common and expected for a maturing system. In the longer term, this ratio should be on the order of approximately -4%. A ratio that is significantly more negative than that for an extended period could be a leading indicator of potential exhaustion of assets.
(15) and (16) Investment return is probably the largest single risk that most systems face. The year by year return and the 5-year geometric average give an indicator of the realism of the systems assumed return. Of course, past performance is not a guarantee of future results.

Supplemental Information

The remainder of the report includes information supporting the results presented in the previous sections.

- **Plan assets** presents information about the plan's assets as reported by the Public Employees Retirement Association of Minnesota. The assets represent the portion of total fund liabilities that has been funded.

- **Membership data** presents and describes the membership data used in the valuation.

- **Development of costs** shows the liabilities for plan benefits and the derivation of the contribution amount.

- **Actuarial basis** describes the plan provisions, as well as the methods and assumptions used to value the plan. The valuation is based on the premise that the plan is ongoing.

- **Additional schedules** shows the Schedule of Funding Progress and Schedule of Contributions.

- **Glossary** defines the terms used in this report.

Plan Assets

Statement of Fiduciary Net Position *(Dollars in Thousands)*

	Market Value	
Assets in Trust	**June 30, 2016**	**June 30, 2015**
Cash, equivalents, short term securities	$ 145,521	$ 141,036
Fixed income	1,751,552	1,727,568
Equity	4,282,601	4,563,032
SBI alternative	908,179	905,931
Other	0	0
Total Assets in Trust	**$ 7,087,853**	**$ 7,337,567**
Assets receivable	15,918 *	14,267 **
Amounts payable	(5,681)	(3,130)
Net Assets Held in Trust for Pension Benefits	**$ 7,098,090**	**$ 7,348,704**

* *Includes $13.648 million contribution from Minneapolis to be paid by July 15, 2016.*
** *Includes $11.534 million contribution from Minneapolis paid by July 15, 2015.*

Plan Assets

Reconciliation of Plan Assets *(Dollars in Thousands)*

The following exhibit shows the revenue, expenses and resulting assets of the Fund as reported by the Public Employees Retirement Association for the prior two fiscal years.

Change in Assets		Market Value	
Year Ending		**June 30, 2016**	**June 30, 2015**
1.	Fund balance at market value at beginning of year	**$ 7,348,704**	**$ 7,273,100**
2.	Contributions		
	a. Member	95,172	88,733
	b. Employer	156,065 *	144,317 **
	c. Other sources (state contribution)	9,000	9,000
	d. Total contributions	260,237	242,050
3.	Investment income		
	a. Investment income/(loss)	549	327,786
	b. Investment expenses	(9,498)	(10,230)
	c. Net subtotal	(8,949)	317,556
4.	Other	3	84
5.	**Total income:** *(2.d.) + (3.c.) + (4.)*	**$ 251,291**	**$ 559,690**
6.	Benefits Paid		
	a. Annuity benefits	(498,608)	(481,330)
	b. Refunds	(2,391)	(1,953)
	c. Total benefits paid	(500,999)	(483,283)
7.	Expenses		
	a. Other	0	0
	b. Administrative	(906)	(803)
	c. Total expenses	(906)	(803)
8.	**Total disbursements:** *(6.c.) + (7.c.)*	**(501,905)**	**(484,086)**
9.	**Fund balance at market value at end of year**	**$ 7,098,090**	**$ 7,348,704**
10.	Approximate return on market value of assets	-0.1%	4.4%

* *Includes $13.648 million contribution from Minneapolis to be paid by July 15, 2016.*
** *Includes $11.534 million contribution from Minneapolis paid by July 15, 2015.*

Plan Assets

Actuarial Asset Value *(Dollars in Thousands)*

		June 30, 2016	June 30, 2015
1. Market value of assets available for benefits		**$ 7,098,090**	**$ 7,348,704**
2. Determination of average balance			
a. Total assets available at beginning of year		7,348,704	7,273,100
b. Total assets available at end of year		7,098,090	7,348,704
c. Net investment income for fiscal year		(8,949)	317,556
d. Average balance *[a. + b. - c.] / 2*		7,227,871	7,152,124
3. Expected return *[8.0% * 2.d.]*		578,230	572,170
4. Actual return		(8,949)	317,556
5. Current year asset gain/(loss) *[4. - 3.]*		(587,179)	(254,614)
6. Unrecognized asset returns			
	Original Amount	**Unrecognized Amount**	
a. Year ended June 30, 2016	$ (587,179)	$ (469,743)	N/A
b. Year ended June 30, 2015	(254,614)	(152,768)	$ (203,691)
c. Year ended June 30, 2014	659,930	263,972	395,958
d. Year ended June 30, 2013	354,260	70,852	141,704
e. Year ended June 30, 2012	(307,690)	N/A	(61,538)
f. Unrecognized return adjustment		(287,687)	272,433
7. **Actuarial value at end of year** *(1. - 6.f.)*		**$ 7,385,777**	**$ 7,076,271**
8. Approximate return on actuarial value of assets during fiscal year		7.9%	12.4%
9. Ratio of actuarial value of assets to market value of assets		1.04	0.96

Membership Data

Distribution of Active Members**

	Years of Service as of June 30, 2016									
Age	**<3***	**3 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25 - 29**	**30 - 34**	**35+**	**Total**
< 25	313	4								**317**
Avg. Earnings	41,349	37,246								**41,297**
25 - 29	741	296	123							**1,160**
Avg. Earnings	50,777	65,810	67,480							**56,384**
30 - 34	484	315	824	254	1					**1,878**
Avg. Earnings	51,399	65,005	74,700	78,894	97,858					**67,648**
35 - 39	255	146	490	857	214					**1,962**
Avg. Earnings	52,297	66,649	75,509	79,535	84,310					**74,551**
40 - 44	97	74	223	519	923	133				**1,969**
Avg. Earnings	53,423	66,433	72,296	79,560	85,434	88,166				**80,291**
45 - 49	63	41	136	288	728	682	163			**2,101**
Avg. Earnings	57,164	63,013	69,597	78,890	85,878	91,709	95,257			**85,179**
50 - 54	32	16	54	115	307	402	409	64		**1,399**
Avg. Earnings	54,543	66,521	74,131	81,819	84,631	91,889	97,051	93,448		**89,219**
55 - 59	14	5	18	51	99	115	110	59	8	**479**
Avg. Earnings	55,045	52,645	82,193	78,138	85,839	95,078	98,483	102,964	111,389	**91,293**
60 - 64	1	2	7	18	26	10	23	13	8	**108**
Avg. Earnings	6,503	57,879	55,706	82,569	86,364	78,759	94,202	98,980	103,783	**86,251**
65 - 69			4	1	2	1	3	2	1	**14**
Avg. Earnings			30,536	68,245	83,945	64,921	74,984	102,873	139,480	**70,956**
70+			1	1						**2**
Avg. Earnings			12,254	75,999						**44,127**
Total	**2,000**	**899**	**1,880**	**2,104**	**2,300**	**1,343**	**708**	**138**	**17**	**11,389**
Avg. Earnings	**50,043**	**65,383**	**73,642**	**79,485**	**85,395**	**91,584**	**96,674**	**98,174**	**109,462**	**76,197**

* *This exhibit does not reflect service earned in other PERA or Combined Service Annuity benefits. It should not be relied upon as an indicator of non-vested status.*

** *This exhibit excludes nine members who were merged into PERA P&F in 2012 from the Minneapolis Police and Minneapolis Fire Retirement Funds whose benefits are not pay related.*

In each cell, the top number is the count of active participants for the age/service combination and the bottom number is average valuation earnings for the fiscal year ending on the valuation date.

