Public Employees Retirement Association of Minnesota

General Employees Retirement Plan
Actuarial Valuation Report as of July 1, 2017

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November 10, 2017

Public Employees Retirement Association of Minnesota
Trustees of the General Employees Retirement Plan
St. Paul, Minnesota

Dear Trustees of the General Employees Retirement Plan:

The results of the July 1, 2017 annual actuarial valuation of the General Employees Retirement 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, 2017 according to the prescribed assumptions. 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.

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.

In our professional judgement, the statutory discount rate of 8.0% used in this report deviates materially from the guidance set forth in Actuarial Standards of Practice No. 27 (ASOP No. 27). In a 2017 analysis of long-term rate of investment return and inflation assumptions, GRS suggested that an investment return assumption in the range of 6.85% to 7.68% would be reasonable. Please see our letter dated September 11, 2017 for additional information. If a discount rate within the reasonable range were used in this valuation instead of 8.0%, the unfunded liability and contribution deficiency would be higher than shown. Note that estimated results based on a 7.0% discount rate are shown on page five.

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 pages five and six, 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.

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 General Employees Retirement 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, 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:bd

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 24 years;
(2) The funded status of the plan will increase gradually towards a 100% funded ratio; and
(3) The unfunded liability will grow initially as a dollar amount before beginning to decline.

However, as noted elsewhere in this report, we do not expect the earnings assumption of 8.00% to be met. Unfunded liabilities based on a lower earnings assumption have the potential to grow indefinitely.

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.
(4) The funded status would appear lower if it were based upon an investment return assumption that meets the requirements of ASOP 27.

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.

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, 2017	July 1, 2016
Statutory Contributions - Chapter 353 (% of Payroll)	14.60%	14.62%
Required Contributions - Chapter 356 (% of Payroll)	16.18%	16.49%
Sufficiency/(Deficiency)	(1.58)%	(1.87)%

The statutory contribution deficiency decreased from (1.87)% of payroll to (1.58)% of payroll. The primary reasons for the decreased contribution deficiency were the change in Combined Service Annuity assumptions and the asset return for the year being greater than expected. On a market value of assets basis, contributions are deficient by 1.32% of payroll.

Based on the actuarial value of assets and scheduled contribution rates, statutory contributions are not sufficient to fully amortize the unfunded actuarial accrued liability over the statutory amortization period of 16 years. Based on current statutory contributions, the actuarial value of assets, and other methods and assumptions described in this report, the unfunded liability will be eliminated in approximately 24 years.

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 15.1% for the plan year ending June 30, 2017. The AVA earned approximately 9.3% for the plan year ending June 30, 2017 as compared to the assumed rate of 8.00%. The assumed rate is mandated by Minnesota Statutes, and is outside the 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 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, 2017	**July 1, 2016**
Contributions (*% of Payroll*)		
Statutory - Chapter 353	14.60%	14.62%
Required - Chapter 356	16.18%	16.49%
Sufficiency/(Deficiency)	(1.58)%	(1.87)%
Funding Ratios (*dollars in thousands*)		
Accrued Benefit Funding Ratio		
- Current assets (AVA)	$ 19,916,322	$ 18,765,863
- Current benefit obligations	$ 24,254,435	$ 23,661,661
- Funding ratio	82.11%	79.31%
Accrued Liability Funding Ratio		
- Current assets (AVA)	$ 19,916,322	$ 18,765,863
- Market value of assets (MVA)	$ 20,100,579	$ 17,994,909
- Actuarial accrued liability	$ 25,615,722	$ 24,848,409
- Funding ratio (AVA)	77.75%	75.52%
- Funding ratio (MVA)	78.47%	72.42%
Projected Benefit Funding Ratio		
- Current and expected future assets	$ 28,125,034	$ 26,825,926
- Current and expected future benefit obligations	$ 29,242,236	$ 28,133,869
- Projected benefit funding ratio	96.18%	95.35%
Participant Data		
Active members		
- Number	152,867	148,745
- Annual valuation earnings *(000s)*	$ 5,897,762	$ 5,620,479
- Projected annual earnings *(000s)*	$ 6,201,854	$ 5,906,821
- Average projected annual earnings	$ 40,570	$ 39,711
- Average age	46.3	46.5
- Average service	9.8	10.1
Service retirements	85,777	81,911
Survivors	8,645	8,547
Disability retirements	3,779	3,830
Deferred retirements	52,274	52,516
Terminated other non-vested	138,335	132,416
Total	**441,677**	**427,965**

Summary of Valuation Results

Effects of Changes

The following changes in plan provisions, actuarial assumptions and methods were recognized as of July 1, 2017:

- Loading factors to account for members with Combined Service Annuities were updated as follows:
  - Active Members: Reduced from 0.8% (0.2% for MERF members) of liabilities to 0.0% of liabilities
  - Deferred Vested Members: Reduced from 60% (30% for MERF members) of liabilities to 15% of liabilities
  - Non-Vested Terminated Members: Reduced from 60% (30% for MERF members) of liabilities to 3% of liabilities
  - The Combined Service Annuity assumption changes were approved by the LCPR based on an analysis completed by the LCPR actuary and documented in a report dated October 2016
- The assumed post-retirement benefit increase assumption changed from 1.00% per year through 2052 and 2.50% thereafter to 1.00% through 2035 and 2.50% thereafter. See page four for additional detail about this assumption.

The combined impact of the above changes was to decrease the accrued liability by $61 million and increase the required contribution by 0.2% of pay, as follows:

	Before Assumption Changes	Reflecting Assumption Changes
Normal Cost Rate, % of Pay	7.6%	7.9%
Amortization of Unfunded Accrued Liability, % of Pay	8.2%	8.1%
Expenses (% of Pay)	0.2%	0.2%
Total Required Contribution, % of Pay	16.0%	16.2%
Accrued Liability Funding Ratio	77.6%	77.8%
Projected Benefit Funding Ratio	96.7%	96.2%
Unfunded Accrued Liability (in billions)	$5.8	$5.7

Summary of Valuation Results

Valuation of Future Post-Retirement Benefit Increases

Benefit recipients receive a future annual 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 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 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 contributions (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 2035, and that the plan would begin paying 2.50% benefit increases on January 1, 2036. This assumption is reflected in our calculations. This is only an assumption. Actual timing will depend on actual experience.

As noted elsewhere in this report, we do not expect the earnings assumption of 8.00% to be met. The funding ratio threshold would be achieved later if it was based upon an investment return assumption that meets the requirements of ASOP No. 27.

Summary of Valuation Results

Sensitivity Tests

During the 2017 legislative session, the Legislative Commission on Pensions and Retirement (LCPR) enacted a new sensitivity disclosure requirement for PERA's 2017 valuations. Per the LCPR's requirement, we have calculated the liabilities associated with the following scenarios:

1) 7% interest rate assumption
2) 9% interest rate assumption
3) 1.0% post-retirement benefit increase for all future years
4) 2.5% post-retirement benefit increase for all future years

In each case, all other assumptions were unchanged from those used to develop the final valuation results in this report. Note that we believe the 9% interest rate assumption is an unrealistic assumption.

	Final Valuation Assumptions	Final Valuation Assumptions with 7% interest	Final Valuation Assumptions with 9% interest	Final Valuation Assumptions with 1.0% COLA for all future years	Final Valuation Assumptions with 2.5% COLA for all future years
Normal Cost Rate, % of Pay	7.9%	9.8%	6.6%	7.4%	8.3%
Amortization of Unfunded Accrued Liability, % of Pay	8.1%	12.0%	4.4%	6.9%	12.0%
Expenses (% of Pay)	0.2%	0.2%	0.2%	0.2%	0.2%
Total Required Contribution, % of Pay	16.2%	22.0%	11.2%	14.5%	20.5%
Contribution Sufficiency/(Deficiency), % of Pay	(1.6)%	(7.4)%	3.4 %	0.1 %	(5.9)%
Accrued Liability Funding Ratio	77.8%	68.7%	87.1%	80.4%	70.2%
Actuarial Accrued Liability (in billions)	$25.6	$29.0	$22.9	$24.8	$28.4
Unfunded Accrued Liability (in billions)	$5.7	$9.1	$2.9	$4.9	$8.5

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	$17,180,956	$ 11,338,582	$5,842,374	$ 4,804,627	66.0%	$ 7,900,020	46.0%	357.6%	236.0%
2011	$17,898,849	$ 13,616,622	$4,282,227	$ 5,079,429	76.1%	$ 8,315,059	46.5%	352.4%	268.1%
2012	$18,598,897	$ 13,577,653	$5,021,244	$ 5,142,592	73.0%	$ 8,870,045	47.7%	361.7%	264.0%
2013	$19,379,769	$ 15,084,608	$4,295,161	$ 5,246,928	77.8%	$ 9,351,606	48.3%	369.4%	287.5%
2014	$21,282,504	$ 17,404,822	$3,877,682	$ 5,351,920	81.8%	$10,229,051	48.1%	397.7%	325.2%
2015	$23,560,951	$ 18,581,795	$4,979,156	$ 5,549,255	78.9%	$12,092,665	51.3%	424.6%	334.9%
2016	$24,848,409	$ 17,994,909	$6,853,500	$ 5,773,708	72.4%	$13,066,753	52.6%	430.4%	311.7%
2017	$25,615,722	$ 20,100,579	$5,515,143	$ 6,156,985	78.5%	$13,896,408	54.2%	416.0%	326.5%

Valuation Date (6/30)	(10) Portfolio Std Dev	(11) Std Dev % of Pay (9) x (10)	(12) Unfunded/ Payroll (3) / (4)	(13) Non-Investment Cash Flow (NICF)	(14) NICF/ Assets (13)/(2)	(15) Market Rate of Return	(16) 5-Year Trailing Average
2010			121.6%	$ (298,297)	-2.6%	15.7%	N/A
2011			84.3%	$ (329,963)	-2.4%	23.0%	N/A
2012			97.6%	$ (359,950)	-2.7%	2.3%	2.3%
2013			81.9%	$ (396,791)	-2.6%	14.2%	6.2%
2014			72.5%	$ (441,245)	-2.5%	18.5%	14.5%
2015	14.1%	47.2%	89.7%	$ (492,445)	-2.7%	4.4%	12.2%
2016	14.1%	43.9%	118.7%	$ (566,466)	-3.1%	-0.2%	7.6%
2017	14.1%	46.0%	89.6%	$ (577,882)	-2.9%	15.1%	10.2%

(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)*

Assets in Trust	Market Value June 30, 2017		Market Value June 30, 2016	
Cash, equivalents, short term securities	$ 491,850		$ 371,576	
Fixed income	$ 3,895,018		$ 4,437,241	
Equity	$ 13,042,724		$ 10,849,195	
SBI Alternative	$ 2,635,922		$ 2,300,707	
Other	$ 6,906		$ 7,014	
Total Assets in Trust	**$ 20,072,420**		**$ 17,965,733**	
Assets Receivable	$ 40,865	*	$ 41,539	**
Amounts Payable	$ (12,706)		$ (12,363)	
Net Assets Held in Trust for Pension Benefits	**$ 20,100,579**		**$ 17,994,909**	

** Includes $31 million Employer Supplemental Contribution to be paid in July and December 2017.*
*** Includes $31 million Employer Supplemental Contribution paid in July and December 2016.*

Plan Assets

Reconciliation of Plan Assets *(Dollars in Thousands)*

The following exhibits show 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**			**Market Value**	
Year Ending		**June 30, 2017**			**June 30, 2016**	
1. Fund balance at market value at beginning of year	$	17,994,909		$	18,581,795	
2. Adjustment to match restated PERA fund balance	$	240		$	-	
3. Fund balance at market value at beginning of year, as restated	$	17,995,149		$	18,581,795	
4. Contributions						
a. Member	$	400,204		$	375,291	
b. Employer	$	477,888	*	$	459,978	**
c. Other sources	$	6,000		$	6,000	
d. Total contributions	$	884,092		$	841,269	
5. Investment income						
a. Investment income/(loss)	$	2,703,723		$	3,160	
b. Investment expenses	$	(20,822)		$	(24,011)	
c. Net subtotal	$	2,682,901		$	(20,851)	
6. Other	$	411		$	431	
7. Total income: *(4.d.) + (5.c.) + (6.)*	**$**	**3,567,404**		**$**	**820,849**	
8. Benefits Paid						
a. Annuity benefits	$	(1,413,448)		$	(1,359,176)	
b. Refunds	$	(37,234)		$	(37,209)	
c. Total benefits paid	$	(1,450,682)		$	(1,396,385)	
9. Expenses						
a. Other	$	-		$	-	
b. Administrative	$	(11,292)		$	(11,350)	
c. Total expenses	$	(11,292)		$	(11,350)	
10. Total disbursements: *(8.c.) + (9.c.)*	**$**	**(1,461,974)**		**$**	**(1,407,735)**	
11. Transfer between funds	**$**	**-**		**$**	**-**	
12. Fund balance at market value at end of year	**$**	**20,100,579**		**$**	**17,994,909**	
13. Approximate return on market value of assets		15.1%			(0.2)%	

** Includes $31 million Employer Supplemental Contribution to be paid in July and December 2017.*
*** Includes $31 million Employer Supplemental Contribution paid in July and December 2016.*

Plan Assets

Actuarial Asset Value *(Dollars in Thousands)*

			June 30, 2017	June 30, 2016
1. Market value of assets available for benefits			$ 20,100,579	$ 17,994,909
2. Determination of average balance				
a. Total assets available at beginning of year			$ 17,995,149	$ 18,581,795
b. Total assets available at end of year			$ 20,100,579	$ 17,994,909
c. Net investment income for fiscal year			$ 2,682,901	$ (20,851)
d. Average balance *[a. + b. - c.] / 2*			$ 17,706,413	$ 18,298,777
3. Expected return *[8.0% * 2.d.]*			$ 1,416,513	$ 1,463,902
4. Actual return			$ 2,682,901	$ (20,851)
5. Current year asset gain/(loss) *[4. - 3.]*			$ 1,266,388	$ (1,484,753)
6. Unrecognized asset returns				
		Original Amount	Unrecognized Amount	
a. Year ended June 30, 2017		$ 1,266,388	$ 1,013,111	N/A
b. Year ended June 30, 2016		$ (1,484,753)	$ (890,851)	$ (1,187,802)
c. Year ended June 30, 2015		$ (630,861)	$ (252,344)	$ (378,517)
d. Year ended June 30, 2014		$ 1,571,711	$ 314,341	$ 628,684
e. Year ended June 30, 2013		$ 833,405	N/A	$ 166,681
f. Unrecognized return adjustment			$ 184,257	$ (770,954)
7. **Actuarial value at end of year** *(1. - 6.f.)*			**$ 19,916,322**	**$ 18,765,863**
8. Approximate return on actuarial value of assets during fiscal year			9.3%	7.6%
9. Ratio of actuarial value of assets to market value of assets			0.99	1.04

Membership Data

Distribution of Active Members (Total)

	Years of Service as of June 30, 2017									
Age	**<3***	**3 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25 - 29**	**30 - 34**	**35+**	**Total**
< 25	6,600	278	16							**6,894**
Avg. Earnings	$ 15,386	$ 24,008	$ 32,008							**$ 15,773**
25 - 29	9,295	2,408	1,004	20						**12,727**
Avg. Earnings	$ 25,070	$ 34,934	$ 38,038	$ 41,042						**$ 27,985**
30 - 34	7,274	2,942	3,258	911	18					**14,403**
Avg. Earnings	$ 29,124	$ 40,868	$ 45,690	$ 50,598	$ 42,427					**$ 36,645**
35 - 39	6,415	2,575	3,356	2,582	825	13				**15,766**
Avg. Earnings	$ 27,390	$ 40,258	$ 47,086	$ 56,331	$ 57,380	$ 55,006				**$ 40,016**
40 - 44	5,152	2,264	3,065	2,461	2,192	437	6			**15,577**
Avg. Earnings	$ 25,564	$ 35,734	$ 40,671	$ 55,626	$ 63,409	$ 62,303	$ 51,235			**$ 41,130**
45 - 49	4,505	2,195	3,622	2,937	2,557	1,764	459	19		**18,058**
Avg. Earnings	$ 25,945	$ 33,545	$ 36,280	$ 47,329	$ 60,756	$ 65,342	$ 62,361	$ 72,060		**$ 42,172**
50 - 54	3,682	1,779	3,580	3,652	3,245	2,161	1,744	698	15	**20,556**
Avg. Earnings	$ 25,987	$ 32,176	$ 34,233	$ 39,808	$ 48,904	$ 60,331	$ 66,891	$ 63,366	$ 61,949	**$ 42,408**
55 - 59	3,258	1,537	3,035	3,635	4,255	2,990	2,414	1,679	734	**23,537**
Avg. Earnings	$ 23,356	$ 31,815	$ 35,308	$ 37,903	$ 42,970	$ 50,648	$ 63,336	$ 69,472	$ 63,648	**$ 43,355**
60 - 64	2,183	1,117	1,985	2,167	2,879	2,537	2,050	1,194	1,200	**17,312**
Avg. Earnings	$ 21,741	$ 28,301	$ 33,921	$ 39,814	$ 41,708	$ 44,316	$ 53,950	$ 64,081	$ 68,389	**$ 42,419**
65 - 69	1,086	507	874	722	781	638	483	277	312	**5,680**
Avg. Earnings	$ 14,179	$ 21,363	$ 25,682	$ 35,109	$ 43,153	$ 43,657	$ 49,253	$ 60,948	$ 71,105	**$ 34,936**
70+	649	275	491	363	238	103	92	61	85	**2,357**
Avg. Earnings	$ 11,046	$ 11,890	$ 13,626	$ 20,180	$ 31,076	$ 33,531	$ 42,733	$ 44,669	$ 57,861	**$ 19,889**
Total	**50,099**	**17,877**	**24,286**	**19,450**	**16,990**	**10,643**	**7,248**	**3,928**	**2,346**	**152,867**
Avg. Earnings	**$ 24,203**	**$ 34,742**	**$ 38,204**	**$ 44,749**	**$ 49,744**	**$ 53,439**	**$ 60,265**	**$ 65,774**	**$ 66,844**	**$ 38,581**