Membership Data

Distribution of Service Retirements

	Years Retired as of June 30, 2016							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<50								
Avg. Benefit								
50 - 54	101	340		1				**442**
Avg. Benefit	49,319	48,135		60,401				**48,434**
55 - 59	114	624	363					**1,101**
Avg. Benefit	56,320	58,712	49,624					**55,468**
60 - 64	30	350	619	405	10			**1,414**
Avg. Benefit	52,124	55,117	57,224	47,583	63,252			**53,875**
65 - 69	13	106	252	563	529		4	**1,467**
Avg. Benefit	49,836	47,719	49,672	52,841	51,557		64,640	**51,469**
70 - 74	1	22	76	148	738	103		**1,088**
Avg. Benefit	70,189	45,451	37,670	43,150	56,502	46,401		**52,203**
75 - 79		4	6	48	377	318	36	**789**
Avg. Benefit		49,051	31,676	35,783	58,562	59,524	42,892	**56,596**
80 - 84		2	1	5	145	212	119	**484**
Avg. Benefit		27,432	24,825	49,711	53,864	59,033	53,276	**55,772**
85 - 89		3		3	31	110	148	**295**
Avg. Benefit		24,520		14,445	55,166	58,067	56,542	**56,212**
90+					29	45	68	**142**
Avg. Benefit					59,344	58,081	46,839	**52,955**
Total	**259**	**1,451**	**1,317**	**1,173**	**1,859**	**788**	**375**	**7,222**
Avg. Benefit	**52,832**	**54,222**	**52,415**	**49,000**	**55,365**	**57,391**	**52,522**	**53,546**

In each cell, the top number is the count of retired participants for the age/years retired combination and the bottom number is the average annual benefit amount.

Membership Data

Distribution of Survivors

	Years Since Death as of June 30, 2016							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<45	13	53	53	21	2	1		**143**
Avg. Benefit	16,969	15,236	15,844	15,785	27,889	6,233		**15,814**
45 - 49	1	7	5	5	2	1		**21**
Avg. Benefit	62,637	34,563	31,946	39,851	33,527	31,165		**36,275**
50 - 54		13	15	3	5	3	1	**40**
Avg. Benefit		40,999	35,163	32,597	40,923	37,078	26,651	**37,518**
55 - 59	4	11	20	10	8	2	5	**60**
Avg. Benefit	39,328	35,780	35,902	34,804	37,299	27,482	39,391	**36,121**
60 - 64	12	35	28	19	10	8	8	**120**
Avg. Benefit	31,182	31,706	31,948	35,330	32,794	40,123	34,014	**33,089**
65 - 69	9	50	35	23	34	22	19	**192**
Avg. Benefit	26,844	35,532	30,910	31,694	34,310	40,375	34,066	**34,016**
70 - 74	17	70	52	40	53	25	15	**272**
Avg. Benefit	47,932	31,119	31,610	31,173	33,215	37,413	32,408	**33,330**
75 - 79	14	56	38	32	52	19	22	**233**
Avg. Benefit	30,989	32,183	29,941	34,488	34,091	29,760	35,370	**32,591**
80 - 84	11	54	48	41	57	36	26	**273**
Avg. Benefit	30,468	30,389	30,612	32,596	30,683	33,663	32,001	**31,410**
85 - 89	10	47	39	43	66	54	29	**288**
Avg. Benefit	32,529	31,262	37,945	31,519	29,802	30,130	24,350	**31,006**
90+	3	16	29	27	80	37	39	**231**
Avg. Benefit	44,271	29,882	25,950	24,041	30,525	29,854	25,623	**28,392**
Total	**94**	**412**	**362**	**264**	**369**	**208**	**164**	**1,873**
Avg. Benefit	**32,960**	**30,173**	**29,571**	**30,561**	**32,009**	**32,967**	**30,151**	**30,921**

In each cell, the top number is the count of survivors for the age/years since death combination and the bottom number is the average annual benefit amount.

Membership Data

Distribution of Disability Retirements

	Years Disabled* as of June 30, 2016							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
< 45	25	58	20	8				**111**
Avg. Benefit	40,499	38,730	31,948	28,553				**37,173**
45 - 49	10	41	22	25	8	1		**107**
Avg. Benefit	51,068	43,182	33,886	34,212	32,003	23,436		**38,891**
50 - 54	8	58	30	29	20	4		**149**
Avg. Benefit	52,914	49,124	42,220	38,212	35,076	37,547		**43,617**
55 - 59	10	44	25	49	38	5		**171**
Avg. Benefit	36,140	50,025	39,767	39,165	39,715	44,205		**42,140**
60 - 64	2	23	35	90	43	9		**202**
Avg. Benefit	54,885	41,407	47,852	50,106	44,598	46,100		**47,422**
65 - 69	8	8	11	93	129	19		**268**
Avg. Benefit	54,902	41,292	43,582	48,913	49,946	49,019		**49,150**
70 - 74	1	5	4	16	89	37		**152**
Avg. Benefit	60,462	59,228	32,813	48,682	53,799	56,039		**53,476**
75+				3	22	46	26	**97**
Avg. Benefit				74,964	50,610	51,098	51,842	**51,925**
Total	**64**	**237**	**147**	**313**	**349**	**121**	**26**	**1,257**
Avg. Benefit	**45,583**	**44,919**	**40,345**	**45,282**	**47,934**	**50,949**	**51,842**	**46,069**

** Based on effective date as provided by PERA; "Years Disabled" may reflect years since age 65 for members over age 65.*

In each cell, the top number is the count of disabled participants for the age/years disabled combination and the bottom number is the average annual benefit amount.

Membership Data

Reconciliation of Members

		Terminated		Recipients			
	Actives	Deferred Retirement	Other Non-Vested	Service Retirement	Disability Retirement	Survivor	Total
Members on 7/1/2015	**11,157**	**1,560**	**995**	**7,121**	**1,194**	**1,894**	**23,921**
New members	710						710
Return to active	60	(31)	(29)	0	0	0	0
Terminated non-vested	(84)	0	84	0	0	0	0
Service retirements	(178)	(91)	0	269	0	0	0
Terminated deferred	(172)	172	0	0	0	0	0
Terminated refund/transfer	(34)	(18)	(19)	0	0	0	(71)
Deaths	(8)	(2)	(1)	(153)	(21)	(107)	(292)
New beneficiary	0	0	0	0	0	98	98
Disabled	(54)	0	0	0	54	0	0
Data adjustments	1	(100)	29	(15)	30	(12)	(67)
Net change	241	(70)	64	101	63	(21)	378
Members on 6/30/2016	**11,398**	**1,490**	**1,059**	**7,222**	**1,257**	**1,873**	**24,299**

Terminated Member Statistics	**Deferred Retirement**	**Other Non-Vested**	**Total**
Number	1,490	1,059	2,549
Average age	44.7	44.9	44.8
Average service	7.2	0.7	4.5
Average annual benefit, with augmentation to Normal Retirement Date and 30% Combined Service Annuity (CSA) load	$20,076	N/A	$20,076
Average refund value, with 30% CSA load	$36,485	$2,839	$22,507

Development of Costs

Actuarial Valuation Balance Sheet *(Dollars in Thousands)*

The actuarial balance sheet is based on the principle that the long-term projected benefit obligations of the plan should be ideally equal to the long-term resources available to fund those obligations. **A Projected Benefit Funding Ratio less than 100% indicates that contributions are insufficient.** The resources available to meet projected obligations for current members consist of current Fund assets plus the present value of anticipated future contributions intended to fund benefits for current members. In the exhibit below, B.2 is the estimated present value of contributions to fund the normal cost rate for current members until their respective termination dates. Item B.1 is the present value of the total 29.48% statutory contribution net of normal cost and anticipated plan expenses during the period from the valuation date to the statutory unfunded amortization date.

The contributions made in excess of amounts required for current benefit payments are accumulated as a reserve to help meet benefit payments in later years. It is this reserve system which permits the establishment of a level rate of contribution each year.

			June 30, 2016
A. Actuarial Value of Assets			$ 7,385,777
B. Expected Future Assets			
1. Present value of expected future statutory supplemental contributions*			1,194,126
2. Present value of future normal cost contributions			1,734,513
3. Total expected future assets: *(1.) + (2.)*			$ 2,928,639
C. Total Current and Expected Future Assets *(A.+ B.3)*			$ 10,314,416
D. Current Benefit Obligations**			
1. Benefit recipients	**Non-Vested**	**Vested**	**Total**
a. Service retirements	$ 0	$ 4,028,164	$ 4,028,164
b. Disability retirements	0	584,190	584,190
c. Survivors	0	454,251	454,251
2. Deferred retirements with augmentation	0	211,107	211,107
3. Former members without vested rights	1,669	0	1,669
4. Active members	86,445	2,782,923	2,869,368
5. Total current benefit obligations	$ 88,114	$ 8,060,635	$ 8,148,749
E. Expected Future Benefit Obligations			$ 2,003,385
F. Total Current and Expected Future Benefit Obligations***			$ 10,152,134
G. Unfunded Current Benefit Obligations: *(D.5.) - (A.)*			$ 762,972
H. Unfunded Current and Future Benefit Obligations: *(F.) - (C.)*			(162,282)
I. Accrued Benefit Funding Ratio: *(A.)/(D.5.)*			90.64%
J. Projected Benefit Funding Ratio: *(C.)/(F.)*			101.60%

* *Per the LCPR Standards for Actuarial Work, calculated assuming the current contribution toward the unfunded liability continues for the entire amortization period.*

** *Present value of credited projected benefits (projected compensation, current service).*

*** *Present value of projected benefits (projected compensation, projected service).*

Development of Costs

Determination of Unfunded Actuarial Accrued Liability and Supplemental Contribution Rate (*Dollars in Thousands)*

	Actuarial Present Value of Projected Benefits	Actuarial Present Value of Future Normal Costs	Actuarial Accrued Liability
A. Determination of Actuarial Accrued Liability (AAL)			
1. Active members			
a. Retirement annuities	$ 4,256,213	$ 1,321,499	$ 2,934,714
b. Disability benefits	434,901	262,610	172,291
c. Survivor's benefits	59,523	38,747	20,776
d. Deferred retirements	117,392	100,311	17,081
e. Refunds*	4,724	11,346	(6,622)
f. Total	$ 4,872,753	$ 1,734,513	$ 3,138,240
2. Deferred retirements with future augmentation	211,107	0	211,107
3. Former members without vested rights	1,669	0	1,669
4. Annuitants	5,066,605	0	5,066,605
5. Total	$10,152,134	$ 1,734,513	$ 8,417,621
B. Determination of Unfunded Actuarial Accrued Liability (UAAL)			
1. Actuarial accrued liability			$ 8,417,621
2. Current assets (AVA)			7,385,777
3. Unfunded actuarial accrued liability			$ 1,031,844
C. Determination of Supplemental Contribution Rate**			
1. Present value of future payrolls through the amortization date of June 30, 2041			$ 13,804,928
2. Supplemental contribution rate: *(B.3.) / (C.1.)*			7.47% ***

* *Includes non-vested refunds and non-married survivor benefits only.*

** *The amortization of the Unfunded Actuarial Accrued Liability (UAAL) using the current amortization method results in initial payments less than the "interest only" payment on the UAAL. Payments less than the interest only amount will result in the UAAL increasing for an initial period of time.*

*** *The amortization factor as of July 1, 2016 is 15.073729.*

Development of Costs

Changes in Unfunded Actuarial Accrued Liability (UAAL) *(Dollars in Thousands)*

	Year Ending June 30, 2016		
	Actuarial Accrued Liability	**Current Assets**	**Unfunded Actuarial Accrued Liability**
A. Unfunded actuarial accrued liability at beginning of year	$ 8,460,477	$ 7,076,271	$ 1,384,206
B. Changes due to interest requirements and current rate of funding			
1. Normal cost, including expenses	$ 193,151	$ 0	$ 193,151
2. Benefit payments	(500,999)	(500,999)	0
3. Contributions	0	260,237	(260,237)
4. Interest on A., B.1., B.2. and B.3.	664,524	556,471	108,053
5. Total *(B.1. + B.2. + B.3. + B.4.)*	356,676	315,709	40,967
C. Expected unfunded actuarial accrued liability at end of year *(A. + B.5.)*			$ 1,425,173
D. Increase (decrease) due to actuarial losses (gains) because of experience deviations from expected			
1. Age and service retirements			$ (6,258)
2. Disability retirements			$ 2,944
3. Death-in-service benefits			(290)
4. Withdrawals			(896)
5. Salary increases			(29,913)
6. Investment income			6,203
7. Mortality of annuitants			1,454
8. Other items*			(95,954)
9. Total			(122,710)
E. Unfunded actuarial accrued liability at end of year before plan amendments and changes in actuarial assumptions *(C. + D.9.)*			$ 1,302,463
F. Change in unfunded actuarial accrued liability due to changes in plan provisions			$ 0
G. Change in unfunded actuarial accrued liability due to changes in actuarial assumptions			(270,619)
H. Change in unfunded actuarial accrued liability due to changes in decrement timing and miscellaneous methodology			0
I. Unfunded actuarial accrued liability at end of year *(E. + F. + G. + H.)***			$ 1,031,844

* *Includes a liability reduction of approximately $100 million due to deferred member data adjustments provided by PERA.*

** *The unfunded actuarial accrued liability on a market value of assets basis is $1,319,531.*

Development of Costs

Determination of Contribution Sufficiency/(Deficiency) *(Dollars in Thousands)*

The required contribution is defined in Minnesota statutes as the sum of normal cost, a supplemental contribution to amortize the UAAL, and an allowance for expenses. The dollar amounts shown are for illustration purposes and equal percent of pay multiplied by projected annual payroll.

	Percent of Payroll	Dollar Amount
A. Statutory contributions - Chapter 353		
1. Employee contributions	10.80%	$ 98,909
2. Employer contributions	16.20%	148,364
3. Minneapolis Police contributions***	0.98%	8,890
4. Minneapolis Fire contributions***	0.52%	4,757
5. Virginia Fire contributions	0.00%	30
6. State contributions****	0.98%	9,000
7. Total	29.48%	$ 269,950
B. Required contributions - Chapter 356		
1. Normal cost		
a. Retirement benefits	15.79%	$ 144,609
b. Disability benefits	3.19%	29,215
c. Survivors	0.49%	4,488
d. Deferred retirement benefits	1.13%	10,349
e. Refunds*	0.13%	1,191
f. Total	20.73%	$ 189,852
2. Supplemental contribution amortization of Unfunded Actuarial Accrued Liability by June 30, 2041	7.47%	$ 68,412
3. Allowance for expenses	0.10%	$ 916
4. Total	28.30% **	$ 259,180
C. Contribution Sufficiency/(Deficiency) *(A.7. - B.4.)*	1.18%	$ 10,770

Note: Projected annual payroll for fiscal year beginning on the valuation date: $915,827.

* *Includes non-vested refunds and non-married survivor benefits only.*
** *The required contribution on a market value of assets basis is 30.39% of payroll.*
*** *Contributions due July 15, 2017. 2016 contributions are included in assets as receivable contributions.*
**** *Contributions paid until both PERA P&F and MSRS State Patrol reach 90% funding (on a Market Value of Assets basis).*

Development of Costs

Special Groups – Minneapolis Police Relief Association (000s)

The Minneapolis Police Relief Association was consolidated with the P&F Plan on December 30, 2011, per 2011 legislation. The annual employer contribution after consolidation is defined as the amount necessary to amortize on a level dollar basis the estimated unfunded present value of benefits at consolidation by December 31, 2031. Contributions are payable annually on July 15th.

The employer contribution to be made annually on July 15th beginning in 2013 and ending in 2015 is $7,612,423 (previously calculated). Due to the change in P&F's statutory discount rate, the contribution amount was recalculated. The employer contribution to be made annually on July 15th beginning in 2016 and ending in 2031 is $8,890,272 (previously calculated).