* *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.*

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 Active Members (Basic)

	Years of Service as of June 30, 2017									
Age	**<3***	**3 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25 - 29**	**30 - 34**	**35+**	**Total**
< 25										
Avg. Earnings										
25 - 29										
Avg. Earnings										
30 - 34										
Avg. Earnings										
35 - 39										
Avg. Earnings										
40 - 44										
Avg. Earnings										
45 - 49										
Avg. Earnings										
50 - 54										
Avg. Earnings										
55 - 59										
Avg. Earnings										
60 - 64										
Avg. Earnings										
65 - 69									1	**1**
Avg. Earnings									$91,240	**$ 91,240**
70+									3	**3**
Avg. Earnings									$72,142	**$ 72,142**
Total									**4**	**4**
Avg. Earnings									**$76,917**	**$ 76,917**

* *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.*

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 Active Members (Coordinated)

Age	Years of Service as of June 30, 2017									
	<3*	3 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35+	Total
< 25	6,600	278	16							**6,894**
Avg. Earnings	$ 15,386	$ 24,008	$ 32,008							**$ 15,773**
25 - 29	9,295	2,408	1,004	20						**12,727**
Avg. Earnings	$ 25,070	$ 34,934	$ 38,038	$ 41,042						**$ 27,985**
30 - 34	7,274	2,942	3,258	911	18					**14,403**
Avg. Earnings	$ 29,124	$ 40,868	$ 45,690	$ 50,598	$ 42,427					**$ 36,645**
35 - 39	6,415	2,575	3,356	2,582	825	13				**15,766**
Avg. Earnings	$ 27,390	$ 40,258	$ 47,086	$ 56,331	$ 57,380	$ 55,006				**$ 40,016**
40 - 44	5,152	2,264	3,065	2,461	2,192	437	6			**15,577**
Avg. Earnings	$ 25,564	$ 35,734	$ 40,671	$ 55,626	$ 63,409	$ 62,303	$ 51,235			**$ 41,130**
45 - 49	4,505	2,195	3,622	2,937	2,557	1,764	459	19		**18,058**
Avg. Earnings	$ 25,945	$ 33,545	$ 36,280	$ 47,329	$ 60,756	$ 65,342	$ 62,361	$ 72,060		**$ 42,172**
50 - 54	3,682	1,779	3,580	3,652	3,245	2,161	1,744	698	15	**20,556**
Avg. Earnings	$ 25,987	$ 32,176	$ 34,233	$ 39,808	$ 48,904	$ 60,331	$ 66,891	$ 63,366	$ 61,949	**$ 42,408**
55 - 59	3,258	1,537	3,035	3,635	4,255	2,990	2,414	1,679	734	**23,537**
Avg. Earnings	$ 23,356	$ 31,815	$ 35,308	$ 37,903	$ 42,970	$ 50,648	$ 63,336	$ 69,472	$ 63,648	**$ 43,355**
60 - 64	2,183	1,117	1,985	2,167	2,879	2,537	2,050	1,194	1,190	**17,302**
Avg. Earnings	$ 21,741	$ 28,301	$ 33,921	$ 39,814	$ 41,708	$ 44,316	$ 53,950	$ 64,081	$ 68,375	**$ 42,403**
65 - 69	1,086	507	874	722	781	638	483	277	309	**5,677**
Avg. Earnings	$ 14,179	$ 21,363	$ 25,682	$ 35,109	$ 43,153	$ 43,657	$ 49,253	$ 60,948	$ 70,965	**$ 34,909**
70+	649	275	491	363	238	103	92	61	79	**2,351**
Avg. Earnings	$ 11,046	$ 11,890	$ 13,626	$ 20,180	$ 31,076	$ 33,531	$ 42,733	$ 44,669	$ 57,125	**$ 19,767**
Total	**50,099**	**17,877**	**24,286**	**19,450**	**16,990**	**10,643**	**7,248**	**3,928**	**2,327**	**152,848**
Avg. Earnings	**$ 24,203**	**$ 34,742**	**$ 38,204**	**$ 44,749**	**$ 49,744**	**$ 53,439**	**$ 60,265**	**$ 65,774**	**$ 66,804**	**$ 38,577**

* *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.*

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 Active Members (MERF)

	Years of Service as of June 30, 2017									
Age	**<3***	**3 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25 - 29**	**30 - 34**	**35+**	**Total**
< 25										
Avg. Earnings										
25 - 29										
Avg. Earnings										
30 - 34										
Avg. Earnings										
35 - 39										
Avg. Earnings										
40 - 44										
Avg. Earnings										
45 - 49										
Avg. Earnings										
50 - 54										
Avg. Earnings										
55 - 59										
Avg. Earnings										
60 - 64									10	**10**
Avg. Earnings									$ 70,056	**$ 70,056**
65 - 69									2	**2**
Avg. Earnings									$ 82,699	**$ 82,699**
70+									3	**3**
Avg. Earnings									$ 62,964	**$ 62,964**
Total									**15**	**15**
Avg. Earnings									**$ 70,323**	**$ 70,323**

* *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.*

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 (Total)

	Years Retired as of June 30, 2017							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<50								
Avg. Benefit								
50 - 54	10	17	1					**28**
Avg. Benefit	$ 11,647	$ 11,869	$ 9,373					**$ 11,701**
55 - 59	712	1,397	44	3				**2,156**
Avg. Benefit	$ 15,608	$ 13,220	$ 12,964	$ 34,785				**$ 14,033**
60 - 64	2,246	5,857	2,406	160	17			**10,686**
Avg. Benefit	$ 15,780	$ 15,962	$ 13,157	$ 31,512	$ 39,390			**$ 15,562**
65 - 69	2,255	10,630	6,938	2,765	195	10		**22,793**
Avg. Benefit	$ 15,167	$ 14,721	$ 14,992	$ 14,041	$ 36,863	$ 37,948		**$ 14,965**
70 - 74	359	3,255	7,789	5,250	2,353	51	1	**19,058**
Avg. Benefit	$ 12,781	$ 12,600	$ 13,151	$ 14,146	$ 15,423	$ 50,002	$ 18,409	**$ 13,703**
75 - 79	87	665	1,915	4,818	4,380	1,281	21	**13,167**
Avg. Benefit	$ 6,447	$ 7,945	$ 10,809	$ 11,270	$ 14,146	$ 17,641	$ 46,941	**$ 12,637**
80 - 84	32	237	480	1,080	3,787	2,658	708	**8,982**
Avg. Benefit	$ 6,764	$ 6,436	$ 6,461	$ 9,333	$ 12,012	$ 19,394	$ 20,556	**$ 14,085**
85 - 89	6	46	161	279	752	2,523	1,769	**5,536**
Avg. Benefit	$ 1,505	$ 6,165	$ 5,871	$ 5,837	$ 10,305	$ 17,147	$ 22,065	**$ 16,783**
90+		7	20	87	153	459	2,645	**3,371**
Avg. Benefit		$ 8,841	$ 3,274	$ 6,715	$ 7,205	$ 15,772	$ 20,365	**$ 18,665**
Total	**5,707**	**22,111**	**19,754**	**14,442**	**11,637**	**6,982**	**5,144**	**85,777**
Avg. Benefit	**$ 15,113**	**$ 14,328**	**$ 13,339**	**$ 12,798**	**$ 13,788**	**$ 18,272**	**$ 21,084**	**$ 14,548**

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 Service Retirements (Basic)

Age	Years Retired as of June 30, 2017 <1	1 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25+	Total
<50								
Avg. Benefit								
50 - 54								
Avg. Benefit								
55 - 59								
Avg. Benefit								
60 - 64								
Avg. Benefit								
65 - 69		1	3	32	3			**39**
Avg. Benefit		$ 32,789	$ 34,859	$ 45,167	$ 26,080			**$ 42,588**
70 - 74	1	6	33	85	237	8		**370**
Avg. Benefit	$ 60,962	$ 31,444	$ 26,173	$ 39,172	$ 41,677	$ 36,945		**$ 39,502**
75 - 79	1	1	18	69	391	237	5	**722**
Avg. Benefit	$ 68,599	$ 3,020	$ 32,983	$ 30,068	$ 40,693	$ 48,203	$ 31,297	**$ 41,872**
80 - 84			3	21	206	502	192	**924**
Avg. Benefit			$ 65,255	$ 42,215	$ 30,180	$ 47,529	$ 43,610	**$ 42,784**
85 - 89			1	3	41	368	516	**929**
Avg. Benefit			$ 54,565	$ 21,817	$ 33,783	$ 38,583	$ 41,868	**$ 40,159**
90+				1	7	66	831	**905**
Avg. Benefit				$ 27,431	$ 28,569	$ 39,032	$ 34,952	**$ 35,192**
Total	**2**	**8**	**58**	**211**	**885**	**1,181**	**1,544**	**3,889**
Avg. Benefit	**$ 64,780**	**$ 28,059**	**$ 31,247**	**$ 37,104**	**$ 38,044**	**$ 44,330**	**$ 38,328**	**$ 39,907**

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 Service Retirements (Coordinated)

	Years Retired as of June 30, 2017							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<50								
Avg. Benefit								
50 - 54	10	17	1					**28**
Avg. Benefit	$ 11,647	$ 11,869	$ 9,373					**$ 11,701**
55 - 59	712	1,391	41					**2,144**
Avg. Benefit	$ 15,608	$ 13,102	$ 10,011					**$ 13,875**
60 - 64	2,239	5,831	2,362	49				**10,481**
Avg. Benefit	$ 15,728	$ 15,828	$ 12,639	$ 11,056				**$ 15,066**
65 - 69	2,251	10,589	6,815	2,544	34			**22,233**
Avg. Benefit	$ 15,186	$ 14,678	$ 14,670	$ 11,695	$ 11,000			**$ 14,380**
70 - 74	355	3,231	7,698	4,994	1,900	4		**18,182**
Avg. Benefit	$ 12,087	$ 12,487	$ 12,953	$ 12,961	$ 8,683	$ 13,273		**$ 12,410**
75 - 79	86	657	1,879	4,680	3,798	966	1	**12,067**
Avg. Benefit	$ 5,725	$ 7,364	$ 10,470	$ 10,787	$ 10,321	$ 7,381	$ 19,618	**$ 10,097**
80 - 84	31	237	474	1,032	3,483	2,014	461	**7,732**
Avg. Benefit	$ 6,208	$ 6,436	$ 6,014	$ 8,103	$ 10,458	$ 11,196	$ 7,196	**$ 9,729**
85 - 89	6	46	160	270	687	2,039	1,098	**4,306**
Avg. Benefit	$ 1,505	$ 6,165	$ 5,566	$ 5,179	$ 8,244	$ 12,292	$ 10,142	**$ 10,321**
90+		7	20	83	139	367	1,544	**2,160**
Avg. Benefit		$ 8,841	$ 3,274	$ 5,414	$ 5,423	$ 10,402	$ 10,407	**$ 9,822**
Total	**5,690**	**22,006**	**19,450**	**13,652**	**10,041**	**5,390**	**3,104**	**79,333**
Avg. Benefit	**$ 15,046**	**$ 14,233**	**$ 13,030**	**$ 11,406**	**$ 9,851**	**$ 10,874**	**$ 9,839**	**$ 12,555**

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 Service Retirements (MERF)

	Years Retired as of June 30, 2017							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<50								
Avg. Benefit								
50 - 54								
Avg. Benefit								
55 - 59		6	3	3				**12**
Avg. Benefit		$ 40,499	$ 53,317	$ 34,785				**$ 42,275**
60 - 64	7	26	44	111	17			**205**
Avg. Benefit	$ 32,638	$ 45,838	$ 40,945	$ 40,542	$ 39,390			**$ 40,935**
65 - 69	4	40	120	189	158	10		**521**
Avg. Benefit	$ 4,075	$ 25,507	$ 32,812	$ 40,350	$ 42,633	$ 37,948		**$ 37,842**
70 - 74	3	18	58	171	216	39	1	**506**
Avg. Benefit	$ 78,838	$ 26,512	$ 31,981	$ 36,306	$ 45,902	$ 56,447	$ 18,409	**$ 41,327**
75 - 79		7	18	69	191	78	15	**378**
Avg. Benefit		$ 63,187	$ 23,979	$ 25,252	$ 35,866	$ 51,839	$ 53,978	**$ 37,883**
80 - 84	1		3	27	98	142	55	**326**
Avg. Benefit	$ 24,007		$ 18,249	$ 30,742	$ 29,033	$ 36,204	$ 52,056	**$ 36,068**
85 - 89				6	24	116	155	**301**
Avg. Benefit				$ 27,480	$ 29,172	$ 34,483	$ 40,605	**$ 37,072**
90+				3	7	26	270	**306**
Avg. Benefit				$ 35,798	$ 21,223	$ 32,535	$ 32,411	**$ 32,199**
Total	**15**	**97**	**246**	**579**	**711**	**411**	**496**	**2,555**
Avg. Benefit	**$ 33,686**	**$ 34,790**	**$ 33,497**	**$ 36,759**	**$ 39,191**	**$ 40,417**	**$ 37,774**	**$ 37,814**

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 (Total)

	Years Since Death as of June 30, 2017							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<45	26	88	49	19	14	4	4	**204**
Avg. Benefit	$ 10,950	$ 6,269	$ 5,233	$ 3,951	$ 7,151	$ 13,963	$ 13,664	**$ 6,757**
45 - 49	5	31	31	9	6	7	6	**95**
Avg. Benefit	$ 5,544	$ 6,634	$ 6,305	$ 6,650	$ 5,727	$ 7,056	$ 15,167	**$ 6,983**
50 - 54	18	62	29	20	9	3	8	**149**
Avg. Benefit	$ 10,280	$ 6,813	$ 6,348	$ 8,695	$ 8,662	$ 7,568	$ 8,350	**$ 7,604**
55 - 59	44	139	73	33	18	14	4	**325**
Avg. Benefit	$ 11,382	$ 9,833	$ 10,534	$ 9,097	$ 8,613	$ 12,409	$ 16,246	**$ 10,248**
60 - 64	63	205	200	89	43	25	12	**637**
Avg. Benefit	$ 12,398	$ 12,408	$ 9,677	$ 12,053	$ 10,712	$ 16,114	$ 19,125	**$ 11,658**
65 - 69	80	357	228	141	76	38	32	**952**
Avg. Benefit	$ 13,313	$ 11,593	$ 12,182	$ 11,800	$ 16,399	$ 23,313	$ 17,280	**$ 12,952**
70 - 74	79	311	266	155	84	46	65	**1,006**
Avg. Benefit	$ 14,468	$ 13,213	$ 11,559	$ 12,403	$ 15,320	$ 17,013	$ 22,974	**$ 13,730**
75 - 79	75	346	265	188	135	83	110	**1,202**
Avg. Benefit	$ 15,235	$ 14,588	$ 14,075	$ 13,366	$ 14,204	$ 21,557	$ 23,174	**$ 15,548**
80 - 84	90	309	295	187	169	123	184	**1,357**
Avg. Benefit	$ 14,625	$ 17,309	$ 15,224	$ 18,379	$ 17,133	$ 21,024	$ 24,249	**$ 18,081**
85 - 89	71	294	280	178	169	140	285	**1,417**
Avg. Benefit	$ 21,842	$ 22,331	$ 20,638	$ 17,717	$ 21,734	$ 20,934	$ 23,613	**$ 21,441**
90+	43	163	210	212	163	150	360	**1,301**
Avg. Benefit	$ 17,990	$ 21,337	$ 16,024	$ 18,955	$ 22,530	$ 19,114	$ 23,700	**$ 20,528**
Total	**594**	**2,305**	**1,926**	**1,231**	**886**	**633**	**1,070**	**8,645**
Avg. Benefit	**$ 14,765**	**$ 14,654**	**$ 13,789**	**$ 14,939**	**$ 17,517**	**$ 19,820**	**$ 23,202**	**$ 16,239**

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 Survivors (Basic)

Age	Years Since Death as of June 30, 2017							
	<1	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<45		1			1		1	**3**
Avg. Benefit		$ 7,753			$ 5,790		$ 20,829	**$ 11,457**
45 - 49		1				1	3	**5**
Avg. Benefit		$ 38,763				$ 7,980	$ 24,766	**$ 24,208**
50 - 54		1			1			**2**
Avg. Benefit		$ 29,994			$ 4,793			**$ 17,393**
55 - 59		1		1	1	1	1	**5**
Avg. Benefit		$ 19,214		$ 14,305	$ 2,384	$ 9,240	$ 37,424	**$ 16,513**
60 - 64	1	1	6	3	3		4	**18**
Avg. Benefit	$ 1,144	$ 21,194	$ 10,762	$ 14,469	$ 10,089		$ 32,117	**$ 16,058**
65 - 69	3	7	6	3	5	4	10	**38**
Avg. Benefit	$ 14,517	$ 22,889	$ 20,502	$ 9,967	$ 16,203	$ 45,554	$ 25,109	**$ 22,921**
70 - 74	9	24	16	20	8	6	28	**111**
Avg. Benefit	$ 27,606	$ 30,561	$ 22,140	$ 29,399	$ 35,262	$ 30,149	$ 33,348	**$ 29,918**
75 - 79	15	59	46	39	27	23	42	**251**
Avg. Benefit	$ 34,351	$ 30,234	$ 28,960	$ 30,869	$ 29,430	$ 32,982	$ 27,999	**$ 30,137**
80 - 84	17	67	81	68	55	31	61	**380**
Avg. Benefit	$ 31,090	$ 32,685	$ 29,828	$ 30,956	$ 32,959	$ 39,139	$ 30,681	**$ 31,940**
85 - 89	23	116	104	58	78	64	112	**555**
Avg. Benefit	$ 38,136	$ 33,104	$ 36,368	$ 35,724	$ 34,447	$ 32,520	$ 27,554	**$ 33,199**
90+	16	65	75	96	87	71	163	**573**
Avg. Benefit	$ 28,549	$ 31,458	$ 26,296	$ 30,257	$ 33,742	$ 28,504	$ 23,939	**$ 28,342**
Total	**84**	**343**	**334**	**288**	**266**	**201**	**425**	**1,941**
Avg. Benefit	**$ 31,796**	**$ 31,688**	**$ 30,074**	**$ 31,115**	**$ 32,467**	**$ 32,126**	**$ 27,015**	**$ 30,459**