Year Ending June 30, 2016

Group	Number	Annual Benefits	Average Age	Present Value of Projected Benefits
Active Members	1	N/A	62.9	$ 641
Service Retirements	446	$ 27,655	74.8	253,559
Disability Retirements	17	950	71.1	8,399
Survivors	215	7,421	79.9	51,003
Total	**679**	**$36,026**	**76.3**	**$313,602**

Development of Costs

Special Groups – Minneapolis Firefighters' Relief Association (000s)

The Minneapolis Firefighters' Relief Association was consolidated with the P&F Plan on December 30, 2011, per 2011 legislation. The annual employer contribution after consolidation is defined as the amount necessary to amortize on a level dollar basis the estimated unfunded present value of benefits at consolidation by December 31, 2031. Contributions are payable annually on July 15th.

The employer contribution to be made annually on July 15th beginning in 2013 and ending in 2015 is $3,921,787 (previously calculated). Due to the change in P&F's statutory discount rate, the contribution amount was recalculated. The employer contribution to be made annually on July 15th beginning in 2016 and ending in 2031 is $4,757,457 (previously calculated).

Year Ending June 30, 2016

Group	Number	Annual Benefits	Average Age	Present Value of Projected Benefits
Active Members	8	N/A	61.3	$ 5,096
Service Retirements	270	$ 17,181	75.6	149,726
Disability Retirements	37	2,280	73.4	17,972
Survivors	154	5,462	79.8	37,859
Total	**469**	**$ 24,923**	**76.6**	**$210,653**

Development of Costs

Special Groups – Virginia Fire Department Relief Association (000s)

The Virginia Fire Department Relief Association was consolidated with the P&F Plan on June 29, 2012. The annual employer contribution after consolidation is defined as the amount necessary to amortize on a level dollar basis the estimated unfunded present value of benefits at consolidation by December 31, 2020.

The employer contribution to be made annually beginning in 2012 and ending in 2014 is $25,431 (previously calculated). Due to the change in P&F's statutory discount rate, the contribution amount was recalculated. The employer contribution to be made annually beginning in 2015 and ending in 2020 is $29,611 (previously calculated).

Year Ending June 30, 2016

Group	Number	Annual Benefits*	Average Age	Present Value of Projected Benefits
Service Retirements	5	$ 138	82.7	$ 868
Survivors	4	61	86.6	313
Total	**9**	**$ 199**	**84.4**	**$1,181**

* *Benefit amounts were provided by PERA for all members. Surviving spouses will receive a benefit equal to 50% of the annuitant benefit amount.*

Development of Costs

Special Groups – Fairmont Police Department Relief Association (000s)

The Fairmont Police Department Relief Association was consolidated with the P&F Plan on June 29, 2012. The assets exceeded the present value of future benefits at consolidation by $462,639 (previously calculated). PERA credited these assets to an interest bearing suspense account within the P&F Fund and the account will be used to offset any increase in liability for this group of members due to any changes in P&F's statutory discount rate until June 30, 2015. **It is our understanding that this account has been paid to the City of Fairmont.**

Year Ending June 30, 2016

Group	Number	Annual Benefits*	Average Age	Present Value of Projected Benefits
Service Retirements	8	$ 504	72.8	$ 4,806
Survivors	3	117	85.8	632
Total	**11**	**$ 621**	**76.3**	**$5,438**

* *Benefit amounts were provided by PERA for all members. Surviving spouses will receive an annual benefit equal to 35 times the unit value.*

Actuarial Basis

Actuarial Methods

All actuarial methods are prescribed by Minnesota Statutes, the Legislative Commission on Pensions and Retirement, or the Board of Trustees. Different methodologies may also be reasonable and results based on other methodologies would produce different results.

Actuarial Cost Method

An actuarial cost method is a set of techniques used by the actuary to develop contribution levels under a retirement plan. The actuarial cost method used in this valuation for all purposes is the Entry Age Actuarial Cost Method. Under this method, a normal cost is developed by amortizing the actuarial value of benefits expected to be received by each active participant (as a level percentage of pay) over the total working lifetime of that participant, from hire to termination. Age as of the valuation date was calculated based on the dates of birth provided by the Fund. Entry age for valuation purposes was calculated as the age on the valuation date minus the provided years of service on the valuation date.

To the extent that current assets and future normal costs do not support participants' expected future benefits, an unfunded actuarial accrued liability ("UAAL") develops. The UAAL is amortized over the statutory amortization period using level percent of payroll assuming payroll increases. The total contribution developed under this method is the sum of normal cost, expenses, and the payment toward the UAAL.

Valuation of Future Post-Retirement Benefit Increases

If the plan has reached the funding ratio threshold required to pay a 2.50% benefit increase, Minnesota Statutes require the 2.50% benefit increase rate to be reflected in the liability calculations. If the plan has not yet reached the funding ratio threshold required to pay a 2.50% benefit increase, Minnesota Statutes require a projection to be performed to determine the expected attainment of the funding ratio threshold, and the expected reversion to a 2.50% benefit increase rate must be reflected in the liability calculations.

Funding Objective

The fundamental financing objective of the Fund is to establish contribution rates which, when expressed as a percentage of active member payroll, will remain approximately level from generation to generation and meet the required deadline for full funding.

Actuarial Basis

Actuarial Methods (Concluded)

Asset Valuation Method

The assets are valued based on a five-year moving average of expected and market values (five-year average actuarial value) determined as follows:

- At the end of each plan year, an average asset value is calculated as the average of the market asset value at the beginning and end of the fiscal year net of investment income for the fiscal year;
- The investment gain or (loss) is taken as the excess of actual investment income over the expected investment income based on the average asset value as calculated above;
- The investment gain or (loss) so determined is recognized over five years at 20% per year; and
- The asset value is the sum of the market asset value plus the scheduled recognition of investment gains or (losses) during the current and the preceding four fiscal years.

Payment on the Unfunded Actuarial Accrued Liability

Payment equals a level percentage of payroll each year to the statutory amortization date of June 30, 2041 assuming payroll increases of 3.50% per annum. If there is a negative Unfunded Actuarial Accrued Liability, the surplus amount is amortized over 30 years as a level percentage of payroll. If the unfunded liability increases due to changes in benefits, assumptions, or methods, the statutory amortization date will be re-determined. Projected payroll is multiplied by 0.959 in the determination of the present value of future payroll to account for timing differences (as required by the Standards for Actuarial Work).

Changes in Methods since Prior Valuation

There have been no changes in actuarial methods since the prior valuation.

Actuarial Basis

Summary of Actuarial Assumptions

The following assumptions were used in valuing the liabilities and benefits under the plan. All actuarial assumptions are prescribed by Minnesota Statutes, the Legislative Commission on Pensions and Retirement (LCPR), or the Board of Trustees. These parties are responsible for selecting the assumptions used for this valuation. The assumptions prescribed are based on the last experience study, dated November 2010, prepared by a former actuary, and a review of inflation and investment return assumptions. An experience study for the 2011-2015 period was issued on August 30, 2016. This report recommended many changes to demographic assumptions, expected to be effective at a future date.

The Allowance for Combined Service Annuity was also based on a recommendation by a former actuary. We are unable to judge the reasonableness of this assumption without performing a substantial amount of additional work beyond the scope of the assignment. We note that the LCPR has recently completed a review of this assumption. This review recommended changes to this assumption, expected to be effective at a future date.

Investment return	8.00% per annum.
Benefit increases after retirement	1.00% per annum through 2050 and 2.50% per annum thereafter.
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 earned during the year.
Inflation	2.75% per year.
Payroll growth	3.50% per year.
Mortality rates	
Healthy pre-retirement	RP-2000 employee generational mortality table projected with mortality improvement scale AA, white collar adjustment, set back two years for males and females.
Healthy post-retirement	RP-2000 annuitant generational mortality table projected with mortality improvement scale AA, white collar adjustment. The RP-2000 employee mortality table as published by the Society of Actuaries (SOA) contains mortality rates for ages 15 to 70 and the annuitant mortality table contains mortality rates for ages 50 to 95. We have applied the annuitant mortality table for active members beyond age 70 until the assumed retirement age and the employee mortality table for annuitants younger than age 50.
Disabled	RP-2000 healthy annuitant mortality table, white collar adjustment, set forward eight years for males and females.
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.
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	8.00%
2	5.00%
3	3.50%

Actuarial Basis

Summary of Actuarial Assumptions (Continued)

Disability	Age-related rates based on experience; see table of sample rates. All incidences are assumed to be duty-related.
Allowance for combined service annuity	Liabilities for former members are increased by 30.00% to account for the effect of some participants having eligibility for a Combined Service Annuity.
Administrative expenses	Prior year administrative expenses expressed as percentage of prior year projected payroll.
Refund of contributions	Account balances accumulate interest until normal retirement date and are discounted back to the valuation date. All employees withdrawing after becoming eligible for a deferred benefit take the larger of their contributions accumulated with interest or the value of their deferred benefit.
Commencement of deferred benefits	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 55.
Percentage married	85% of male and 65% of female active members are assumed to be married. Actual marital status is used for members in payment status.
Age of spouse	Wives are assumed to be three years younger than their husbands for male members, and husbands are assumed to be four years older than their wives for female members. For members in payment status, actual spouse date of birth is used, if provided.
Eligible children	Retiring members are assumed to have no dependent children.
Form of payment	Married members retiring from active status are assumed to elect subsidized joint and survivor form of annuity as follows: Males: 10% elect 25% Joint & Survivor option 20% elect 50% Joint & Survivor option 20% elect 75% Joint & Survivor option 35% elect 100% Joint & Survivor option Females: 5% elect 25% Joint & Survivor option 15% elect 50% Joint & Survivor option 5% elect 75% Joint & Survivor option 15% elect 100% Joint & Survivor option Remaining married members and unmarried members are assumed to elect the Straight Life option. Members receiving deferred annuities (including current terminated deferred members) are assumed to elect a straight life annuity.
Eligibility testing	Eligibility for benefits is determined based upon the age nearest birthday and service 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.

Actuarial Basis

Summary of Actuarial Assumptions (Continued)

Pay Increases	Pay increases are assumed to happen at the beginning of the fiscal year. This is equivalent to assuming that reported earnings are pensionable earnings for the year ending on the valuation date.
Unknown data for certain members	To prepare this report, GRS has used and relied on participant data supplied by 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 were applied: <u>Data for active members:</u> There were 28 members reported with a salary less than $100. We used prior year salary (17 members), if available; otherwise high five salary with a 10% load to account for salary increases (10 members). If neither prior year salary nor high five salary was available, we assumed a value of $35,000 (one member). Note former members of either Minneapolis Police or Minneapolis Fire are excluded from these salary counts as salary is not used to calculate the benefit. There were also 108 members reported without a gender. We assumed male gender. There was one member reported without a date of birth. We assumed a date of birth of July 1, 1985. <u>Data for terminated members:</u> We calculated benefits for these members using the reported Average Salary and credited service. If Average Salary was not reported (two members), we assumed a value of $24,000. If credited service was not reported (16 members), we used elapsed time from hire date to termination date (5 members); otherwise we assumed nine years of service (11 members). If termination date was invalid or not reported (10 members), we assumed the termination date was equal to the hire date plus credited service, otherwise the valuation date. If the reported termination date occurs prior to the reported hire date, the two dates were swapped. There were 7 members reported without a gender; male was assumed. No members were reported without a date of birth. <u>Data for inactive members:</u> There were no members with missing or invalid dates of birth. There were 22 members reported without a gender. We assumed retirees are male and beneficiaries are female.
Changes in actuarial assumptions	The assumed post-retirement benefit increase rate was changed from 1.00% per year through 2034 and 2.50% thereafter to 1.00% per year through 2050 and 2.50% thereafter. See page 4 for additional detail about this assumption.

Actuarial Basis

Summary of Actuarial Assumptions (Continued)

	Rate (%)*					
	Healthy Post-Retirement Mortality**		Healthy Pre-Retirement Mortality**		Disability Mortality	
Age	Male	Female	Male	Female	Male	Female
20	0.03%	0.02%	0.03%	0.02%	0.04%	0.02%
25	0.04	0.02	0.04	0.02	0.05	0.04
30	0.04	0.03	0.04	0.02	0.08	0.06
35	0.06	0.05	0.05	0.04	0.11	0.08
40	0.09	0.06	0.08	0.06	0.17	0.13
45	0.13	0.10	0.11	0.08	0.57	0.29
50	0.60	0.24	0.17	0.13	0.57	0.47
55	0.54	0.35	0.24	0.20	0.92	0.74
60	0.66	0.56	0.35	0.31	1.58	1.24
65	1.16	0.91	0.56	0.50	2.67	2.09
70	1.93	1.52	0.85	0.76	4.75	3.50

* *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.*

***These rates were adjusted for mortality improvements using Projection Scale AA.*

	Withdrawal Rates After Third Year		Disability Retirement	
Age	Male	Female	Male	Female
20	6.01%	6.01%	0.11%	0.11%
25	3.24	3.24	0.13	0.13
30	1.90	1.90	0.16	0.16
35	1.46	1.46	0.19	0.19
40	1.26	1.26	0.29	0.29
45	0.91	0.91	0.54	0.54
50	0.50	0.50	1.04	1.04
55	0.11	0.11	2.03	2.03
60	0.00	0.00	0.00	0.00

Actuarial Basis

Summary of Actuarial Assumptions (Concluded)

Age	Retirement
50	13%
51	10
52	10
53	10
54	13
55	30
56	20
57	20
58	20
59	20
60	25
61	25
62	35
63	35
64	35
65	50
66	50
67	50
68	50
69	50
70+	100

Salary Scale	
Year	Increase
1	12.75%
2	10.75%
3	8.75%
4	7.75%
5	6.25%
6	5.85%
7	5.55%
8	5.35%
9	5.15%
10	5.05%
11	4.95%
12	4.85%
13	4.75%
14	4.65%
15	4.55%
16	4.55%
17	4.55%
18	4.55%
19	4.55%
20	4.55%
21	4.45%
22	4.35%
23+	4.25%

Actuarial Basis

Summary of Plan Provisions – Police & Fire Plan

Following is a summary of the major plan provisions used in the valuation of this report. PERA 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	All full-time and certain part-time police officers and fire fighters, and certain paramedics, who are not contributing to any other local retirement fund.
Contributions	Percent of Salary: **Member** January 1, 2015 & later 10.80; **Employer** 16.20. Member contributions are "picked up" according to the provisions of Internal Revenue Code 414(h).
State contributions	$9 million paid annually on October 1 until both PERA P&F and MSRS State Patrol become 90% funded (on a Market Value of Assets basis).
Allowable service	Police and Fire service during which member contributions were made. May also include certain leaves of absence and military service.
Salary	Includes amounts deducted for deferred compensation or supplemental retirement plans, net income from fees and sick leave payments funded by the employer. Excludes unused annual leaves and sick leave payments, severance payments, Workers' Compensation benefits and employer-paid flexible spending accounts, cafeteria plans, healthcare expense accounts, day-care expenses, fringe benefits and the cost of insurance coverage.
Average salary	Average of the five highest successive years of salary. Average Salary is based on all Allowable Service if less than five years.
Vesting	See table below

Vesting

Years of Service	Vesting Percent if First Hired: Before 7/1/2010	After 6/30/2010 & before 7/1/2014	After 6/30/2014
<3	0%	0%	0%
3 – 4	100	0	0
5	100	50	0
6	100	60	0
7	100	70	0
8	100	80	0
9	100	90	0
10	100	100	50
11	100	100	55
12	100	100	60
13	100	100	65
14	100	100	70
15	100	100	75
16	100	100	80
17	100	100	85
18	100	100	90
19	100	100	95
20+	100	100	100

Actuarial Basis

Summary of Plan Provisions – Police & Fire Plan (Continued)

Retirement

Normal retirement benefit

Age/service requirement	Age 55 and at least partially vested. Proportionate Retirement Annuity is available at age 65 and one year of Allowable Service.
Amount	3.00% of Average Salary for each year of Allowable Service (up to 33 years if hired after June 30, 2014), pro-rata for completed months. A pro-rata share of member contributions will be refunded at retirement for excess service.