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 Survivors (Coordinated)

	Years Since Death as of June 30, 2017							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<45	25	87	49	19	13	4	3	**200**
Avg. Benefit	$ 10,008	$ 6,251	$ 5,233	$ 3,951	$ 7,255	$ 13,963	$ 11,276	**$ 6,548**
45 - 49	5	30	29	9	6	6	3	**88**
Avg. Benefit	$ 5,544	$ 5,563	$ 4,875	$ 6,650	$ 5,727	$ 6,902	$ 5,569	**$ 5,549**
50 - 54	18	60	29	20	8	3	8	**146**
Avg. Benefit	$ 10,280	$ 6,387	$ 6,348	$ 8,695	$ 9,146	$ 7,568	$ 8,350	**$ 7,459**
55 - 59	43	136	72	30	16	12	3	**312**
Avg. Benefit	$ 11,189	$ 9,620	$ 10,234	$ 7,024	$ 7,519	$ 11,092	$ 9,187	**$ 9,673**
60 - 64	61	194	191	83	36	20	6	**591**
Avg. Benefit	$ 12,397	$ 11,852	$ 9,210	$ 10,710	$ 9,073	$ 11,040	$ 11,967	**$ 10,698**
65 - 69	75	335	216	130	58	19	16	**849**
Avg. Benefit	$ 12,546	$ 10,301	$ 11,226	$ 10,606	$ 13,154	$ 12,423	$ 9,906	**$ 11,016**
70 - 74	65	268	246	135	68	35	20	**837**
Avg. Benefit	$ 9,564	$ 10,139	$ 10,551	$ 9,601	$ 9,787	$ 12,186	$ 11,065	**$ 10,278**
75 - 79	57	269	209	147	101	44	40	**867**
Avg. Benefit	$ 9,640	$ 9,628	$ 9,659	$ 8,662	$ 9,837	$ 10,140	$ 8,179	**$ 9,456**
80 - 84	70	222	209	117	111	76	65	**870**
Avg. Benefit	$ 8,850	$ 10,934	$ 8,801	$ 10,727	$ 8,772	$ 10,834	$ 9,611	**$ 9,843**
85 - 89	38	146	170	120	90	69	88	**721**
Avg. Benefit	$ 7,669	$ 9,457	$ 10,078	$ 9,014	$ 10,849	$ 8,932	$ 9,556	**$ 9,571**
90+	24	81	128	116	76	77	82	**584**
Avg. Benefit	$ 8,806	$ 11,426	$ 9,391	$ 9,598	$ 9,695	$ 9,675	$ 10,423	**$ 9,877**
Total	**481**	**1,828**	**1,548**	**926**	**583**	**365**	**334**	6,065
Avg. Benefit	**$ 10,259**	**$ 9,952**	**$ 9,608**	**$ 9,552**	**$ 9,876**	**$ 10,321**	**$ 9,713**	$ 9,829

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 Survivors (MERF)

	Years Since Death as of June 30, 2017							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<45	1							**1**
Avg. Benefit	$ 34,504							**$ 34,504**
45 - 49			2					**2**
Avg. Benefit			$ 27,035					**$ 27,035**
50 - 54		1						**1**
Avg. Benefit		$ 9,202						**$ 9,202**
55 - 59	1	2	1	2	1	1		**8**
Avg. Benefit	$ 19,675	$ 19,653	$ 32,186	$ 37,582	$ 32,352	$ 31,371		**$ 28,757**
60 - 64	1	10	3	3	4	5	2	**28**
Avg. Benefit	$ 23,713	$ 22,324	$ 37,265	$ 46,797	$ 25,925	$ 36,410	$ 14,618	**$ 29,076**
65 - 69	2	15	6	8	13	15	6	**65**
Avg. Benefit	$ 40,275	$ 35,171	$ 38,299	$ 31,889	$ 30,952	$ 31,177	$ 23,895	**$ 32,406**
70 - 74	5	19	4		8	5	17	**58**
Avg. Benefit	$ 54,577	$ 34,115	$ 28,641		$ 42,404	$ 35,039	$ 19,898	**$ 32,557**
75 - 79	3	18	10	2	7	16	28	**84**
Avg. Benefit	$ 25,951	$ 37,442	$ 37,900	$ 17,761	$ 18,488	$ 36,532	$ 37,356	**$ 34,836**
80 - 84	3	20	5	2	3	16	58	**107**
Avg. Benefit	$ 56,062	$ 36,573	$ 47,119	$ 38,463	$ 36,340	$ 34,329	$ 33,890	**$ 35,851**
85 - 89	10	32	6		1	7	85	**141**
Avg. Benefit	$ 38,226	$ 42,017	$ 47,175		$ 9,725	$ 33,309	$ 32,973	**$ 35,854**
90+	3	17	7			2	115	**144**
Avg. Benefit	$ 35,151	$ 30,532	$ 28,579			$ 49,140	$ 32,828	**$ 32,625**
Total	**29**	**134**	**44**	**17**	**37**	**67**	**311**	**639**
Avg. Benefit	**$ 40,175**	**$ 35,198**	**$ 37,275**	**$ 34,301**	**$ 30,428**	**$ 34,649**	**$ 32,477**	**$ 33,885**

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 (Total)

Age	Years Disabled* as of June 30, 2017 <1	1 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25+	Total
< 45	2	14	7	2	1			**26**
Avg. Benefit	$ 12,953	$ 6,233	$ 6,210	$ 2,122	$ 1,844			**$ 6,259**
45 - 49	3	25	17	6	2			**53**
Avg. Benefit	$ 9,001	$ 9,838	$ 7,121	$ 6,200	$ 1,880			**$ 8,207**
50 - 54	9	62	40	30	11	2		**154**
Avg. Benefit	$ 13,342	$ 12,419	$ 8,278	$ 6,240	$ 5,974	$ 4,290		**$ 9,628**
55 - 59	26	167	117	91	34	16	7	**458**
Avg. Benefit	$ 17,550	$ 14,683	$ 12,506	$ 8,889	$ 5,937	$ 6,674	$ 6,564	**$ 12,085**
60 - 64	47	223	252	150	84	41	12	**809**
Avg. Benefit	$ 19,492	$ 17,707	$ 13,297	$ 11,738	$ 9,030	$ 9,347	$ 9,082	**$ 13,878**
65 - 69	213	575	61	38	13	7	10	**917**
Avg. Benefit	$ 12,961	$ 13,529	$ 11,459	$ 8,449	$ 10,120	$ 28,650	$ 24,566	**$ 13,236**
70 - 74		121	497	19	8	8	10	**663**
Avg. Benefit		$ 12,112	$ 13,367	$ 11,411	$ 26,951	$ 35,771	$ 28,152	**$ 13,739**
75+			59	323	185	75	57	**699**
Avg. Benefit			$ 12,548	$ 14,020	$ 16,853	$ 18,342	$ 22,904	**$ 15,834**
Total	**300**	**1,187**	**1,050**	**659**	**338**	**149**	**96**	**3,779**
Avg. Benefit	**$ 14,354**	**$ 14,110**	**$ 12,754**	**$ 11,934**	**$ 13,303**	**$ 15,846**	**$ 20,704**	**$ 13,537**

** 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

Distribution of Disability Retirements (Basic)

	Years Disabled* as of June 30, 2017							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
< 45								
Avg. Benefit								
45 - 49								
Avg. Benefit								
50 - 54								
Avg. Benefit								
55 - 59								
Avg. Benefit								
60 - 64								
Avg. Benefit								
65 - 69								
Avg. Benefit								
70 - 74		3	9					**12**
Avg. Benefit		$ 43,557	$ 44,477					**$ 44,247**
75+			4	18	28	17	13	**80**
Avg. Benefit			$ 42,878	$ 41,934	$ 40,923	$ 38,698	$ 36,761	**$ 40,099**
Total		**3**	**13**	**18**	**28**	**17**	**13**	**92**
Avg. Benefit		**$ 43,557**	**$ 43,985**	**$ 41,934**	**$ 40,923**	**$ 38,698**	**$ 36,761**	**$ 40,640**

** 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

Distribution of Disability Retirements (Coordinated)

	Years Disabled* as of June 30, 2017							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
< 45	2	14	7	2	1			**26**
Avg. Benefit	$ 12,953	$ 6,233	$ 6,210	$ 2,122	$ 1,844			**$ 6,259**
45 - 49	3	25	17	6	2			**53**
Avg. Benefit	$ 9,001	$ 9,838	$ 7,121	$ 6,200	$ 1,880			**$ 8,207**
50 - 54	9	62	40	30	11	2		**154**
Avg. Benefit	$ 13,342	$ 12,419	$ 8,278	$ 6,240	$ 5,974	$ 4,290		**$ 9,628**
55 - 59	26	167	117	91	34	16	7	**458**
Avg. Benefit	$ 17,550	$ 14,683	$ 12,506	$ 8,889	$ 5,937	$ 6,674	$ 6,564	**$ 12,085**
60 - 64	47	215	252	150	84	41	12	**801**
Avg. Benefit	$ 19,492	$ 17,596	$ 13,297	$ 11,738	$ 9,030	$ 9,347	$ 9,082	**$ 13,810**
65 - 69	213	571	61	38	13	1	1	**898**
Avg. Benefit	$ 12,961	$ 13,443	$ 11,459	$ 8,449	$ 10,120	$ 5,146	$ 9,307	**$ 12,920**
70 - 74		118	488	19	1			**626**
Avg. Benefit		$ 11,313	$ 12,793	$ 11,411	$ 2,027			**$ 12,455**
75+			55	305	153	55	18	**586**
Avg. Benefit			$ 10,342	$ 12,373	$ 12,455	$ 11,913	$ 9,025	**$ 12,058**
Total	**300**	**1,172**	**1,037**	**641**	**299**	**115**	**38**	**3,602**
Avg. Benefit	**$ 14,354**	**$ 13,950**	**$ 12,363**	**$ 11,092**	**$ 10,271**	**$ 10,078**	**$ 8,597**	**$ 12,533**

** 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

Distribution of Disability Retirements (MERF)

	Years Disabled* as of June 30, 2017							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
< 45								
Avg. Benefit								
45 - 49								
Avg. Benefit								
50 - 54								
Avg. Benefit								
55 - 59								
Avg. Benefit								
60 - 64		8						**8**
Avg. Benefit		$ 20,675						**$ 20,675**
65 - 69		4				6	9	**19**
Avg. Benefit		$ 25,793				$ 32,567	$ 26,261	**$ 28,154**
70 - 74					7	8	10	**25**
Avg. Benefit					$ 30,511	$ 35,771	$ 28,152	**$ 31,251**
75+					4	3	26	**33**
Avg. Benefit					$ 16,554	$ 20,862	$ 25,583	**$ 24,060**
Total		**12**			**11**	**17**	**45**	**85**
Avg. Benefit		**$ 22,381**			**$ 25,436**	**$ 32,009**	**$ 26,290**	**$ 26,771**

** 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
GERP Members on 7/1/2016	**148,745**	**52,516**	**132,416**	**81,911**	**3,830**	**8,547**	**427,965**
New members	18,849	0	0	0	0	0	**18,849**
Return to active	3,007	(914)	(2,093)	0	0	0	**0**
Terminated non-vested	(8,102)	0	8,102	0	0	0	**0**
Service retirements	(3,286)	(2,750)	0	6,036	0	0	**0**
Terminated deferred	(3,813)	3,813	0	0	0	0	**0**
Terminated refund/transfer	(2,243)	(970)	(1,361)	0	0	0	**(4,574)**
Deaths	(194)	(128)	(299)	(2,247)	(183)	(522)	**(3,573)**
New beneficiary	0	0	0	0	0	642	**642**
Disabled	(99)	0	0	0	99	0	**0**
Data adjustments	3	707	1,570	77	33	(22)	**2,368**
Net change	4,122	(242)	5,919	3,866	(51)	98	**13,712**
GERP Members on 6/30/2017	**152,867**	**52,274**	**138,335**	**85,777**	**3,779**	**8,645**	**441,677**

Terminated Member Statistics	**Deferred Retirement**	**Other Non-Vested**	**Total**
Number*	52,274	138,335	190,609
Average age	51.1	47.4	48.4
Average service	7.3	1.0	2.7
Average annual benefit, with augmentation to Normal Retirement Date and 15% CSA load	$ 6,613	N/A	$ 6,613
Average refund value, with 15% CSA load (3% CSA load for Non-Vested)	$ 11,444	$ 755	$ 3,687

** Includes 17 deferred MERF members.*

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 14.60% 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.

	Non-Vested	Vested	June 30, 2017
A. Actuarial Value of Assets			$ 19,916,322
B. Expected Future Assets			
1. Present value of expected future statutory supplemental contributions*			$ 4,582,198
2. Present value of future normal cost contributions			$ 3,626,514
3. Total expected future assets: *(1.) + (2.)*			$ 8,208,712
C. Total Current and Expected Future Assets *(A.+ B.3)*			$ 28,125,034
D. Current Benefit Obligations**			
1. Benefit recipients	**Non-Vested**	**Vested**	**Total**
a. Service retirements	$ -	$ 12,367,330	$ 12,367,330
b. Disability retirements	$ -	$ 476,606	$ 476,606
c. Survivors	$ -	$ 1,052,472	$ 1,052,472
2. Deferred retirements with augmentation	$ -	$ 1,855,224	$ 1,855,224
3. Former members without vested rights	$ 48,784	$ -	$ 48,784
4. Active members	$ 282,764	$ 8,171,255	$ 8,454,019
5. Total Current Benefit Obligations	$ 331,548	$ 23,922,887	$ 24,254,435
E. Expected Future Benefit Obligations			$ 4,987,801
F. Total Current and Expected Future Benefit Obligations***			$ 29,242,236
G. Unfunded Current Benefit Obligations: *(D.5.) - (A.)*			$ 4,338,113
H. Unfunded Current and Future Benefit Obligations: *(F.) - (C.)*			$ 1,117,202
I. Accrued Benefit Funding Ratio: *(A.)/(D.)*			82.11%
J. Projected Benefit Funding Ratio: *(C.)/(F.)*			96.18%

* *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	$ 12,256,837	$ 2,522,906	$ 9,733,931
b. Disability benefits	$ 323,749	$ 112,332	$ 211,417
c. Survivor's benefits	$ 169,675	$ 46,240	$ 123,435
d. Deferred retirements	$ 601,033	$ 684,215	$ (83,182)
e. Refunds*	$ 90,526	$ 260,821	$ (170,295)
f. Total	$ 13,441,820	$ 3,626,514	$ 9,815,306
2. Deferred retirements with future augmentation	$ 1,855,224	$ -	$ 1,855,224
3. Former members without vested rights	$ 48,784	$ -	$ 48,784
4. Annuitants	$ 13,896,408	$ -	$ 13,896,408
5. Total	$ 29,242,236	$ 3,626,514	$ 25,615,722
B. Determination of Unfunded Actuarial Accrued Liability (UAAL)			
1. Actuarial accrued liability			$ 25,615,722
2. Current assets (AVA)			$ 19,916,322
3. Unfunded actuarial accrued liability			$ 5,699,400
C. Determination of Supplemental Contribution Rate			
1. Present value of future payrolls through the amortization date of June 30, 2033			$ 70,495,358
2. Supplemental contribution rate: *(B.3.) / (C.1.)*			8.08 % **

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

** *The amortization factor as of June 30, 2017 is 11.3668.*

Development of Costs

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

	Year Ending June 30, 2017		
	Actuarial Accrued Liability	Current Assets	Unfunded Actuarial Accrued Liability
A. At beginning of year	$ 24,848,409	$ 18,765,863	$ 6,082,546
B. Changes due to interest requirements and current rate of funding			
1. Normal cost, including expenses	$ 460,247	$ -	$ 460,247
2. Benefit payments	$ (1,450,682)	$ (1,450,682)	$ -
3. Contributions	$ -	$ 884,092	$ (884,092)
4. Interest on A., B.1., B.2., and B.3.	$ 1,948,255	$ 1,478,605	$ 469,650
5. Total *(B.1. + B.2. + B.3. + B.4.)*	$ 957,820	$ 912,015	$ 45,805
C. Expected unfunded actuarial accrued liability at end of year *(A. + B.5.)*			$ 6,128,351
D. Increase (decrease) due to actuarial losses (gains) because of experience deviations from expected			
1. Age and service retirements			$ 17,078
2. Disability retirements			$ (728)
3. Death-in-service benefits			$ (11,864)
4. Withdrawals			$ (17,813)
5. Salary increases			$ 3,195
6. Investment income			$ (238,444)
7. Mortality of annuitants			$ (19,552)
8. Other items			$ (99,625)
9. Total			$ (367,753)
E. Unfunded actuarial accrued liability at end of year before plan amendments and changes in actuarial assumptions *(C. + D.9.)*			$ 5,760,598
F. Change in unfunded actuarial accrued liability due to changes in plan provisions			$ -
G. Change in unfunded actuarial accrued liability due to changes in actuarial assumptions			$ (61,198)
H. Change in unfunded actuarial accrued liability due to changes in miscellaneous methodology			$ -
I. Unfunded actuarial accrued liability at end of year *(E. + F. + G. + H.)**			$ 5,699,400

** The unfunded actuarial accrued liability on a market value of assets basis is $5,515,143.*

Development of Costs

Determination of Contribution Sufficiency/(Deficiency) – Total *(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-payroll multiplied by projected annual payroll.