Early retirement

Age/service requirement	Age 50 and at least partially vested.
Amount	Normal Retirement Benefit based on Allowable Service and Average Salary at retirement date and 0.10% (0.20% for members enrolled in the plan after June 30, 2007) reduction for each month the member is under age 55. If the effective date of retirement is after June 30, 2019, the reduction is 5/12% for each month that the member is under age 55 at the time of retirement. The change in early retirement factors will be phased-in over a five-year period for retirements occurring between July 1, 2014 and June 30, 2019.
Form of payment	Life annuity with return on death of any balance of contributions over aggregate monthly payments. Actuarially equivalent options are: 25%, 50%, 75% or 100% Joint and Survivor with bounce back feature. The Joint and Survivor options are determined on an actuarially equivalent basis, but with no actuarial reduction for the bounce back feature.
Benefit Increases	Benefit recipients receive a future annual 1.00% post-retirement benefit increase. The annual adjustment will equal 2.50% any time the Fund exceeds a 90% funded ratio for two consecutive years. If the adjustment is increased to 2.50% and the funded ratio falls below 80% for one year or 85% for two consecutive years the post-retirement benefit increase will be lowered to 1.00%. A benefit recipient who has been receiving a benefit for at least 12 full months as of June 30 will receive a full increase. Members receiving benefits for at least one month but less than 12 full months as of June 30 will receive a pro rata increase. For retirements after May 31, 2014, the first increase will be delayed two years. Members retired under laws in effect before July 1, 1973 receive an additional lump sum payment each year. In 1989, this lump sum payment is the greater of $25 times each full year of Allowable Service or the difference between $400 times each full year of Allowable Service and the sum of benefits paid from any Minnesota public pension plan plus cash payments from the Social Security Administration for the preceding fiscal year July 1, 1988 through June 30, 1989. In each following year, the lump sum payment will increase by the same percentage increase that is applied to regular annuities paid from the Fund. Effective January 1, 2002, annual lump sum payment is divided by 12 and paid as a monthly life annuity in the annuity form elected.

Actuarial Basis

Summary of Plan Provisions – Police & Fire Plan (Continued)

Disability

Duty disability benefit

Age/service requirement	Physically or mentally unable to perform normal duties as a police officer or fire fighter as a direct result of an act of duty specific to protecting property and personal safety of others. Members age 55 or older with 20 or more years of Allowable Service are not eligible to apply for duty disability benefits.
Amount	60.00%, plus an additional 3.00% for each year of service in excess of 20 years, of Average Salary paid until Normal Retirement Age, or for 60 months, whichever is later. The retirement benefit is then recalculated but is never lower than the disability benefit. If a member became disabled prior to July 1, 1997 but did not commence their benefit before July 1, 1997, the benefit is calculated under the laws in effect before July 1, 1997, and an actuarial increase shall be made for the change in post-retirement interest rates from 5.00% to 6.00%.

Regular disability benefit

Age/service requirement	Physically or mentally unable to perform normal duties as a police officer or fire fighter with one year of Allowable Service. Members age 55 or older with 15 or more years of Allowable Service are not eligible to apply for regular disability benefits.
Amount	45.00% of Average Salary, paid until Normal Retirement Age, or for 60 months, whichever is later. The retirement benefit is then recalculated but is never lower than the disability benefit. Benefits for total and permanent regular disability are calculated as 3.00% of Average Salary for each year of Allowable Service, with a minimum of 45.00% of Average Salary. If a member became disabled prior to July 1, 1997 but did not commence his or her benefit before July 1, 1997, the benefit payable is calculated under the laws in effect before July 1, 1997, and an actuarial increase shall be made for the change in post-retirement interest rates from 5.00% to 6.00%.
Benefit increases	Same as for retirement.

Retirement benefit

Age/service requirement	Upon cessation of disability benefits.
Amount	Any optional annuity continues. Otherwise, the larger of the disability benefit paid before age 55 or the normal retirement benefit available at age 55, or an actuarially equivalent optional annuity.
Form of payment	Same as for retirement.
Benefit increases	Same as for retirement.

Actuarial Basis

Summary of Plan Provisions – Police & Fire Plan (Continued)

Death

Surviving spouse benefit

Age/service requirement	Death of active member or regular disabled member with surviving spouse whose disability benefit accrued before July 1, 2007, who is vested at death (service requirement is waived if death occurs in the line of duty).
Amount	50.00% of salary (60.00% if death occurs in the line of duty after June 30, 2007) averaged over last six months. Benefit paid until spouse's death but no payments while spouse is remarried prior to July 1, 1991. If a member becomes deceased prior to July 1, 1997 and the beneficiary was not eligible to commence their survivor benefits before July 1, 1997, the benefit payable is calculated under the laws in effect before July 1, 1997, and an actuarial increase shall be made for the change in the post-retirement interest rates from 5.00% to 6.00%.
Benefit increases	Same as for retirement.

Surviving dependent children's benefit

Age/service requirement	Non-duty related death of active member or regular disabled member with eligible dependent child.
Amount	10.00% of salary averaged over last six months for each child. Family benefit minimum (including spouse's benefit) of 50.00% of salary and maximum of 70.00% of salary. Benefits paid until child marries, dies, or attains age 18 (age 23 if full-time student).

Duty disability surviving spouse benefit

Age/service requirement	Member who is totally and permanently disabled who dies before age 55 or within five years of the effective date of the disability benefit, whichever is later.
Amount	60.00% of salary averaged over last six months. Benefits paid until spouse's death but no payments while spouse is remarried prior to July 1, 1991.
Benefit increases	Same as for retirement.

Actuarial Basis

Summary of Plan Provisions – Police & Fire Plan (Continued)

Death (Continued)

Duty disability surviving dependent children's benefit

Age/service requirement	Death of a member with an eligible dependent child who was disabled in the line of duty and died as a direct result of the disability.
Amount	10.00% of salary averaged over last six months for each child. Family benefit minimum (including spouse's benefit) of 60.00% of salary and maximum of 80.00% of salary. Benefits paid until child marries, dies, or attains age 18 (age 23 if full-time student). If a member became deceased prior to July 1, 1997 and the beneficiary was not eligible to commence their survivor benefits before July 1, 1997, the benefit payable is calculated under the laws in effect before July 1, 1997, and an actuarial increase shall be made for the change in the post-retirement interest rates from 5.00% to 6.00%.

Surviving spouse optional annuity

Age/service requirement	Active member dies before age 55. Benefits commence when member would have been age 55 or as early as age 50 if qualified for early retirement, benefits commence immediately if member had 30 years of service.
Amount	Survivor's payment of the 100% joint and survivor benefit the member could have elected if terminated. Alternatively, spouse may elect refund of deceased's contributions with interest if there are no dependent children. If a member became deceased prior to July 1, 1997 and the beneficiary was not eligible to commence their survivor benefits before July 1, 1997, the benefit payable is calculated under the laws in effect before July 1, 1997, and an actuarial increase shall be made for the change in the post-retirement interest rates from 5.00% to 6.00%.
Benefit increases	Same as for retirement.

Actuarial Basis

Summary of Plan Provisions – Police & Fire Plan (Continued)

Termination	
Refund of contributions	
Age/service requirement	Termination of public service.
Amount	If member terminated before July 1, 2011, member's contributions credited with 6% interest compounded annually prior to July 1, 2011 and 4% interest thereafter. If member terminated after June 30, 2011, member's contributions credited with 4% interest compounded annually. A deferred annuity may be elected in lieu of a refund if vested.
Deferred benefit	
Age/service requirement	Partially or fully vested.
Amount	Benefit computed under law in effect at termination and increased by the following percentage (augmentation) compounded annually for terminations prior to 2012: (a.) 0.00% before July 1, 1971; (b.) 5.00% from July 1, 1971 to January 1, 1981; (c.) 3.00% (2.50% if hired after June 30, 2006) thereafter until the earlier of January 1 of the year following attainment of age 55 and January 1, 2012; (d.) 5.00% (2.50% if hired after June 30, 2006) thereafter until the earlier of the date the annuity begins and January 1, 2012; and (e.) 1.00% from January 1, 2012 thereafter. Members who terminate after 2011 will receive no future augmentation. If a member terminated employment prior to July 1, 1997 but was not eligible to commence their pension before July 1, 1997, the benefit payable is calculated under the laws in effect before July 1, 1997 and an actuarial increase shall be made for the change in the post-retirement interest rates from 5.00% to 6.00%.
Form of payment	Same as for retirement.
Optional form conversion factors	Actuarially equivalent factors based on RP-2000 for healthy annuitants, white collar adjustment, projected to 2027 using scale AA, no setbacks, blended 90% males, and 7.00% post-retirement interest. The post-retirement interest rate assumption will change to 6.5% on the earlier of the effective date of the next mortality adjustment or July 1, 2017.

Actuarial Basis

Summary of Plan Provisions – Police & Fire Plan (Concluded)

Combined service annuity	Members are eligible for combined service benefits if they: (a.) Meet minimum retirement age for each plan participated in and total public service meets the vesting requirements of each plan; or (b.) Have three or more years of service under PERA and the covered fund(s) (if hired prior to July 1, 2010). Other requirements for combined service include: (a.) Member must have at least six months of allowable service credit in each plan worked under; and (b.) Member may not be in receipt of a benefit from another plan. Members who meet the above requirements must have their benefit based on the following: (a.) Allowable service in all covered plans is combined in order to determine eligibility for early retirement. (b.) Average salary is based on the high five consecutive years during their entire service in all covered plans.
Changes in plan provisions	There have been no changes in plan provisions since the previous valuation.

Actuarial Basis

Summary of Plan Provisions – Minneapolis Police Relief Association

Normal retirement benefit	Monthly benefits are equal to the number of units multiplied by the unit values described herein. Units are based on service, as follows: **Service** / **Units** 20 — 35.0 units 21 — 36.6 units 22 — 38.2 units 23 — 39.8 units 24 — 41.4 units 25 or more — 43.0 units Members must be at least age 50 with 5 years of service to receive this benefit.
Unit values	**Calendar Year** / **Unit Value** 2012 — $ 104.651 2013 — 109.011 2014 — 114.825 2015 — 124.031 Unit values after 2015 are assumed to increase 1.00% per year through 2050 and 2.50% thereafter.
Surviving spouse's benefit	Annual benefit based on 23 units for the surviving spouse of an active or retired member. Upon retirement, members may choose an alternative form of payment that provides 50%, 75%, or 100% of their benefit to their spouse after their death. The units are adjusted if one of these alternate forms is selected.
Surviving children's benefit	Annual benefit based on 8 units for each surviving child of an active or retired member. Benefits continue to age 18 or if the child is a full-time student, to age 22. The total benefit for surviving children and spouse combined is limited to 41 units.
Contributions	Member and employer contributions equal to 8.00% of the monthly unit value multiplied by 80 are required for each member. After 25 years of service, member contributions are paid to a separate health insurance account.
Benefit increases	Benefit recipients receive a future annual 1.00% post-retirement benefit increase. The annual adjustment will equal 2.50% any time the Fund exceeds a 90% funded ratio for two consecutive years. If the adjustment is increased to 2.50% and the funded ratio falls below 80% for one year or 85% for two consecutive years the post-retirement benefit increase will be lowered to 1.00%.

Actuarial Basis

Summary of Plan Provisions – Minneapolis Firefighters' Relief Association

Normal retirement benefit

Monthly benefits are equal to the number of units multiplied by the unit values described herein. Units are based on service, as follows:

Service	Units
15	25.0 units
16	26.6 units
17	28.2 units
18	29.8 units
19	31.4 units
20	35.0 units
21	36.6 units
22	38.2 units
23	39.8 units
24	41.4 units
25 or more	43.0 units

Members must be at least age 50 with 5 years of service to receive this benefit.

Members may choose among alternative survivor payment forms which modify the number of units payable to the member and their spouse. A member who is single at the time of retirement and who has at least 25 years of service may choose to receive 43.3 units on the condition of a reduced survivor payment to any future spouse.

Unit values

Calendar Year	Unit Value
2013	100.775
2014	104.264
2015	124.031

Unit values after 2015 are assumed to increase 1.00% per year through 2050 and 2.50% thereafter.

Disability benefit

Annual benefit based on 41 units for the disabled member.

Surviving spouse's benefit

Annual benefit based on 23 units for the surviving spouse of an active or retired member and 22 units for the surviving spouse of a disabled member. Upon retirement, members may choose an alternative form of payment that provides 50%, 75% or 100% of their benefit to their spouse after their death. The units are adjusted if one of these alternate forms is selected.

Surviving children's benefit

Annual benefit based on 8 units for each surviving child of an active or retired member. Benefits continue to age 18 or if the child is a full-time student, to age 22. The total benefit for surviving children and spouse combined is limited to 43 units.

Contributions

Member and employer contributions equal to 8.00% of the monthly unit value multiplied by 80 are required for each member. After 25 years of service, member contributions are paid to a separate health insurance account.

Benefit increases

Benefit recipients receive a future annual 1.00% post-retirement benefit increase. The annual adjustment will equal 2.50% any time the Fund exceeds a 90% funded ratio for two consecutive years. If the adjustment is increased to 2.50% and the funded ratio falls below 80% for one year or 85% for two consecutive years the post-retirement benefit increase will be lowered to 1.00%.

Additional Schedules

Schedule of Funding Progress[1] *(Dollars in Thousands)*

Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL) (b)	Unfunded (Overfunded) AAL (UAAL) (b) - (a)	Funded Ratio (a)/(b)	Actual Covered Payroll (Previous FY) (c)	UAAL as a Percentage of Covered Payroll [(b)-(a)]/(c)
7-1-1994	$ 1,234,961	$ 1,099,221	$ (135,740)	112.35 %	$ 277,566	(48.90) %
7-1-1995	1,385,901	1,196,795	(189,106)	115.80	293,919	(64.34)
7-1-1996	1,633,010	1,334,202	(298,808)	122.40	316,189	(94.50)
7-1-1997	1,974,635	1,556,483	(418,152)	126.87	346,319	(120.74)
7-1-1998	2,337,313	1,741,344	(595,969)	134.22	375,131	(158.87)
7-1-1999	3,679,551	3,004,637	(674,914)	122.46	352,066	(191.70)
7-1-2000	4,145,351	3,383,187	(762,164)	122.53	392,796	(194.04)
7-1-2001	4,472,041	3,712,360	(759,681)	120.46	500,839	(151.68)
7-1-2002	4,672,679	3,886,311	(786,368)	120.23	522,153	(150.60)
7-1-2003	4,683,115	4,390,953	(292,162)	106.65	560,503	(52.12)
7-1-2004	4,746,834	4,692,190	(54,644)	101.16	551,266	(9.91)
7-1-2005	4,814,961	4,956,340	141,379	97.15	580,723	24.35
7-1-2006	5,017,951	5,260,564	242,613	95.39	618,435	39.23
7-1-2007	5,198,922	5,669,347	470,425	91.70	648,342	72.56
7-1-2008	5,233,015	5,918,061	685,046	88.42	703,701	97.35
7-1-2009	5,239,855	6,296,274	1,056,419	83.22	733,164	144.09
7-1-2010	5,188,339	5,963,672	775,333	87.00	740,101	104.76
7-1-2011	5,274,602	6,363,546	1,088,944	82.89	775,806	140.36
7-1-2012	5,797,868	7,403,295	1,605,427	78.31	794,417 [2]	202.09
7-1-2013	5,932,945	7,304,032	1,371,087	81.23	796,188 [2]	172.21
7-1-2014	6,525,019	8,151,328	1,626,309	80.05	820,333 [3]	198.25
7-1-2015	7,076,271	8,460,477	1,384,206	83.64	845,076 [4]	163.80
7-1-2016	7,385,777	8,417,621	1,031,844	87.74	881,222 [5]	117.09