	Percent-of-Payroll	Dollar Amount
A. Statutory Contributions - Chapter 353		
1. Employee contributions	6.50%	$ 403,165
2. Employer contributions	7.50%	$ 465,177
3. Employer supplemental contributions	0.50%	$ 31,000
4. State contributions	0.10%	$ 6,000
5. Total	14.60%	$ 905,342
B. Required Contributions - Chapter 356		
1. Normal cost		
a. Retirement benefits	5.68%	$ 351,627
b. Disability benefits	0.23%	$ 14,287
c. Survivors	0.10%	$ 6,202
d. Deferred retirement benefits	1.35%	$ 83,743
e. Refunds*	0.55%	$ 34,115
f. Total	7.91%	$ 489,974
2. Supplemental Contribution Amortization of Unfunded Actuarial Accrued Liability by June 30, 2033	8.08%	$ 501,110
3. Allowance for Expenses	0.19%	$ 11,784
4. Total	16.18% **	$ 1,002,868
C. Contribution Sufficiency/(Deficiency) *(A.5. - B.4.)*	(1.58)%	$ (97,526)

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

*** The required contribution on a market value of assets basis is 15.92% of payroll.*

Note: Projected annual payroll for fiscal year beginning on the valuation date: $6,201,854.

Development of Costs

Determination of Normal Cost – Basic *(Dollars in Thousands)*

This exhibit compares statutory contributions to normal cost for the group of Basic Plan active members. This closed plan includes members not covered under the Social Security Act.

	Percent-of-Payroll	Dollar Amount
A. Statutory contributions - Chapter 353		
1. Employee contributions	9.10%	$ 29
2. Employer contributions	11.78%	$ 37
3. Total	20.88%	$ 66
B. Required contributions - Chapter 356		
1. Normal cost		
a. Retirement benefits	3.83%	$ 12
b. Disability benefits	0.21%	$ 1
c. Survivors	0.09%	$ -
d. Deferred retirement benefits	2.63%	$ 8
e. Refunds*	0.58%	$ 2
f. Total	7.34%	$ 23

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

Note: Projected annual payroll for fiscal year beginning on the valuation date: $318.

Development of Costs

This exhibit compares statutory contributions to normal cost for the group of Coordinated Plan active members.

Determination of Normal Cost – Coordinated *(Dollars in Thousands)*

	Percent-of-Payroll	Dollar Amount
A. Statutory contributions - Chapter 353		
1. Employee contributions	6.50%	$ 403,029
2. Employer contributions	7.50%	$ 465,033
3. Total	14.00%	$ 868,062
B. Required contributions - Chapter 356		
1. Normal cost		
a. Retirement benefits	5.67%	$ 351,565
b. Disability benefits	0.23%	$ 14,261
c. Survivors	0.10%	$ 6,200
d. Deferred retirement benefits	1.35%	$ 83,706
e. Refunds*	0.55%	$ 34,102
f. Total	7.90%	$ 489,834

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

Note: Projected annual payroll for fiscal year beginning on the valuation date: $6,200,442.

Development of Costs

This exhibit compares statutory contributions to normal cost for the MERF Plan active members.

Determination of Normal Cost – MERF *(Dollars in Thousands)*

	Percent-of-Payroll	Dollar Amount
A. Statutory contributions - Chapter 353		
1. Employee contributions	9.75%	$ 107
2. Employer contributions	9.75%	$ 107
3. Employer supplemental contributions	2,833.64%	$ 31,000
4. State contributions	548.45%	$ 6,000
5. Total	3,401.59%	$ 37,214
B. Required contributions - Chapter 356		
1. Normal cost		
a. Retirement benefits	4.57%	$ 50
b. Disability benefits	2.31%	$ 25
c. Survivors	0.22%	$ 2
d. Deferred retirement benefits	2.64%	$ 29
e. Refunds*	0.98%	$ 11
f. Total	10.72%	$ 117

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

Note: Projected annual payroll for fiscal year beginning on the valuation date: $1,094.

Development of Costs

Special Groups – Minneapolis Employees Retirement Fund (MERF)

The MERF Division merged with PERA on January 1, 2015. Former members of the MERF Division are now members of this plan.

Year Ending June 30, 2017

Group	Number	Average Annual Benefits	Average Age	Actuarial Accrued Liability (000s)
Active Members	15	N/A	64.4	$ 11,033
Deferred Retirements	17	N/A	63.7	$ 1,624
Service Retirements	2,555	$ 37,814	76.4	$ 888,041
Disability Retirements	85	$ 26,771	74.0	$ 19,448
Survivors	639	$ 33,885	81.2	$ 158,230
Total	**3,311**	**$ 36,762**	**77.1**	**$ 1,078,376**

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 be different.

Actuarial Cost Method

Actuarial Accrued Liability and required contributions in this report are computed using the Entry Age Normal Cost Method. This method is prescribed by Minnesota Statute. 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, 2033 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 – Basic and Coordinated

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. Unless noted otherwise, the assumptions prescribed are based on the last experience study dated June 30, 2015. The Allowance for Combined Service Annuity assumptions are based on an analysis completed by the LCPR actuary and documented in a report dated October 2016.

Investment return	8.00% per annum.
Benefit increases after retirement	1.00% per annum through 2035 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-2014 Employee Mortality Table, adjusted for white collar and mortality improvements using projection scale MP-2015, from a base year of 2014. Rates are set forward one year for males and set back one year for females.
Healthy post-retirement	RP-2014 Healthy Annuitant Mortality Table, adjusted for white collar and mortality improvements using projection scale MP-2015, from a base year of 2014. Rates are set forward two years for males. Female rates are multiplied by a factor of 0.90.
Disabled retirees	RP-2014 Disabled Mortality Table, adjusted for mortality improvements using projection scale MP-2015, from a base year of 2014. Rates are set forward one year for males and set forward six years for females. 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 tables. Members who have attained the highest assumed retirement age are assumed to retire in one year.
Withdrawal	Service-related rates based on experience; see table of sample rates.

Actuarial Basis

Summary of Actuarial Assumptions – Basic and Coordinated (Continued)

Disability	Age-related rates based on experience; see table of sample rates.
Allowance for combined service annuity	Liabilities for former members are increased by 15.0% for vested members and 3.0% for non-vested members 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 dates at the rates described in the Summary of Plan Provisions 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 Normal Retirement.
Percentage married	80% of male and 70% of female active members are assumed to be married. Actual marital status is used for members in payment status.
Age of spouse	Males are assumed to have a beneficiary three years younger, while females are assumed to have a beneficiary two years older. 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 15% elect 50% Joint & Survivor option 10% elect 75% Joint & Survivor option 35% elect 100% Joint & Survivor option Females: 10% elect 25% Joint & Survivor option 10% 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 – Basic and Coordinated (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 3,636 members reported with a salary less than $100. We used prior year salary (2,452 members), if available; otherwise high five salary with a 10% load to account for salary increases (1,057 members). If neither prior year salary or high five salary was available, we assumed a value of $35,000. There were also 2,339 members reported without a gender and 51 members reported with an invalid date of birth. We assumed a date of birth based on an entry age of 38 and female gender. <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 (186 members), we assumed a value of $24,000. If credited service was not reported (141 members), we assumed credited service was elapsed time from hire to termination date (92 members); otherwise nine years. If termination date was invalid or not reported (116 members), we assumed the termination date was equal to hire date plus credited service; otherwise the valuation date unless they are noted as a pre-July 1, 1989 hire, then June 30, 1989. If reported termination date occurs prior to reported hire date, the two dates were swapped. There were 44 members reported with an invalid date of birth and 272 members reported without a gender. We assumed a date of birth of July 1, 1967 and female gender. <u>Data for retired members:</u> There were 106 members reported without a gender. We assumed retirees are female and beneficiaries are male. There were 8 members reported with an invalid date of birth. We assumed a date of birth of July 1, 1945. There were 595 members that were active last year, and retirement eligible, and not on the retiree data file this year. At the direction of PERA, we included these members in the 2017 valuation as retirees with an estimated life only monthly benefit.

Actuarial Basis

Summary of Actuarial Assumptions – Basic and Coordinated (Continued)

Unknown data for certain members (Continued)	Data for retired members (Continued): Because PERA reclassifies disabled members as retirees once the member reaches Normal Retirement Age, we compare the members that PERA reports as retirees to our disabled group from the last valuation. If a member was disabled in the valuation, we reclassify that member as a disabled retiree in this year's valuation. We reclassified 2,142 retirees as disabled retirees in this valuation.
Changes in actuarial assumptions	The Combined Service Annuity (CSA) loads were 0.8% for active members (0.2% for active MERF members) and 60.0% for vested and non-vested deferred member liability (30.0% for deferred MERF members). The revised CSA loads are now 0.0% for active member liability, 15.0% for vested deferred member liability, and 3.0% for non-vested deferred member liability. The assumed post-retirement benefit increase rate was changed from 1.00% per year through 2052 and 2.50% per year thereafter to 1.00% per year through 2035 and 2.50% per year thereafter.

Summary of Actuarial Assumptions – Basic and Coordinated (Continued)

	Percentage of Members Dying Each Year*					
	Healthy Post-Retirement Mortality		Healthy Pre-Retirement Mortality		Disability Mortality	
Age in 2017	Male	Female	Male	Female	Male	Female
20	0.03%	0.01%	0.03%	0.01%	0.06%	0.10%
25	0.04	0.02	0.03	0.01	0.23	0.24
30	0.06	0.04	0.03	0.02	0.52	0.46
35	0.09	0.07	0.04	0.02	0.89	0.71
40	0.14	0.10	0.04	0.03	1.27	0.95
45	0.20	0.13	0.07	0.05	1.61	1.17
50	0.29	0.18	0.12	0.08	1.93	1.42
55	0.42	0.24	0.21	0.13	2.29	1.74
60	0.59	0.34	0.36	0.19	2.69	2.16
65	0.89	0.56	0.63	0.27	3.22	2.90
70	1.47	0.90	1.10	0.46	4.08	4.21

* *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.*

	Disability Retirement	
Age	Male	Female
20	0.01%	0.01%
25	0.01	0.01
30	0.01	0.01
35	0.03	0.02
40	0.05	0.04
45	0.08	0.05
50	0.15	0.10
55	0.34	0.16
60	0.53	0.28
65	0.00	0.00
70	0.00	0.00

Summary of Actuarial Assumptions – Basic and Coordinated (Continued)

	Retirement		
Age	Rule of 90 Eligible	Tier 1	Tier 2
55	20.0%	5.0%	5.0%
56	15.0%	5.0%	5.0%
57	15.0%	5.0%	5.0%
58	15.0%	6.0%	5.0%
59	15.0%	7.0%	6.0%
60	15.0%	8.0%	7.0%
61	18.0%	10.0%	9.0%
62	35.0%	20.0%	15.0%
63	25.0%	20.0%	15.0%
64	25.0%	25.0%	15.0%
65	32.5%	32.5%	25.0%
66	25.0%	25.0%	25.0%
67	20.0%	20.0%	20.0%
68	17.5%	17.5%	17.5%
69	15.0%	15.0%	15.0%
70	17.5%	17.5%	17.5%
71+	100.0%	100.0%	100.0%

Actuarial Basis

Summary of Actuarial Assumptions – Basic and Coordinated (Concluded)

Salary Scale			% Withdrawals	
Year	Increase	Year	Male	Female
1	11.50%	1	25.00%	25.00%
2	8.50	2	20.00	20.00
3	7.00	3	15.00	15.00
4	6.00	4	10.00	11.00
5	5.50	5	9.00	10.00
6	5.20	6	7.00	9.00
7	4.90	7	5.50	7.50
8	4.80	8	5.00	6.50
9	4.70	9	4.50	5.50
10	4.50	10	4.00	5.00
11	4.25	11	3.25	4.25
12	4.10	12	3.00	4.00
13	4.00	13	2.75	3.75
14	3.90	14	2.50	3.50
15	3.90	15	2.50	3.25
16	3.85	16	2.25	3.00
17	3.80	17	2.00	2.75
18	3.75	18	1.75	2.50
19	3.75	19	1.50	2.50
20	3.75	20	1.50	2.25
21	3.75	21	1.50	2.25
22	3.70	22	1.50	2.25
23	3.60	23	1.00	2.00
24	3.60	24	1.00	2.00
25	3.60	25	1.00	1.75
26+	3.50	26	1.00	1.75
		27	1.00	1.50
		28	1.00	1.50
		29	1.00	1.50
		30	1.00	1.50

Actuarial Basis

Summary of Actuarial Assumptions - MERF

The following assumptions were used in valuing the liabilities and benefits under the plan for MERF members only. Assumptions regarding investment return, mortality, benefit increases, and Combined Service Annuity (CSA) are the same as shown in the Basic and Coordinated Plan assumption summary.

Salary increases	Total reported pay for prior calendar year increased 1.86% (half year of 3.75%, compounded) to prior fiscal year and 3.75% annually for each future year.
Retirement	Active members are assumed to retire at age 61, or immediately if currently age 61 or older.
Withdrawal	Rates are shown in rate table.
Disability	Age-related rates based on experience; see table of sample rates.
Commencement of deferred benefits	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 60.
Percentage married	66.67% 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 three years younger than their male spouses. 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	Members are assumed to elect a life annuity.
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: There were no members with missing or invalid dates of birth. <u>Data for active members:</u> There were no active members with missing salary or service. <u>Data for terminated members:</u> Benefits were provided by PERA for five members. For the remaining members, we calculated benefits using the reported Average Salary, credited service and termination date from the 2016 valuation data file. <u>Data for Retired members:</u> There were no members reported with missing benefits. There was one member reported without a gender. We assumed male gender.

Actuarial Basis

Summary of Actuarial Assumptions – MERF (Concluded)

	Withdrawal		Disability Retirement	
Age	**Male**	**Female**	**Male**	**Female**
20	21.00%	21.00%	0.21%	0.21%
25	11.00	11.00	0.21	0.21
30	5.00	5.00	0.23	0.23
35	1.50	1.50	0.30	0.30
40	1.00	1.00	0.41	0.41
45	1.00	1.00	0.61	0.61
50	1.00	1.00	0.93	0.93
55	1.00	1.00	1.60	1.60
60	1.00	1.00	0.00	0.00
65	0.00	0.00	0.00	0.00
70	0.00	0.00	0.00	0.00

Actuarial Basis

Summary of Plan Provisions - Basic

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	A public employee who is not covered under the Social Security Act. General exceptions are employees covered by other public funds, certain part-time employees and full-time students under age 23.
Contributions	Shown as a percent of salary: <u>Member</u> 9.10% of salary <u>Employer</u> 11.78% of salary Member contributions are "picked up" according to the provisions of Internal Revenue Code 414(h).
Allowable service	Service during which member contributions were made. May also include certain leaves of absence 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 and employer-paid deferred compensation deposits, 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 annual salary. Average salary is based on all Allowable Service if less than five years.
Vesting	Hired before July 1, 2010: 100% vested after 3 years of Allowable Service. Hired after June 30, 2010: 100% vested after 5 years of Allowable Service. (Not applicable since all Basic members were hired before 1968.)
Retirement <u>Normal retirement benefit</u>	
Age/service requirement	Age 65 and vested. Proportionate retirement annuity is available at age 65 and one year of Allowable Service.
Amount	2.70% of Average Salary for each year of Allowable Service.
<u>Early retirement benefit</u>	
Age/service requirement	(a.) Age 55 and vested. (b.) Any age with 30 years of Allowable Service. (c.) Rule of 90: Age plus Allowable Service totals 90.

Summary of Plan Provisions – Basic (Continued)

Retirement (Continued)

Early retirement benefit (Continued)

Age/service requirement	The greater of (a) or (b):
Amount	(a.) 2.20% of Average Salary for each of the first ten years of Allowable Service and 2.70% of Average Salary for each subsequent year with reduction of 0.25% for each month if the Member is under age 65 at time of retirement and has less than 30 years of Allowable Service or if the Member is under age 62 and has 30 or more years of Allowable Service. No reduction if age plus years of Allowable Service totals 90. (b.) 2.70% of Average Salary for each year of Allowable Service assuming augmentation to age 65 at 3.00% per year and actuarial reduction for each month the Member is under age 65.
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. If a Joint and Survivor benefit is elected and the beneficiary predeceases the annuitant, the annuitant's benefit increases to the Life Annuity amount. This "bounce back" is subsidized by the plan.
Benefit increases	Benefit recipients receive a future annual 1.00% post-retirement benefit increase. If the funding ratio reaches 90% 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 will decrease 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. 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.

Summary of Plan Provisions – Basic (Continued)

Disability

Disability benefit

Age/service requirement	Total and permanent disability before normal retirement age if vested. Since all remaining active Basic members are over normal retirement age, none are eligible for disability benefits.
Amount	Normal Retirement benefit based on Allowable Service and Average Salary at disability without reduction for commencement before Normal Retirement Age. Supplemental benefit of $25 per month payable to the later of the normal retirement age or the five-year anniversary of commencement of disability. The disability benefit is reduced to that amount which, when added to Workers' Compensation, does not exceed the salary the disabled Member received as of the date of the disability or the salary currently payable for the same employment position substantially similar to the one the person held as of the date of the disability, whichever is greater. If a member becomes 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 at the time the Member became disabled and an actuarial increase shall be made for the change in the post-retirement interest rates from 5.00% to 6.00%. Payments stop earlier if disability ceases. If death occurs prior to age 65, or within five years of disability, the surviving spouse can receive a refund or a survivor benefit. Dependent children are entitled to dependent child benefits subject to the 70.00% family maximum. Payments revert to a retirement annuity at normal retirement age. Benefits may be reduced on resumption of partial employment.
Form of payment	Same as for retirement.
Benefit increases	Same as for retirement.

Retirement after disability

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

Summary of Plan Provisions - Basic (Continued)

Death

Surviving spouse benefit

Age/service requirement	Active Member with 18 months of Allowable Service or while Member is receiving a disability benefit.
Amount	50.00% of salary averaged over last six months. Family benefit is maximum of 70.00% and minimum of 50.00% of average salary. 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 benefit as of 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 may be elected in lieu of this benefit.
Benefit increases	Same as for retirement.

Surviving dependent children's benefit

Age/service requirement	Active Member with 18 months of Allowable Service or while Member is receiving a disability benefit.
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 average salary. Benefits paid until child marries, dies, or attains age 18 (age 22 if full-time student). If a member becomes deceased prior to July 1, 1997 and the beneficiary was not eligible to commence their survivor 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 the post-retirement interest rates from 5.00% to 6.00%.
Benefit increases	Same as for retirement.

Summary of Plan Provisions - Basic (Continued)

Death (Continued)	
Surviving spouse optional annuity	
Age/service requirement	Member or former Member who dies before retirement benefits commence and other survivor annuity is waived by spouse.
Amount	Survivor's payment of the 100% joint and survivor benefit the Member could have elected if terminated or an actuarial equivalent term certain annuity. If commencement is prior to age 65 (age 62 if 30 years of service), the benefit is reduced the same as early retirement with half the applicable reduction factor used from age 55 to the actual commencement age. If no surviving spouse, then an actuarial equivalent dependent child benefit is paid to age 20 or for five years if longer. If a member becomes deceased prior to July 1, 1997 and the beneficiary was not eligible to commence their survivor benefit as of 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.
Refund of contributions with interest	
Age/service requirement	Member dies before receiving any retirement benefits and survivor benefits are not payable.
Amount	The excess of the Member's contributions with 6.00% interest until June 30, 2011; 4.00% interest thereafter over any disability or survivor benefits paid.
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 three or more years of Allowable Service.

Actuarial Basis

Summary of Plan Provisions - Basic (Continued)

Termination (Continued)	
<u>Deferred benefit</u>	
Age/service requirement	Fully vested.
Amount	Benefit computed under law in effect at termination and increased by the following "augmentation" percentage 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% thereafter until the earlier of January 1 of the year following attainment of age 55 and January 1, 2012; (d.) 5.00% 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. Members active with a public employer the day prior to the privatization of the employer become vested immediately and receive enhanced augmentation (unless the enhancement results in a net loss to the Plan). Amount is payable at a normal or early retirement. Augmentation equals 2.00% compounded annually, unless the enhancement results in a net loss to the Plan, in which case augmentation equals 1.00% compounded annually. If privatization occurred prior to January 1, 2011, augmentation occurs at the rate of 4.00% compounded annually through the year the Member turns age 55 and 6.00% thereafter until the annuity begins. If privatization occurred prior to January 1, 2007 (or January 1, 2008 for Hutchinson Area Health Care), augmentation occurs at the rate of 5.50% compounded annually through the year the Member turns age 55 and 7.50% thereafter until the annuity begins. 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 the RP-2000 mortality table for healthy annuitants, white collar adjustment, projected to 2025, females set back two years and no setback for males, blended 45% males, 7.50% post-retirement interest, and 8.50% pre-retirement interest.

Summary of Plan Provisions - Basic (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 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 previous valuation.

Actuarial Basis

Summary of Plan Provisions - Coordinated

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	A public employee who is covered under the Social Security Act. General exceptions are employees covered by other public funds, certain part-time employees and full-time students under age 23. City managers and persons holding certain elective office positions may choose to become Members.	
Contributions	Shown as a percent of salary:	
Effective date	**Member**	**Employer**
January 1, 2015	6.50%	7.50%
	Member contributions are "picked up" according to the provisions of Internal Revenue Code 414(h).	
Allowable service	Service during which member contributions are deducted. 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 leave and sick leave payments, severance payments, Workers' Compensation benefits and employer-paid flexible spending accounts and employer-paid deferred compensation deposits, 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 annual salary. Average salary is based on all Allowable Service if less than five years.	
Vesting	Hired before July 1, 2010: 100% vested after three years of Allowable Service. Hired after June 30, 2010: 100% vested after five years of Allowable Service.	
Retirement		
Normal retirement benefit		
Age/service requirement	First hired before July 1, 1989: (a.) Age 65 and vested. (b.) Proportionate retirement annuity is available at age 65 and one year of Allowable Service.	
Amount	1.70% of Average Salary for each year of Allowable Service.	

Summary of Plan Provisions – Coordinated (Continued)

Retirement (Continued)

Normal retirement benefit (Continued)

Age/service requirement

First hired after June 30, 1989:

(a.) The greater of age 65 or the age eligible for full Social Security retirement benefits but no later than age 66 and vested.
(b.) Proportionate Retirement Annuity is available at normal retirement age and one year of Allowable Service.

Amount

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

Early retirement benefit

Age/service requirement

First hired before July 1, 1989:

(a.) Age 55 and vested.
(b.) Any age with 30 years of Allowable Service.
(c.) Rule of 90: Age plus Allowable Service totals 90.

First hired after June 30, 1989:

(a.) Age 55 and vested.

Amount

First hired before July 1, 1989:

The greater of (a) or (b):

(a.) 1.20% of Average Salary for each of the first ten years of Allowable Service and 1.70% of Average Salary for each subsequent year with reduction of 0.25% for each month the Member is under age 65 at time of retirement or under age 62 if 30 years of Allowable Service. No reduction if age plus years of Allowable Service totals 90.
(b.) 1.70% of Average Salary for each year of Allowable Service assuming augmentation to age 65 at 3.00% per year and actuarial reduction for each month the Member is under age 65.

First hired after June 30, 1989:

(a.) 1.70% of Average Salary for each year of Allowable Service assuming augmentation to normal retirement age at 3.00% per year (2.50% if hired after June 30, 2006) and actuarial reduction for each month the Member is under normal retirement age.

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. 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.

Summary of Plan Provisions – Coordinated (Continued)

Retirement (Continued)	
Benefit increases	Benefit recipients receive a future annual 1.00% post-retirement benefit increase. If the funding ratio reaches 90% 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 will decrease 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. 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 $25 times each full year of Allowable Service. 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.
Disability	
Disability benefit	
Age/service requirement	Total and permanent disability before normal retirement age if vested.
Amount	Normal Retirement benefit based on Allowable Service and Average Salary at disability without reduction for commencement before normal retirement age. The disability benefit is reduced to that amount which, when added to Workers' Compensation, does not exceed the salary the disabled Member received as of the date of the disability or the salary currently payable for the same employment position substantially similar to the one the person held as of the date of the disability, whichever is greater. If a Member becomes 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 the post-retirement interest rates from 5.00% to 6.00%. Payments stop if disability ceases or death occurs. Payments change to a retirement annuity at normal retirement age. Benefits may be reduced on resumption of partial employment.
Form of payment	Same as for retirement.
Benefit increases	Same as for retirement.

Actuarial Basis

Summary of Plan Provisions – Coordinated (Continued)

Disability (Continued)	
Retirement after disability	
Age/service requirement	Normal retirement age.
Amount	Any optional annuity continues. Otherwise, the larger of the disability benefit paid before normal retirement age or the normal retirement benefit available at normal retirement age, or an actuarially equivalent optional annuity.
Benefit increases	Same as for retirement.
Death	
Surviving spouse optional annuity	
Age/service requirement	Member or former Member who dies before retirement or disability benefits commence.
Amount	Survivor's payment of the 100% joint and survivor benefit the Member could have elected if terminated or an actuarial equivalent term certain annuity. If commencement is prior to age 65 (age 62 if 30 years of service), the benefit is reduced the same as early retirement with half the applicable reduction factor used from age 55 to the actual commencement age. If no surviving spouse, then an actuarial equivalent dependent child benefit is paid to age 20 or for five years if longer. If a member becomes deceased prior to July 1, 1997 and the beneficiary was not eligible to commence their survivor 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 the post-retirement interest rates from 5.00% to 6.00%.
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	The excess of the Member's contributions with 6.00% interest until June 30, 2011; 4.00% interest thereafter over any disability or survivor benefits paid.
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.

Summary of Plan Provisions – Coordinated (Continued)

Termination (Continued)

Deferred benefit

Age/service requirement	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; or (e.) 1.00% from January 1, 2012 to when the benefit begins. Members who terminate after 2011 will receive no future augmentation. Members active with a public employer the day prior to the privatization of the employer become vested immediately and receive enhanced augmentation (unless the enhancement results in a net loss to the Plan). Amount is payable at a normal or early retirement. Augmentation equals 2% compounded annually, unless the enhancement results in a net loss to the Plan, in which case augmentation equals 1.00% compounded annually. If privatization occurred prior to January 1, 2011, augmentation occurs at the rate of 4.00% compounded annually through the year the Member turns age 55 and 6.00% thereafter until the annuity begins. If privatization occurred prior to January 1, 2007 (or January 1, 2008 for Hutchinson Area Health Care), augmentation occurs at the rate of 5.50% compounded annually through the year the Member turns age 55 and 7.50% thereafter until the annuity begins. 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.
Actuarial equivalent factors	Actuarially equivalent factors based on the RP-2000 mortality table for healthy annuitants, white collar adjustment, projected to 2025, females set back two years and no setback for males, blended 45% males, 7.50% post-retirement interest and 8.50% pre-retirement interest. The post-retirement interest rate will change to 6.50% on the earlier of the effective date of the next mortality adjustment or July 1, 2017.

Summary of Plan Provisions – Coordinated (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 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.
Contribution stabilizer	The following is a summary of contribution stabilizer provisions in Minnesota Statute 353.27: • If a contribution sufficiency of more than 1.00% exists, member and employer contributions may be adjusted by the Board of Directors to a level necessary to maintain a 1.00% sufficiency. Member and employer contributions may not be less than the sum of normal cost and administrative expenses. • If a contribution deficiency of at least 0.50% exists, the member and employer contribution rates may be increased by the Board of Directors to eliminate the deficiency. • Any adjustment to the contribution rates must be reported to the Legislative Commission on Pensions and Retirement (LCPR) by January 15 following the most recent valuation report. If the LCPR does not recommend against or alter the change in rates, the adjustment becomes effective on the salary paid after the next January 1st.
Changes in plan provisions	There have been no changes in plan provisions since the previous valuation.

Actuarial Basis

Summary of Plan Provisions of Minneapolis Employees Retirement Fund (MERF)

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/employee rule	An employee of the City of Minneapolis, the Metropolitan Airports Commission, the Met Council/Environmental Services, the Municipal Employees Retirement Fund, and Special School District No. 1 if covered prior to July 1, 1978. Employees covered July 1, 1978 or later are covered by the Public Employees Retirement Association (PERA) Plan. Effective July 1, 1992, licensed peace officers and firefighters who are employed by the Metropolitan Airports Commission and covered by the Minneapolis Employees Retirement Fund will receive the greater of retirement, disability, or survivor benefits under: a) The Minneapolis Employees Retirement Fund; or b) The Public Employees Retirement Association (PERA) Police & Fire Plan.
Full consolidation	The MERF Division fully merged with PERA's General Employees Retirement Plan, effective January 1, 2015. Upon consolidation, state and employer contributions were revised as shown herein.
Contributions	
Member	9.75% of salary
Employer	9.75% of salary (Employer Regular Contributions) Employer Regular and Additional Contributions will be paid as long as there are active members. Employer Supplemental Contribution equals $21,000,000 in calendar years 2017 and 2018 and $31,000,000 in calendar years 2019 to 2031.
Contribution allocation	Employer Supplemental Contributions are allocated to the employers in proportion to their share of the actuarial accrued liability of MERF on July 1, 2009, as follows:

Employer	Allocation
City of Minneapolis	54.78%
Minneapolis Park Board	10.33%
Met Council	1.74%
Metropolitan Airport Commission	5.76%
Municipal Building Commission	1.08%
Minneapolis School District No. 1	23.04%
Hennepin County	3.17%
MnSCU	0.10%
Total	100.00%

Actuarial Basis

Summary of Plan Provisions of Minneapolis Employees Retirement Fund (MERF) (Continued)

State contributions	The State's contribution equals $16,000,000 in 2017 and 2018, and $6,000,000 thereafter. The State's contributions are payable by September 30 each year and end on September 15, 2031.
Allowable service	Service during which member contributions were made. Allowable Service may also include certain leaves of absence, military service and service prior to becoming a member. Allowable service also includes time on duty disability provided that the member returns to active service if the disability ceases.
Salary	All amounts of salary, wages or compensation.
Average salary	Average of the five highest calendar years of salary out of the last ten calendar years.
Retirement Normal retirement benefit	
Age/service requirement	Age 60 and 10 years of employment. Any age with 30 years of employment. Proportionate retirement annuity is available at age 65 and one year allowable service.
Amount	2.00% of average salary for the first 10 years of allowable service plus 2.50% of average salary for each subsequent year of allowable service.

Actuarial Basis

Summary of Plan Provisions of Minneapolis Employees Retirement Fund (MERF) (Continued)

Disability	
Disability benefit	
Age/service requirement	Total and permanent disability before age 60 with five years of allowable service, or no allowable service if a work-related disability.
Amount	2.00% of average salary for the first 10 years of disability service plus 2.50% of average salary for each subsequent year of disability service. Disability service is the greater of (a) or (b) where: (a.) equals allowable service plus service projected to age 60, subject to a maximum of 22 years, and (b.) equals allowable service. Benefit is reduced by Workers' Compensation benefits. Payments stop at age 60 or earlier if disability ceases or death occurs. Benefits may be reduced on resumption of partial employment.
Disability after separation	
Age/service requirement	Total and permanent disability after electing to receive a retirement benefit but before age 60.
Amount	Actuarial equivalent of total credit to member's account.
Retirement after disability	
Age/service requirement	Total and permanent disability after electing to receive a retirement benefit but before age 60. Employee is still disabled after age 60.
Amount	Benefit continues according to the option selected.

Summary of Plan Provisions of Minneapolis Employees Retirement Fund (MERF) (Continued)

Death

<u>Pre-retirement survivor's spouse benefit</u>

Age/service requirement	Active member with 18 months of allowable service.
Amount	30% of salary averaged over the last six months to the surviving spouse plus 10% of salary averaged over the last six months to each surviving child. Maximum benefit is $900 per month.

<u>Pre-retirement survivor's spouse annuity</u>

Age/service requirement	Active member or former member who dies before retirement with 20 years of allowable service.
Amount	Actuarial equivalent of a single life annuity which would have been paid as a retirement benefit on the date of death without regard to eligibility age for retirement benefit. If there is no surviving spouse, the designated beneficiary may be a dependent child or dependent parent.

<u>Refund of accumulated city contributions</u>

Age/service requirement	Active member or former member dies after 10 years of allowable service and prior to retirement.
Amount	Present value of the City's annual installments of $60 or, in the case of a former member, the net accumulation of city deposits. This benefit is not payable if survivor's benefits are paid.

<u>Lump sum</u>

Age/service requirement	Death prior to service or disability retirement without an eligible surviving beneficiary.
Amount	$750 with less than 10 years allowable service, or $1,500 with 10 or more years of allowable service.

<u>Refund of member contributions at death</u>

Age/service requirement	Active member or former member dies before retirement.
Amount	The excess of the member's contributions (exclusive of the contributions to the survivor's account) plus interest to the date of death.

Actuarial Basis

Summary of Plan Provisions of Minneapolis Employees Retirement Fund (MERF) (Concluded)

Termination	
Deferred benefit	
Age/service requirement	Three years of allowable service.
Amount	Benefit computed under law in effect at termination and increased by the following percentage (augmentation), compounded annually: (a.) 0.00% prior to July 1, 1971, (b.) 5.00% from July 1, 1971 to January 1, 1981, and (c.) 3.00% thereafter until the annuity begins. Amount is payable at or after age 60.
Refund of member contributions upon termination	
Age/service requirement	Termination of public service.
Amount	Member's contributions with interest. A deferred annuity may be elected in lieu of a refund if vested.
Form of payment	▪ Life annuity. ▪ Life annuity with 3, 5, 10 or 15 years guaranteed. ▪ Life annuity with lump sum death benefit. ▪ Joint & Survivor (with or without bounce back feature).
Optional form conversion factors	1986 PET mortality table with a one-year setback, blended 50% male and 50% female, and 5% interest.
Two dollar bill and annuity	Optional Two Dollar Bill money purchase annuity available at age 55 with 20 years of service if member had service prior to June 28, 1973. According to PERA, this option is rarely utilized. We have assumed that remaining active members will not elect this optional benefit.
Benefit increases	Benefit recipients receive future annual 1.00% benefit increases. If the accrued liability funding ratio of the General Employees Retirement Plan reaches 90% (on a market value of assets basis) for two consecutive years, the benefit increase will change 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 will decrease to 1.00%.
Changes in plan provisions	The Employer Supplemental Contribution changed from $21,000,000 to $31,000,000 in calendar years 2019 to 2031. The state's contribution changed from $16,000,000 to $6,000,000 in calendar years 2019 to 2031.