[1] *Information prior to 2012 provided by prior actuary. See prior reports for additional detail.*
[2] *Assumed equal to actual member contributions divided by 9.60%.*
[3] *Assumed equal to actual member contributions divided by 9.90%.*
[4] *Assumed equal to actual member contributions divided by 10.50%.*
[5] *Assumed equal to actual member contributions divided by 10.80%.*

Additional Schedules

Schedule of Contributions from the Employer and Other Contributing Entities[1]

(Dollars in Thousands)

Plan Year Ended June 30	Actuarially Required Contribution Rate (a)	Actual Covered Payroll (b)	Actual Member Contributions (c)	Annual Required Contributions [(a)x(b)] - (c) = (d)	Actual Employer Contributions[5] (e)	Percentage Contributed (e)/(d)
1994	17.45%	$ 277,566	$ 21,806	$ 26,629	$ 32,536	122.18%
1995	17.28	293,919	22,356	28,433	33,548	117.99
1996	16.49	316,189	24,065	28,075	36,066	128.46
1997	15.11	346,319	26,354	25,975	39,508	152.10
1998	15.69	375,131	28,552	30,306	42,786	141.18
1999	12.32	352,066	30,897	12,478	46,280	370.89
2000	12.87	392,796	31,214	19,339	53,178	274.98
2001	12.21	500,839	31,341	29,811	52,960	177.65
2002	12.61	522,153	33,801	32,042	90,664	282.95
2003	15.52	560,503	34,751	35,424	50,917	143.74
2004	19.47	551,266	36,313	71,019	52,770	74.30
2005	21.99	580,723	37,873	89,828	55,802	62.12
2006	24.36	618,435	42,970	107,681	63,603	59.07
2007	25.76	648,342	50,688	116,325	74,707	64.22
2008	28.82	703,701	58,259	144,548	87,023	60.20
2009	28.41	733,164	67,701	140,591	101,548	72.23
2010	29.99	740,101	71,736	150,220	107,066	71.27
2011	25.52	775,806	73,702	124,284	109,604	88.19
2012	28.78	794,417 [2]	76,264	152,369	121,891	80.00
2013	33.37	796,188 [2]	76,434	189,254	125,995	66.57
2014	29.89	820,333 [3]	81,213	163,985	141,632	86.37
2015	33.85	845,076 [4]	88,733	197,325	153,317	77.70
2016	32.29	881,222 [6]	95,172	189,375	165,065	87.16
2017	28.30					

[1] *Information prior to 2012 provided by prior actuary. See prior reports for additional detail.*
[2] *Assumed equal to actual member contributions divided by 9.60%.*
[3] *Assumed equal to actual member contributions divided by 9.90%.*
[4] *Assumed equal to actual member contributions divided by 10.50%.*
[5] *Includes contributions from other sources (if applicable).*
[6] *Assumed equal to actual member contributions divided by 10.80%*

Glossary of Terms

Accrued Benefit Funding Ratio	The ratio of assets to Current Benefit Obligations.
Accrued Liability Funding Ratio	The ratio of assets to Actuarial Accrued Liability.
Actuarial Accrued Liability (AAL)	The difference between the Actuarial Present Value of Future Benefits, and the Actuarial Present Value of Future Normal Costs.
Actuarial Assumptions	Assumptions about future plan experience that affect costs or liabilities, such as: mortality, withdrawal, disablement, and retirement; future increases in salary; future rates of investment earnings; future investment and administrative expenses; characteristics of members not specified in the data, such as marital status; characteristics of future members; future elections made by members; and other items.
Actuarial Cost Method	A procedure for allocating the Actuarial Present Value of Future Benefits between the Actuarial Present Value of Future Normal Costs and the Actuarial Accrued Liability.
Actuarial Equivalent	Of equal Actuarial Present Value, determined as of a given date and based on a given set of Actuarial Assumptions.
Actuarial Present Value (APV)	The amount of funds required to provide a payment or series of payments in the future. It is determined by discounting the future payments with an assumed interest rate and with the assumed probability each payment will be made.
Actuarial Present Value of Projected Benefits	The Actuarial Present Value of amounts which are expected to be paid at various future times to active members, retired members, beneficiaries receiving benefits, and inactive, non-retired members entitled to either a refund or a future retirement benefit. Expressed another way, it is the value that would have to be invested on the valuation date so that the amount invested plus investment earnings would provide sufficient assets to pay all projected benefits and expenses when due.
Actuarial Valuation	The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a plan. An Actuarial Valuation for a governmental retirement system typically also includes calculations of items needed for compliance with GASB No. 25, such as the Funded Ratio and the Annual Required Contribution (ARC).
Actuarial Value of Assets	The value of the assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets or a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the actuarially required contribution (ARC).

Glossary of Terms (Continued)

Amortization Method A method for determining the Amortization Payment. Under the Level Percentage of Pay method, the Amortization payment is one of a stream of increasing payments, whose Actuarial Present Value is equal to the UAAL. The stream of payments increases at the rate at which total covered payroll of all active members is assumed to increase.

Amortization Payment That portion of the plan contribution or ARC which is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.

Amortization Period The period used in calculating the Amortization Payment.

Annual Required Contribution (ARC) The employer's periodic required contributions, expressed as a dollar amount or a percentage of covered plan compensation, determined under GASB No. 25. The ARC consists of the Employer Normal Cost and Amortization Payment.

Augmentation Annual increases to deferred benefits.

Closed Amortization Period A specific number of years that is reduced by one each year, and declines to zero with the passage of time. For example if the amortization period is initially set at 30 years, it is 29 years at the end of one year, 28 years at the end of two years, etc.

Current Benefit Obligations The present value of benefits earned to the valuation date, based on current service and including future salary increases to retirement.

Employer Normal Cost The portion of the Normal Cost to be paid by the employer. This is equal to the Normal Cost less expected member contributions.

Expected Assets The present value of anticipated future contributions intended to fund benefits for current members.

Experience Gain/Loss A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions, during the period between two actuarial valuations. To the extent that actual experience differs from that assumed, Unfunded Actuarial Accrued Liabilities emerge which may be larger or smaller than projected. Gains are due to favorable experience, e.g., the assets earn more than projected, salaries do not increase as fast as assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, losses are the result of unfavorable experience, i.e., actual results that produce Unfunded Actuarial Accrued Liabilities which are larger than projected.

Glossary of Terms (Concluded)

GASB	Governmental Accounting Standards Board.
GASB No. 25 and GASB No. 27	These are the governmental accounting standards that set the accounting rules for public retirement systems and the employers that sponsor or contribute to them. Statement No. 27 sets the accounting rules for the employers that sponsor or contribute to public retirement systems, while Statement No. 25 sets the rules for the systems themselves.
GASB No. 50	The accounting standard governing a state or local governmental employer's accounting for pensions.
GASB No. 67 and GASB No. 68	Statements No. 67 and No. 68, issued in June 2012, replace the requirements of Statements No. 25 and No. 27, respectively. Statement No. 68 sets the accounting rules for the employers that sponsor or contribute to public retirement systems, while Statement No. 67 sets the rules for the systems themselves. Accounting information prepared according to Statements No. 67 and No. 68 will be provided in a separate report.
Normal Cost	The annual cost assigned, under the Actuarial Cost Method, to the current plan year.
Projected Benefit Funding Ratio	The ratio of the sum of Actuarial Value of Assets and Expected Assets to the Actuarial Present Value of Projected Benefits. A Ratio less than 100% indicates that contributions are insufficient.
Unfunded Actuarial Accrued Liability	The difference between the Actuarial Accrued Liability and Actuarial Value of Assets.
Valuation Date	The date as of which the Actuarial Present Value of Future Benefits are determined. The benefits expected to be paid in the future are discounted to this date.