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)
7-1-1995	$ 5,138,461	$ 6,622,069	$ 1,483,608	77.60 %	$ 2,679,069	55.38 %
7-1-1996	$ 5,786,398	$ 7,270,073	$ 1,483,675	79.59	$ 2,814,126	52.72
7-1-1997	$ 6,658,410	$ 8,049,666	$ 1,391,256	82.72	$ 2,979,260	46.70
7-1-1998	$ 7,636,668	$ 8,769,303	$ 1,132,635	87.08	$ 3,271,737	34.62
7-1-1999	$ 8,489,177	$ 9,443,678	$ 954,501	89.89	$ 3,302,808	28.90
7-1-2000	$ 9,609,367	$ 11,133,682	$ 1,524,315	86.31	$ 3,437,954	44.34
7-1-2001	$ 10,527,270	$ 12,105,337	$ 1,578,067	86.96	$ 3,466,587	45.52
7-1-2002	$ 11,017,414	$ 12,958,105	$ 1,940,691	85.02	$ 3,809,864	50.94
7-1-2003	$ 11,195,902	$ 13,776,198	$ 2,580,296	81.27	$ 4,387,649	58.81
7-1-2004	$ 11,477,961	$ 14,959,465	$ 3,481,504	76.73	$ 3,968,034	87.74
7-1-2005	$ 11,843,936	$ 15,892,555	$ 4,048,619	74.53	$ 4,096,138	98.84
7-1-2006	$ 12,495,207	$ 16,737,757	$ 4,242,550	74.65	$ 4,247,109	99.89
7-1-2007	$ 12,985,324	$ 17,705,627	$ 4,720,303	73.34	$ 4,448,954	106.10
7-1-2008	$ 13,048,970	$ 17,729,847	$ 4,680,877	73.60	$ 4,722,432	99.12
7-1-2009	$ 13,158,490	$ 18,799,416	$ 5,640,926	69.99	$ 4,778,708	118.04
7-1-2010	$ 13,126,993	$ 17,180,956	$ 4,053,963	76.40	$ 4,804,627	84.38
7-1-2011	$ 13,455,753	$ 17,898,849	$ 4,443,096	75.18	$ 5,079,429 [2]	87.47
7-1-2012	$ 13,661,682	$ 18,598,897	$ 4,937,215	73.45	$ 5,142,592 [3]	96.01
7-1-2013	$ 14,113,295	$ 19,379,769	$ 5,266,474	72.82	$ 5,246,928 [3]	100.37
7-1-2014	$ 15,644,540	$ 21,282,504	$ 5,637,964	73.51	$ 5,351,920 [3]	105.34
7-1-2015	$ 17,974,439	$ 23,560,951	$ 5,586,512	76.29	$ 5,549,255 [4]	100.67
7-1-2016	$ 18,765,863	$ 24,848,409	$ 6,082,546	75.52	$ 5,773,708 [5]	105.35
7-1-2017	$ 19,916,322	$ 25,615,722	$ 5,699,400	77.75	$ 6,156,985 [5]	92.57

[1] *Information prior to 2012 provided by prior actuaries. See prior reports for additional detail.*
[2] *Assumed equal to actual member contributions divided by 6.125%.*
[3] *Assumed equal to actual member contributions divided by 6.250%.*
[4] *Assumed equal to actual member contributions divided by 6.375%.*
[5] *Assumed equal to actual member contributions divided by 6.500%.*

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[2] (e)	Percentage Contributed (e)/(d)
1995	9.76 %	$ 2,679,069	$ 115,986	$ 145,491	$ 123,984	85.22%
1996	9.61	$ 2,814,126	$ 121,525	$ 148,913	$ 129,738	87.12
1997	9.75	$ 2,979,260	$ 128,234	$ 162,244	$ 136,686	84.25
1998	9.62	$ 3,271,737	$ 140,385	$ 174,356	$ 151,499	86.89
1999	9.63	$ 3,302,808	$ 158,475	$ 159,585	$ 173,370	108.64
2000	9.22	$ 3,437,954	$ 171,073	$ 145,906	$ 186,637	127.92
2001	11.84	$ 3,466,587	$ 173,380	$ 237,064	$ 188,208	79.39
2002	11.85	$ 3,809,864	$ 191,422	$ 260,047	$ 206,982	79.59
2003	11.52	$ 4,387,649	$ 205,963	$ 299,494	$ 221,689	74.02
2004	12.25	$ 3,968,034	$ 215,697	$ 270,387	$ 225,745	83.49
2005	12.72	$ 4,096,138	$ 216,701	$ 304,328	$ 232,963	76.55
2006	13.26	$ 4,247,109	$ 235,901	$ 327,266	$ 255,531	78.08
2007	13.41	$ 4,448,954	$ 260,907	$ 335,698	$ 283,419	84.43
2008	13.86	$ 4,722,432	$ 280,007	$ 374,522	$ 303,304	80.98
2009	14.22	$ 4,778,708	$ 298,381	$ 381,151	$ 328,603	86.21
2010	15.55	$ 4,804,627	$ 303,571	$ 443,548	$ 342,678	77.26
2011	12.46	$ 5,079,429 [3]	$ 311,115	$ 321,782	$ 357,596	111.13
2012	13.47	$ 5,142,592 [4]	$ 321,412	$ 371,295	$ 368,037	99.12
2013	14.46	$ 5,246,928 [4]	$ 327,933	$ 430,773	$ 372,652	86.51
2014	15.15	$ 5,351,920 [4]	$ 334,495	$ 476,321	$ 382,251	80.25
2015	15.80	$ 5,549,255 [5]	$ 353,765	$ 523,017	$ 435,115	83.19
2016	15.89	$ 5,773,708 [6]	$ 375,291	$ 542,151	$ 465,978	85.95
2017	16.49	$ 6,156,985 [6]	$ 400,204	$ 615,083	$ 483,888	78.67
2018	16.18					

[1] *Information prior to 2012 provided by prior actuary. See prior reports for additional detail.*
[2] *Includes contributions from other sources (if applicable).*
[3] *Assumed equal to actual member contributions divided by 6.125%.*
[4] *Assumed equal to actual member contributions divided by 6.25%.*
[5] *Assumed equal to actual member contributions divided by 6.375%.*
[6] *Assumed equal to actual member contributions divided by 6.500%.*

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 (comparable to a Projected Unit Credit measurement).
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, effective for the fiscal year beginning July 1, 2014, sets the accounting rules for the employers that sponsor or contribute to public retirement systems, while Statement No. 67, effective for the fiscal year beginning July 1, 2013, 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.

Public Employees Retirement Association of Minnesota

Local Government Correctional Service Retirement Plan
Actuarial Valuation Report as of July 1, 2017

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November 10, 2017

Public Employees Retirement Association of Minnesota
Trustees of the Local Government Correctional Service Retirement Plan
St. Paul, Minnesota

Dear Trustees of the Local Government Correctional Service Retirement Plan:

The results of the July 1, 2017 annual actuarial valuation of the Local Government Correctional Service Retirement 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 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, 2017 according to the prescribed assumptions. 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.

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.

In our professional judgement, the statutory discount rate of 8.0% used in this report deviates materially from the guidance set forth in Actuarial Standards of Practice No. 27 (ASOP No. 27). In a 2017 analysis of long-term rate of investment return and inflation assumptions, GRS suggested that an investment return assumption in the range of 6.85% to 7.68% would be reasonable. Please see our letter dated September 11, 2017 for additional information. If a discount rate within the reasonable range were used in this valuation instead of 8.0%, the unfunded liability and contribution deficiency would be higher than shown. Note that estimated results based on a 7.0% discount rate are shown on page four.

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 pages four and 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.

277 Coon Rapids Boulevard | Suite 212 | Coon Rapids, Minnesota 55433-2629

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.

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 Local Government Correctional Service Retirement 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, 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 normal cost of the plan is expected to remain approximately level as a percent of pay, and
(2) The funded status of the plan is expected to gradually improve but is not expected to be 100% funded within the next 50 years.

However, as noted elsewhere in this report, we do not expect the earnings assumption of 8% to be met. Unfunded liabilities based on a lower earnings assumption have the potential to grow indefinitely.

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.
(4) The funded status would appear lower if it were based upon an investment return assumption that meets the requirements of ASOP 27.

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.

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, 2017	Actuarial Valuation as of July 1, 2016
Statutory Contributions - Chapter 353E (% of Payroll)	14.58%	14.58%
Required Contributions - Chapter 356 (% of Payroll)	15.11%	14.46%
Sufficiency / (Deficiency)	(0.53%)	0.12%

The contribution status changed from a sufficiency of 0.12% of payroll to a deficiency of (0.53)% of payroll. On a market value of assets basis, contributions are deficient by 0.28% of payroll. The increased costs are due to the assumption changes described on page three.

Based on the actuarial value of assets and scheduled contribution rates, statutory contributions are not sufficient to fully amortize the unfunded actuarial accrued liability over the statutory amortization period of 21 years. Based on current statutory contributions, the actuarial value of assets, and other methods and assumptions described in this report, the funded status of the plan is expected to gradually improve but is not expected to be 100% funded within the next 50 years.

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 15.1% for the plan year ending June 30, 2017. The AVA earned approximately 9.1% for the plan year ending June 30, 2017 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 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, 2017	**July 1, 2016**
Contributions (*% of Payroll*)		
Statutory - Chapter 353E	14.58%	14.58%
Required - Chapter 356	15.11%	14.46%
Sufficiency / (Deficiency)	(0.53%)	0.12%
Funding Ratios (*dollars in thousands*)		
Assets		
- Current assets (AVA)	$ 595,366	$ 529,879
- Current assets (MVA)	$ 602,460	$ 507,783
Accrued Benefit Funding Ratio		
- Current benefit obligations	$ 581,754	$ 507,023
- Funding ratio (AVA)	102.34%	104.51%
- Funding ratio (MVA)	103.56%	100.15%
Accrued Liability Funding Ratio		
- Actuarial accrued liability	$ 629,870	$ 553,840
- Funding ratio (AVA)	94.52%	95.67%
- Funding ratio (MVA)	95.65%	91.68%
Projected Benefit Funding Ratio		
- Current and expected future assets	$ 829,429	$ 756,342
- Current and expected future benefit obligations	$ 844,365	$ 753,741
- Projected benefit funding ratio (AVA)	98.23%	100.35%
Participant Data		
Active members		
- Number	3,842	3,827
- Annual valuation earnings *(000s)*	$ 197,630	$ 191,593
- Projected annual earnings *(000s)*	$ 208,531	$ 202,134
- Average projected annual earnings	$ 54,277	$ 52,818
- Average age	39.3	39.4
- Average service	7.5	7.5
Service retirements	853	749
Survivors	54	49
Disability retirements	178	169
Deferred retirements	2,933	2,755
Terminated other non-vested	2,624	2,359
Total	**10,484**	**9,908**

Summary of Valuation Results

Effects of Changes

The following changes in plan provisions, actuarial assumptions, and methods were recognized as of July 1, 2017:

- The base mortality table for annuitants and employees was changed from RP-2000 to RP-2014, fully generational, with adjustments. The mortality improvement scale was changed from Scale AA to Scale MP-2016. This change was based on an experience study dated August 30, 2016 for the Public Employees Police and Fire Retirement Plan.
- Loading factors to account for members with Combined Service Annuities were updated (based on an analysis of Combined Service Annuity assumptions completed by the LCPR actuary and documented in an October 2016 report) as follows:
  - Deferred Vested Members: Increased from 30% of liabilities to 35% of liabilities
  - Non-Vested Terminated Members: Reduced from 30% of liabilities to 1% of liabilities
- As a result of the additional liability resulting from the changes described above, the amortization date was extended by 7 years, from June 30, 2031 to June 30, 2038 per Minnesota Statute 356.215, Subd. 11(c).

Refer to the Actuarial Basis section of this report for a complete description of these changes. The combined impact of the above change was to increase the accrued liability by $21.7 million and increase the required contribution by 1.2% of pay, as follows:

	Before Changes	Reflecting Assumption Changes	Reflecting Assumption Changes and Amortization Period Extension
Normal Cost Rate, % of Pay	13.1%	13.7%	13.7%
Amortization of Unfunded Accrued Liability, % of pay	0.6%	1.6%	1.2%
Expenses (% of Pay)	0.2%	0.2%	0.2%
Total Required Contribution, % of Pay	13.9%	15.5%	15.1%
Accrued Liability Funding Ratio	97.9%	94.5%	94.5%
Projected Benefit Funding Ratio	102.0%	97.7%	98.2%
Unfunded Accrued Liability (in millions)	$12.8	$34.5	$34.5

Summary of Valuation Results

Valuation of Future Post-Retirement Benefit Increases

Benefit recipients received a post-retirement benefit increase of 1.00% on January 1, 2013 and January 1, 2014. Because the actuarial accrued liability funding ratio (on a market value of assets basis) was at least 90% as of July 1, 2013 and July 1, 2014, the benefit increase reverted to 2.50% on January 1, 2015.

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 will decrease to 1.00%. Benefit increases already granted, however, will not be affected.

In this valuation, we assumed all future post-retirement benefit increases would equal 2.50%.

As noted elsewhere in this report, we do not expect the earnings assumption of 8.00% to be met. The funding ratio threshold that may result in a 1.00% postretirement benefit increase would be achieved earlier if it was based upon an investment return assumption that meets the requirements of ASOP No. 27.

Sensitivity Tests

During the 2017 legislative session, the Legislative Commission on Pensions and Retirement (LCPR) enacted a new sensitivity disclosure requirement for PERA's 2017 valuations. Per the LCPR's requirement, we have calculated the liabilities associated with the following scenarios:

1) 7% interest rate assumption
2) 9% interest rate assumption
3) 1.0% post-retirement benefit increase for all future years

In each case, all other assumptions were unchanged from those used to develop the final valuation results in this report. Note that we believe the 9% interest rate assumption is an unrealistic assumption.

	Final Valuation Assumptions	Final Valuation Assumptions with 7% interest	Final Valuation Assumptions with 9% interest	Final Valuation Assumptions with 1.0% COLA for all future years
Normal Cost Rate, % of Pay	13.7%	17.2%	11.1%	11.8%
Amortization of Unfunded Accrued Liability, % of Pay	1.2%	4.8%	-1.8%	-1.6%
Expenses (% of Pay)	0.2%	0.2%	0.2%	0.2%
Total Required Contribution, % of Pay	15.1%	22.2%	9.5%	10.4%
Contribution Sufficiency/(Deficiency)	(0.5%)	(7.6%)	5.1%	4.2%
Accrued Liability Funding Ratio	94.5%	80.0%	110.5%	110.3%
Actuarial Accrued Liability (in millions)	$629.9	$743.9	$538.9	$539.5
Unfunded Accrued Liability (in millions)	$34.5	$148.5	($56.4)	($55.8)

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) Ret Liab/ AAL (6)/(1)	(8) AAL/ Payroll (1)/(4)	(9) Assets/ Payroll (2)/(4)
2010	$ 248,867	$ 211,368	$ 37,499	$ 154,777	84.9%	$ 39,723	16.0%	160.8%	136.6%
2011	$ 284,593	$ 280,031	$ 4,562	$ 165,077	98.4%	$ 50,393	17.7%	172.4%	169.6%
2012	$ 343,199	$ 305,408	$ 37,791	$ 164,340	89.0%	$ 63,419	18.5%	208.8%	185.8%
2013	$ 381,179	$ 366,750	$ 14,429	$ 164,820	96.2%	$ 74,683	19.6%	231.3%	222.5%
2014	$ 426,508	$ 453,232	$ (26,724)	$ 172,041	106.3%	$ 85,638	20.1%	247.9%	263.4%
2015	$ 498,052	$ 490,731	$ 7,321	$ 179,623	98.5%	$ 106,898	21.5%	277.3%	273.2%
2016	$ 553,840	$ 507,783	$ 46,057	$ 188,816	91.7%	$ 126,066	22.8%	293.3%	268.9%
2017	$ 629,870	$ 602,460	$ 27,410	$ 200,103	95.6%	$ 162,539	25.8%	314.8%	301.1%

Valuation Date (6/30)	(10) Portfolio Std Dev	(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			24.2%	19,323	9.1%	15.7%	N/A
2011			2.8%	18,320	6.5%	23.0%	N/A
2012			23.0%	17,531	5.7%	2.3%	2.3%
2013			8.8%	16,964	4.6%	14.2%	6.2%
2014			-15.5%	17,031	3.8%	18.5%	14.5%
2015	14.1%	38.5%	4.1%	17,127	3.5%	4.4%	12.2%
2016	14.1%	37.9%	24.4%	16,845	3.3%	0.0%	7.6%
2017	14.1%	42.5%	13.7%	16,314	2.7%	15.1%	10.2%

(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, 2017**		**June 30, 2016**	
Cash, equivalents, short term securities	$	15,461	$	11,243
Fixed income	$	116,764	$	125,331
Equity	$	390,993	$	306,438
SBI Alternative	$	79,019	$	64,984
Other	$	-	$	-
Total Assets in Trust	**$**	**602,237**	**$**	**507,996**
Assets Receivable	$	718	$	234
Amounts Payable	$	(495)	$	(447)
Net Assets Held in Trust for Pension Benefits	**$**	**602,460**	**$**	**507,783**

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 Plan's prior two fiscal years.

Change in Assets	**Market Value**	
Year Ending	**June 30, 2017**	**June 30, 2016**
1. Fund balance at market value at end of prior year	$ 507,783	$ 490,731
2. Adjustment to match reported value	$ -	$ -
3. Fund balance at market value at beginning of year	$ 507,783	$ 490,731
4. Contributions		
a. Member	$ 11,666	$ 11,008
b. Employer	$ 17,489	$ 16,490
c. Other sources	$ -	$ -
d. Total contributions	$ 29,155	$ 27,498
5. Investment income		
a. Investment income/(loss)	$ 78,973	$ 870
b. Investment expenses	$ (610)	$ (661)
c. Net subtotal	$ 78,363	$ 209
6. Other	$ -	$ (2)
7. Total income: *(4.d.) + (5.c.) + (6.)*	**$ 107,518**	**$ 27,705**
8. Benefits Paid		
a. Annuity benefits	$ (11,033)	$ (9,381)
b. Refunds	$ (1,478)	$ (982)
c. Total benefits paid	$ (12,511)	$ (10,363)
9. Expenses		
a. Other	$ -	$ -
b. Administrative	$ (330)	$ (290)
c. Total expenses	$ (330)	$ (290)
10. Total disbursements: *(6.c.) + (7.c.)*	**$ (12,841)**	**$ (10,653)**
11. Fund balance at market value at end of year	**$ 602,460**	**$ 507,783**
12. Approximate return on market value of assets	15.1%	0.0%

Plan Assets

Actuarial Asset Value *(Dollars in Thousands)*

	Original Amount	June 30, 2017	June 30, 2016
1. Market value of assets available for benefits		$ 602,460	$ 507,783
2. Determination of average balance			
a. Total assets available at beginning of year		$ 507,783	$ 490,731
b. Total assets available at end of year		$ 602,460	$ 507,783
c. Net investment income for fiscal year		$ 78,363	$ 209
d. Average balance *[a. + b. - c.] / 2*		$ 515,940	$ 499,152
3. Expected return *[8.0% * 2.d.]*		$ 41,275	$ 39,932
4. Actual return		$ 78,363	$ 209
5. Current year asset gain/(loss) *[4. - 3.]*		$ 37,088	$ (39,723)
6. Unrecognized asset returns			
	Original Amount	**Unrecognized Amount**	
a. Year ended June 30, 2017	$ 37,088	$ 29,670	N/A
b. Year ended June 30, 2016	$ (39,723)	$ (23,834)	$ (31,778)
c. Year ended June 30, 2015	$ (16,571)	$ (6,628)	$ (9,943)
d. Year ended June 30, 2014	$ 39,430	$ 7,886	$ 15,772
e. Year ended June 30, 2013	$ 19,267	N/A	$ 3,853
f. Unrecognized return adjustment		$ 7,094	$ (22,096)
7. **Actuarial value at end of year** *(1. - 6.f.)*		**$ 595,366**	**$ 529,879**
8. Approximate return on actuarial value of assets during fiscal year		9.1%	7.6%
9. Ratio of actuarial value of assets to market value of assets		0.99	1.04

Membership Data

Distribution of Active Members

	Years of Service as of June 30, 2017									
Age	**<3***	**3 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25 - 29**	**30 - 34**	**35+**	**Total**
< 25	291	6								**297**
Avg. Earnings	$ 28,975	$ 49,080								**$ 29,381**
25 - 29	520	125	25	1						**671**
Avg. Earnings	$ 37,087	$ 47,950	$ 49,866	$ 55,904						**$ 39,615**
30 - 34	260	111	164	54	1					**590**
Avg. Earnings	$ 36,857	$ 47,444	$ 56,813	$ 59,913	$ 66,171					**$ 46,556**
35 - 39	161	57	117	153	36					**524**
Avg. Earnings	$ 34,789	$ 45,856	$ 56,704	$ 64,218	$ 64,095					**$ 51,492**
40 - 44	99	39	73	106	127					**444**
Avg. Earnings	$ 39,282	$ 48,634	$ 58,461	$ 65,182	$ 67,627					**$ 57,548**
45 - 49	79	24	68	92	192					**455**
Avg. Earnings	$ 37,886	$ 49,497	$ 56,451	$ 67,122	$ 70,127					**$ 60,789**
50 - 54	45	16	40	82	202					**385**
Avg. Earnings	$ 34,759	$ 40,504	$ 60,704	$ 66,348	$ 72,596					**$ 64,274**
55 - 59	30	13	31	59	159					**292**
Avg. Earnings	$ 39,329	$ 58,279	$ 49,461	$ 65,587	$ 71,461					**$ 64,051**
60 - 64	15	2	12	30	89					**148**
Avg. Earnings	$ 37,599	$ 26,932	$ 54,258	$ 62,461	$ 69,687					**$ 63,141**
65 - 69	1	1	3	11	14					**30**
Avg. Earnings	$ 13,347	$ 22,069	$ 39,078	$ 53,247	$ 66,418					**$ 55,607**
70+	1	1	1	1	2					**6**
Avg. Earnings	$ 961	$ 2,931	$ 48,293	$ 30,004	$ 59,538					**$ 33,544**
Total	**1,502**	**395**	**534**	**589**	**822**					3,842
Avg. Earnings	**$ 35,356**	**$ 47,437**	**$ 56,335**	**$ 64,517**	**$ 70,200**					$ 51,439

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

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, 2017							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<50								
Avg. Benefit								
50 - 54	12	29						**41**
Avg. Benefit	$ 13,422	$ 9,240						**$ 10,464**
55 - 59	39	70	15					**124**
Avg. Benefit	$ 14,349	$ 10,769	$ 7,647					**$ 11,517**
60 - 64	38	115	67	3				**223**
Avg. Benefit	$ 17,880	$ 12,420	$ 8,985	$ 3,689				**$ 12,201**
65 - 69	20	105	95	29				**249**
Avg. Benefit	$ 10,319	$ 12,618	$ 9,485	$ 5,709				**$ 10,433**
70 - 74		18	63	51	6			**138**
Avg. Benefit		$ 11,378	$ 8,505	$ 4,911	$ 2,004			**$ 7,269**
75 - 79			13	32	18			**63**
Avg. Benefit			$ 5,962	$ 4,663	$ 1,420			**$ 4,005**
80 - 84			2	5	6			**13**
Avg. Benefit			$ 5,170	$ 3,691	$ 1,005			**$ 2,679**
85 - 89					2			**2**
Avg. Benefit					$ 1,228			**$ 1,228**
90+								
Avg. Benefit								
Total	**109**	**337**	**255**	**120**	**32**			**853**
Avg. Benefit	**$ 14,739**	**$ 11,809**	**$ 8,790**	**$ 4,956**	**$ 1,440**			**$ 9,928**

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, 2017							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<45	2	5	1	2				**10**
Avg. Benefit	$ 5,405	$ 10,412	$ 4,096	$ 6,360				**$ 7,969**
45 - 49		1	2					**3**
Avg. Benefit		$ 6,372	$ 9,392					**$ 8,385**
50 - 54		4	2					**6**
Avg. Benefit		$ 8,656	$ 10,743					**$ 9,352**
55 - 59		5		1	1			**7**
Avg. Benefit		$ 16,055		$ 2,462	$ 1,092			**$ 11,976**
60 - 64	1	6	3	1				**11**
Avg. Benefit	$ 6,221	$ 8,303	$ 6,304	$ 1,311				**$ 6,933**
65 - 69	1	3	3	2				**9**
Avg. Benefit	$ 4,731	$ 10,206	$ 8,127	$ 16,129				**$ 10,221**
70 - 74		3	1	2				**6**
Avg. Benefit		$ 3,935	$ 2,308	$ 8,299				**$ 5,119**
75 - 79		1		1				**2**
Avg. Benefit		$ 1,051		$ 546				**$ 799**
80 - 84								
Avg. Benefit								
85 - 89								
Avg. Benefit								
90+								
Avg. Benefit								
Total	**4**	**28**	**12**	**9**	**1**			**54**
Avg. Benefit	**$ 5,441**	**$ 9,522**	**$ 7,497**	**$ 7,322**	**$ 1,092**			**$ 8,247**

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, 2017 *							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
< 45		4	9	2				**15**
Avg. Benefit		$ 14,610	$ 14,109	$ 10,418				**$ 13,750**
45 - 49	1	6	2	3				**12**
Avg. Benefit	20,745	$ 20,798	$ 18,645	$ 20,360				**$ 20,325**
50 - 54	2	8	13	4	2			**29**
Avg. Benefit	$ 15,785	$ 16,874	$ 14,976	$ 19,870	$ 25,763			**$ 16,974**
55 - 59	4	8	10	5	2			**29**
Avg. Benefit	$ 22,465	$ 15,894	$ 15,601	$ 23,865	$ 26,670			**$ 18,817**
60 - 64	1	4	12	16	4			**37**
Avg. Benefit	26,104	$ 14,744	$ 15,225	$ 17,510	$ 19,343			**$ 16,900**
65 - 69	10	24	2		1			**37**
Avg. Benefit	$ 18,541	$ 18,516	$ 13,812		$ 14,109			**$ 18,149**
70 - 74		3	10					**13**
Avg. Benefit		$ 21,737	$ 19,268					**$ 19,838**
75+			2	4				**6**
Avg. Benefit			$ 14,658	$ 12,163				**$ 12,995**
Total	**18**	**57**	**60**	**34**	**9**			**178**
Avg. Benefit	**$ 19,649**	**$ 17,789**	**$ 15,788**	**$ 17,927**	**$ 21,817**			**$ 17,533**

** 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 7/1/2016	**3,827**	**2,755**	**2,359**	**749**	**169**	**49**	**9,908**
New members	610	0	0	0	0	0	**610**
Return to active	30	(12)	(18)	0	0	0	**0**
Terminated non-vested	(330)	0	330	0	0	0	**0**
Service retirements	(70)	(45)	0	115	0	0	**0**
Terminated deferred	(159)	159	0	0	0	0	**0**
Terminated refund/transfer	(54)	(34)	(29)	0	0	0	**(117)**
Deaths	(5)	(6)	(2)	(9)	(3)	0	**(25)**
New beneficiary	0	0	0	0	0	4	**4**
Disabled	(7)	0	0	0	7	0	**0**
Data correction	0	116	(16)	(2)	5	1	**104**
Net change	15	178	265	104	9	5	**576**
Members on 6/30/2017	**3,842**	**2,933**	**2,624**	**853**	**178**	**54**	**10,484**

Terminated Member Statistics	**Deferred Retirement**	**Other Non-Vested**	**Total**
Number	2,933	2,624	5,557
Average age	42.2	37.7	40.0
Average service	3.6	1.0	2.4
Average annual benefit, with augmentation to Normal Retirement Date and 35% Combined Service Annuity (CSA) load	$ 5,947	N/A	$ 5,947
Average refund value, with 35% CSA load (1% CSA load for Non-Vested)	$ 11,285	$ 1,320	$ 6,579

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 14.58% 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, 2017
A. Actuarial Value of Assets			$ 595,366
B. Expected Future Assets			
1. Present value of expected future statutory supplemental contributions*			$ 19,568
2. Present value of future normal cost contributions			$ 214,495
3. Total expected future assets: *(1.) + (2.)*			$ 234,063
C. Total Current and Expected Future Assets: *(A.+ B.3)*			$ 829,429
D. Current Benefit Obligations**			
1. Benefit recipients	**Non-Vested**	**Vested**	**Total**
a. Service retirements	$ -	$ 112,974	$ 112,974
b. Disability retirements	$ -	$ 44,281	$ 44,281
c. Survivors	$ -	$ 5,284	$ 5,284
2. Deferred retirements with augmentation	$ -	$ 116,761	$ 116,761
3. Former members without vested rights	$ 1,663	$ -	$ 1,663
4. Active members	$ 18,784	$ 282,007	$ 300,791
5. Total Current Benefit Obligations	$ 20,447	$ 561,307	$ 581,754
E. Expected Future Benefit Obligations			$ 262,611
F. Total Current and Expected Future Benefit Obligations***			$ 844,365
G. Unfunded Current Benefit Obligations: *(D.5.) - (A.)*			$ (13,612)
H. Unfunded Current and Future Benefit Obligations: *(F.) - (C.)*			$ 14,936
I. Accrued Benefit Funding Ratio: *(A.)/(D.)*			102.34%
J. Projected Benefit Funding Ratio: *(C.)/(F.)*			98.23%

* *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, projected 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	$ 431,890	$ 128,568	$ 303,322
b. Disability benefits	$ 71,922	$ 39,255	$ 32,667
c. Survivor's benefits	$ 9,427	$ 3,286	$ 6,141
d. Deferred retirements	$ 47,311	$ 35,348	$ 11,963
e. Refunds*	$ 2,852	$ 8,038	$ (5,186)
f. Total	$ 563,402	$ 214,495	$ 348,907
2. Deferred retirements with future augmentation	$ 116,761	$ -	$ 116,761
3. Former members without vested rights	$ 1,663	$ -	$ 1,663
4. Annuitants	$ 162,539	$ -	$ 162,539
5. Total	$ 844,365	$ 214,495	$ 629,870
B. Determination of Unfunded Actuarial Accrued Liability (UAAL)			
1. Actuarial accrued liability			$ 629,870
2. Current assets (AVA)			$ 595,366
3. Unfunded actuarial accrued liability			$ 34,504
C. Determination of Supplemental Contribution Rate**			
1. Present value of future payrolls through the amortization date of June 30, 2038			$ 2,835,968
2. Supplemental contribution rate: *(B.3.) / (C.1.)*			1.22% ***

* *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 June 30, 2017 is 13.59974.*

Development of Costs

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

	Year Ending June 30, 2017		
	Actuarial Accrued Liability	Current Assets	Unfunded Actuarial Accrued Liability
A. At beginning of year	$ 553,840	$ 529,879	$ 23,961
B. Changes due to interest requirements and current rate of funding			
1. Normal cost, including expenses	$ 27,052	$ -	$ 27,052
2. Benefit payments	$ (12,511)	$ (12,511)	$ -
3. Contributions	$ -	$ 29,155	$ (29,155)
4. Interest on A., B.1., B.2. and B.3.	$ 44,889	$ 43,056	$ 1,833
5. Total *(B.1. + B.2. + B.3. + B.4.)*	$ 59,430	$ 59,700	$ (270)
C. Expected unfunded actuarial accrued liability at end of year *(A. + B.5.)*			$ 23,691
D. Increase (decrease) due to actuarial losses (gains) because of experience deviations from expected			
1. Age and Service Retirements			$ (534)
2. Disability Retirements			$ (1,338)
3. Death-in-Service Benefits			$ 26
4. Withdrawals			$ (1,581)
5. Salary increases			$ (938)
6. Investment income			$ (5,787)
7. Mortality of annuitants			$ 149
8. Other items			$ (929)
9. Total			$ (10,932)
E. Unfunded actuarial accrued liability at end of year before Plan amendments and changes in actuarial assumptions *(C. + D.9.)*			$ 12,759
F. Change in unfunded actuarial accrued liability due to changes in Plan provisions			$ -
G. Change in unfunded actuarial accrued liability due to changes in actuarial assumptions			$ 21,745
H. Change in unfunded actuarial accrued liability due to changes in decrement timing and miscellaneous methodology			$ -
I. Unfunded actuarial accrued liability at end of year *(E. + F. + G. + H.)**			$ 34,504

** The unfunded actuarial accrued liability on a market value of assets basis is $27,410.*

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 payroll multiplied by projected annual payroll.

	Percent of Payroll		Dollar Amount
A. Statutory contributions - Chapter 353E			
1. Employee contributions	5.83%	$	12,157
2. Employer contributions	8.75%	$	18,246
3. Total	14.58%	$	30,403
B. Required contributions - Chapter 356			
1. Normal cost			
a. Retirement benefits	8.38%	$	17,475
b. Disability benefits	2.70%	$	5,630
c. Survivors	0.21%	$	438
d. Deferred retirement benefits	1.96%	$	4,087
e. Refunds*	0.48%	$	1,001
f. Total	13.73%	$	28,631
Unfunded Actuarial Accrued Liability by June 30, 2038	1.22%	$	2,544
3. Allowance for expenses	0.16%	$	334
4. Total	15.11% **	$	31,509
C. Contribution Sufficiency/(Deficiency) *(A.3. - B.4.)*	(0.53%)	$	(1,106)

Note: Projected annual payroll for fiscal year beginning on the valuation date: $208,531.

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

** *The required contribution on a market value of assets basis is 14.86% of payroll.*

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 be different.

Actuarial Cost Method

Actuarial Accrued Liability and required contributions in this report are computed using the Entry Age Normal Cost Method. This method is prescribed by Minnesota Statute. 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, 2038 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. Unless noted otherwise, the assumptions prescribed are based on the last experience study, dated February 2012, prepared by a former actuary. The mortality assumption is based on the Public Employees' Police & Fire Plan experience study, dated August 30, 2016. The Allowance for Combined Service Annuity assumptions are based on an analysis completed by the LCPR actuary and documented in a report dated October 2016.

Investment return	8.00% per annum.
Benefit increases after retirement	2.50% 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 earned during the year.
Inflation	2.75% per year.
Payroll growth	3.50% per year.
Mortality rates	
Healthy pre-retirement	RP-2014 employee generational mortality table projected with mortality improvement scale MP-2016, from a base year of 2006.
Healthy post-retirement	RP-2014 annuitant generational mortality table projected with mortality improvement scale MP-2016 from a base year of 2006. Male rates are adjusted by a factor of 0.96.
Disabled	RP-2014 annuitant generational mortality table projected with mortality improvement scale MP-2016 from a base year of 2006. Male rates are adjusted by a factor of 0.96.
	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.
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	25%
2	20%
3	15%

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 35.0% for vested members and 1.0% for non-vested members 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 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 three years younger than their male spouses. 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: 5% elect 25% Joint & Survivor option 10% elect 50% Joint & Survivor option 10% elect 75% Joint & Survivor option 35% elect 100% Joint & Survivor option Females: 5% elect 25% Joint & Survivor option 5% elect 50% Joint & Survivor option 5% elect 75% Joint & Survivor option 5% 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.
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 were applied: <u>Data for active members:</u> There were 68 members reported with a salary less than $100. We used prior year salary (47 members), if available; otherwise high five salary with a 10% load to account for salary increases (21 members). If neither prior year salary or high five salary was available, we assumed a value of $35,000. There were also 43 members reported without a gender and 1 member reported without a date of birth. We assumed an entry age of 31 and male gender. <u>Data for terminated members:</u> We calculated benefits for these members using the reported Average Salary and credited service. There were no members reported without Average Salary. If credited service was not reported (26 members), we used elapsed time from hire date to termination date (16 members), otherwise we assumed nine years of service. If termination date was not reported (12 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 no members reported without a date of birth. There were 3 members reported without a gender; male was assumed. <u>Data for retired members:</u> There were no members reported without a date of birth, gender or benefit. There were 8 members that were active last year, and retirement eligible, and not on the retiree data file this year. At the direction of PERA, we included these members in the 2017 valuation as retirees with an estimated life only monthly benefit. Because PERA reclassifies disabled members as retirees once the member reaches Normal Retirement Age, we compare the members that PERA reports as retirees to our disabled group from the last valuation. If a member was disabled in the valuation, we reclassify that member as a disabled retiree in this year's valuation. We reclassified 54 retirees as disabled retirees in this valuation.

Actuarial Basis

Summary of Actuarial Assumptions (Concluded)

Changes in actuarial assumptions	The base mortality table for healthy annuitants was changed from the RP-2000 fully generational table to the RP-2014 fully generational table (with a base year of 2006), with male rates adjusted by a factor of 0.96. The mortality improvement scale was changed from Scale AA to Scale MP-2016, and is applied to healthy and disabled members. The base mortality table for disabled annuitants was changed from the RP-2000 disabled mortality table to the RP-2014 disabled annuitant mortality table (with future mortality improvement according to MP-2016). The Combined Service Annuity (CSA) load was 30% for vested and non-vested, deferred members. The CSA has been changed to 35% for vested members and 1% for non-vested members.

Summary of Actuarial Assumptions (Continued)

	Percentage of Members Dying Each Year*					
	Healthy Post-Retirement Mortality		Healthy Pre-Retirement Mortality		Disability Mortality	
Age in 2017	Male	Female	Male	Female	Male	Female
20	0.03%	0.02%	0.04%	0.02%	0.03%	0.02%
25	0.05	0.03	0.05	0.02	0.05	0.03
30	0.08	0.06	0.05	0.02	0.08	0.06
35	0.12	0.11	0.06	0.03	0.12	0.11
40	0.18	0.17	0.07	0.04	0.18	0.17
45	0.26	0.21	0.10	0.07	0.26	0.21
50	0.39	0.27	0.17	0.11	0.39	0.27
55	0.55	0.38	0.28	0.17	0.55	0.38
60	0.77	0.56	0.48	0.26	0.77	0.56
65	1.10	0.84	0.86	0.39	1.10	0.84
70	1.65	1.31	1.42	0.64	1.65	1.31

* *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.*

	Withdrawal Rates		Disability Retirement	
Age	Male	Female	Male	Female
20	14.70%	14.20%	0.04%	0.04%
25	14.70%	14.20%	0.06%	0.06%
30	9.10%	11.40%	0.10%	0.08%
35	6.00%	8.60%	0.18%	0.11%
40	4.40%	6.90%	0.23%	0.18%
45	3.40%	4.30%	0.34%	0.39%
50	2.40%	3.10%	0.55%	0.70%
55	1.40%	2.20%	0.88%	1.18%
60	0.10%	0.20%	1.41%	2.41%
65	0.00%	0.00%	1.67%	2.67%

Actuarial Basis

Summary of Actuarial Assumptions (Concluded)

Age	Retirement Rate
50	3%
51	2
52	2
53	2
54	5
55	20
56	8
57	8
58	8
59	8
60	15
61	15
62	30
63	30
64	30
65	40
66	40
67	40
68	40
69	40
70+	100

Salary Scale	
Age	Increase
20	8.75%
25	7.50
30	6.50
35	6.00
40	5.50
45	4.75
50	4.75
55	4.50
60	4.00
65	3.75
70+	3.75

Actuarial Basis

Summary of Plan Provisions

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	Local government employees in covered correctional service for a county administered jail or correctional facility or in a regional correctional facility administered by multiple counties, who are directly responsible for security, custody and control of persons confined in jail or facility, who are expected to respond to incidents within the jail or facility, and who are not members of the Public Employees Police and Fire Fund.
Contributions	Shown as a percent of salary: Member 5.83% Employer 8.75% Member contributions are "picked up" according to the provisions of Internal Revenue Code 414(h).
Allowable service	Local Government Correctional Service during which member contributions were made (effective July 1, 1999). May also include certain leaves of absence, military service and periods while temporary Worker's Compensation is paid.
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	Hired before July 1, 2010: 100% vested after 3 years of Allowable Service; Hired after June 30, 2010: 50% vested after 5 years of Allowable Service; 60% vested after 6 years of Allowable Service; 70% vested after 7 years of Allowable Service; 80% vested after 8 years of Allowable Service; 90% vested after 9 years of Allowable Service; and 100% vested after 10 years of Allowable Service.
Retirement	
Normal retirement benefit	
Age/service requirement	Age 55 and vested. Proportionate Retirement Annuity is available at age 65 and one year of Allowable Service.
Amount	1.9% of Average Salary for each year of Allowable Service, pro rata for completed months.

Summary of Plan Provisions (Continued)

Retirement (Continued)	
<u>Early Retirement</u>	
Age/service requirement	Age 50 and vested.
Amount	Normal Retirement Benefit based on Allowable Service and Average Salary at retirement date with actuarial reduction to commencement age assuming 3% augmentation to age 55 (2.50% if hired after June 30, 2006).
<u>Form of payment</u>	Life annuity. Actuarially equivalent options are: 25%, 50%, 75% or 100% Joint and Survivor. 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>	Benefit recipients received a post-retirement benefit increase of 1.00% on January 1, 2013 and January 1, 2014. Because the actuarial accrued liability funding ratio (on a market value of assets basis) reached 90% for two consecutive years, the benefit increase reverted to 2.50% on January 1, 2015. If the funding ratio declines to less than 80% for one year or less than 85% for two consecutive years, the benefit increase will decrease 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.
Disability	
<u>Duty Disability</u>	
Age/service requirement	Member who cannot perform his duties as a direct result of a disability relating to an act of duty specific to protecting the property and personal safety of others.
Amount	47.50% of Average Salary plus 1.90% of Average Salary for each year in excess of 25 years of Allowable Service (pro rata for completed months). Payment begins at disability and ends at age 65 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.
<u>Regular Disability</u>	
Age/service requirement	At least one year of Allowable Service and a disability preventing member from performing normal duties that arise out of activities not related to covered employment or while at work, activities related to duties that do not present inherent dangers specific to occupation.

Summary of Plan Provisions (Continued)

Disability (Continued)	
Amount	Normal Retirement Benefit based on Allowable Service (minimum of 10 years) and Average Salary at disability. Payment begins at disability and ends at age 65 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 benefit	
Age/service requirement	Age 65 with continued disability.
Amount	Any optional annuity continues. Otherwise, the larger of the disability benefit paid before age 65 or the normal retirement benefit available at age 65, or an actuarially equivalent optional annuity.
Form of payment	Same as for retirement.
Benefit increases	Same as for retirement.
Death	
Surviving spouse benefit	
Age/service requirement	Vested active member at any age or vested former member age 50 or older who dies before retirement or disability benefit commences. If an active member dies, benefits may commence immediately, regardless of age.
Amount	Surviving spouse receives the 100% joint and survivor benefit using the Normal Retirement formula above. If commencement is prior to age 55, the appropriate early retirement formula described above applies except that one-half the monthly reduction factor is used from age 50 to the commencement age. In lieu of this benefit, the surviving spouse may elect a refund of contributions with interest or an actuarially equivalent term certain annuity (lump sum payable to estate at death).
Benefit increases	Same as for retirement.
Surviving dependent children's benefit	
Age/service requirement	If no surviving spouse, all dependent children (biological or adopted) below age 20 who are dependent for more than half of their support on deceased member.
Amount	Actuarially equivalent to surviving spouse 100% joint and survivor annuity payable to the later of age 20 or five years. The amount is to be proportionally divided among surviving children.
Refund of contributions	
Age/service requirement	Active employee dies and survivor benefits paid are less than member's contributions or a former employee dies before annuity begins.

Actuarial Basis

Summary of Plan Provisions (Continued)

Death (Continued)	
Amount	If no survivor benefits are paid, the member's contributions with 6.00% interest until June 30, 2011; 4.00% interest thereafter. If survivor benefits are paid and accumulated contributions exceed total payments to the surviving spouse and children, then the remaining contributions are paid out.
Termination	
Refund of contributions	
Age/service requirement	Termination of local government service.
Amount	If member terminated before July 1, 2011, member's contributions with 6.00% interest compounded annually until June 30, 2011; 4.00% interest thereafter. If member terminated after June 30, 2011, member's contributions credited with 4% interest compounded annually.
Deferred benefit	
Age/service requirement	A deferred annuity may be elected in lieu of a refund if vested. Partially or fully vested.
Amount	Benefit computed under law in effect at termination and increased by the following percentage (augmentation), compounded annually, if termination of employment is prior to January 1, 2012: (a.) 3.00% (2.50% if hired after June 30, 2006) until the earlier of January 1 of the year following attainment of age 55 and January 1, 2012; (b.) 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 (c.) 1.00% from January 1, 2012 thereafter. If a member terminates employment after 2011, they are not eligible for augmentation.
Form of payment	Same as for retirement.
Actuarially equivalent factors	Actuarially equivalent factors based on the RP-2000 mortality table for healthy annuitants, white collar adjustment, projected to 2026 using scale AA, no setbacks, blended 65% males, 6.00% post-retirement interest, and 8.50% pre-retirement interest. The post-retirement interest rate assumption will change to 6.50% on the earlier of the effective date of the next mortality adjustment or July 1, 2017.

Summary of Plan Provisions (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 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 previous valuation.

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)
7-1-2004	$ 75,515	$ 85,693	$ 10,178	88.12 %	$ 109,600	9.29 %
7-1-2005	$ 98,156	$ 108,926	$ 10,770	90.11	$ 116,849	9.22
7-1-2006	$ 125,776	$ 133,306	$ 7,530	94.35	$ 125,189	6.01
7-1-2007	$ 159,548	$ 162,169	$ 2,621	98.38	$ 134,117	1.95
7-1-2008	$ 192,937	$ 192,572	$ (365)	100.19	$ 154,202	(0.24)
7-1-2009	$ 217,577	$ 229,383	$ 11,806	94.85	$ 154,650	7.63
7-1-2010	$ 242,019	$ 248,867	$ 6,848	97.25	$ 154,777	4.42
7-1-2011	$ 274,704	$ 284,593	$ 9,889	96.53	$ 165,077 [2]	5.99
7-1-2012	$ 306,454	$ 343,199	$ 36,745	89.29	$ 164,340 [2]	22.36
7-1-2013	$ 346,778	$ 381,179	$ 34,401	90.98	$ 164,820 [2]	20.87
7-1-2014	$ 410,489	$ 426,508	$ 16,019	96.24	$ 172,041 [2]	9.31
7-1-2015	$ 475,963	$ 498,052	$ 22,089	95.56	$ 179,623 [2]	12.30
7-1-2016	$ 529,879	$ 553,840	$ 23,961	95.67	$ 188,816 [2]	12.69
7-1-2017	$ 595,366	$ 629,870	$ 34,504	94.52	$ 200,103 [2]	17.24

[1] *Information prior to 2012 provided by prior actuaries. See prior reports for additional detail.*
[2] *Assumed equal to actual member contributions divided by 5.83%.*

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[2] (e)	Percentage Contributed (e)/(d)
2004	14.15 %	$ 109,600	$ 6,672	$ 8,837	$ 10,029	113.50 %
2005	13.06	$ 116,849	$ 7,192	$ 8,068	$ 10,814	134.03
2006	13.09	$ 125,189	$ 7,881	$ 8,507	$ 11,826	139.02
2007	12.71	$ 134,117	$ 8,335	$ 8,712	$ 12,499	143.48
2008	12.37	$ 154,202	$ 8,922	$ 10,153	$ 13,388	131.87
2009	13.50	$ 154,650	$ 9,409	$ 11,469	$ 14,124	123.15
2010	14.03	$ 154,777	$ 9,442	$ 12,273	$ 14,170	115.46
2011	13.21	$ 165,077 [3]	$ 9,624	$ 12,183	$ 14,289	117.29
2012	13.42	$ 164,340 [3]	$ 9,581	$ 12,473	$ 14,320	114.80
2013	14.45	$ 164,820 [3]	$ 9,609	$ 14,207	$ 14,498	102.04
2014	14.32	$ 172,041 [3]	$ 10,030	$ 14,606	$ 15,054	103.07
2015	13.49	$ 179,623 [3]	$ 10,472	$ 13,759	$ 15,736	114.37
2016	14.54	$ 188,816 [3]	$ 11,008	$ 16,446	$ 16,490	100.27
2017	14.46	$ 200,103 [3]	$ 11,666	$ 17,269	$ 17,489	101.27
2018	15.11					

[1] *Information prior to 2012 provided by prior actuary. See prior reports for additional detail.*
[2] *Includes contributions from other sources (if applicable).*
[3] *Assumed equal to actual member contributions divided by 5.83%.*

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 (comparable to a Projected Unit Credit measurement).
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, effective for the fiscal year beginning July 1, 2014, sets the accounting rules for the employers that sponsor or contribute to public retirement systems, while Statement No. 67, effective for the fiscal year beginning July 1, 2013, 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.

Public Employees Retirement Association of Minnesota

Public Employees Police & Fire Plan
Actuarial Valuation Report as of July 1, 2017

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November 10, 2017

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, 2017 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, 2017 according to the prescribed assumptions. 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.

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.

In our professional judgement, the statutory discount rate of 8.0% used in this report deviates materially from the guidance set forth in Actuarial Standards of Practice No. 27 (ASOP No. 27). In a 2017 analysis of long-term rate of investment return and inflation assumptions, GRS suggested that an investment return assumption in the range of 6.85% to 7.68% would be reasonable. Please see our letter dated September 11, 2017 for additional information. If a discount rate within the reasonable range were used in this valuation instead of 8.0%, the unfunded liability and contribution deficiency would be higher than shown. Note that estimated results based on a 7.0% discount rate are shown on page five.

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 pages five and six, 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.

277 Coon Rapids Boulevard | Suite 212 | Coon Rapids, Minnesota 55433-2629

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.

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, 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:bd

GRS

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 normal cost of the plan is expected to remain approximately level as a percent of pay, and
(2) The funded status of the plan is expected to gradually improve but is not expected to be 100% funded within the next 50 years.

However, as noted elsewhere in this report, we do not expect the earnings assumption of 8% to be met. Unfunded liabilities based on a lower earnings assumption have the potential to grow indefinitely.

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.
(4) The funded status would appear lower if it were based upon an investment return assumption that meets the requirements of ASOP 27.

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.

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, 2017	Actuarial Valuation as of July 1, 2016
Statutory Contributions - Chapter 353 (% of Payroll)	29.36%	29.48%
Required Contributions - Chapter 356 (% of Payroll)	30.58%	28.30%
Sufficiency / (Deficiency)	(1.22)%	1.18%

The contribution status changed from a sufficiency of 1.18% of payroll to a deficiency of 1.22% of payroll. The increased costs are primarily due to assumption changes described on page three, including earlier expectations for payment of the 2.50% postretirement benefit increase.

Based on the actuarial value of assets and scheduled contribution rates, statutory contributions are not sufficient to fully amortize the unfunded actuarial accrued liability over the statutory amortization period of 26 years. Based on current statutory contributions, the actuarial value of assets, and other methods and assumptions described in this report, the funded status of the plan is expected to gradually improve but is not expected to be 100% funded within the next 50 years.

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 15.2% for the plan year ending June 30, 2017. The AVA earned approximately 9.5% for the plan year ending June 30, 2017 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, 2017	**July 1, 2016**
Contributions (*% of Payroll*)		
Statutory - Chapter 353	29.36%	29.48%
Required - Chapter 356	30.58%	28.30%
Sufficiency / (Deficiency)	(1.22)%	1.18%
Funding Ratios (*dollars in thousands*)		
Assets		
- Current assets (AVA)	$ 7,840,549	$ 7,385,777
- Current assets (MVA)	$ 7,918,879	$ 7,098,090
Accrued Benefit Funding Ratio		
- Current benefit obligations	$ 8,869,242	$ 8,148,749
- Funding ratio (AVA)	88.40%	90.64%
- Funding ratio (MVA)	89.28%	87.11%
Accrued Liability Funding Ratio		
- Actuarial accrued liability	$ 9,199,208	$ 8,417,621
- Funding ratio (AVA)	85.23%	87.74%
- Funding ratio (MVA)	86.08%	84.32%
Projected Benefit Funding Ratio		
- Current and expected future assets	$ 10,871,452	$ 10,314,416
- Current and expected future benefit obligations	$ 11,051,212	$ 10,152,134
- Projected benefit funding ratio (AVA)	98.37%	101.60%
Participant Data		
Active members		
- Number	11,522	11,398
- Annual valuation earnings *(000s)* *	$ 912,722	$ 867,808
- Projected annual earnings *(000s)* *	$ 960,210	$ 915,827
- Average projected annual earnings *	$ 83,373	$ 80,413
- Average age	40.4	40.4
- Average service	12.4	12.4
Service retirements	7,408	7,222
Survivors	1,861	1,873
Disability retirements	1,310	1,257
Deferred retirements	1,506	1,490
Terminated other non-vested	1,134	1,059
Total	**24,741**	**24,299**

** These values exclude 5 members (9 in 2016) 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, 2017 (based on an experience study dated August 30, 2016 and an analysis of Combined Service Annuity assumptions completed by the LCPR actuary and documented in an October 2016 report):

- Assumed increases in member salaries were changed.
- Assumed rates of retirement and termination were changed.
- The percent married assumption for active female members was changed from 65% to 60%.
- The assumed age difference for married members was changed to 2 years (with males older than females).
- The base mortality table for annuitants and employees was changed from RP-2000 to RP-2014, fully generational, with age adjustments. The mortality improvement scale was change from Scale AA to Scale MP-2016.
- Form of payment assumptions were modified for active female members.
- The assumed post-retirement benefit increase rate was changed from 1.00% per year through 2050 and 2.50% per year thereafter to 1.00% per year through 2034 and 2.50% per year thereafter. See page four for additional detail about this assumption.
- Loading factors to account for members with Combined Service Annuities were updated as follows:
  - Deferred Vested Members: Increased from 30% of liabilities to 33% of liabilities
  - Non-Vested Terminated Members: Reduced from 30% of liabilities to 2% of liabilities
- As a result of the additional liability resulting from the changes described above, the amortization date was changed from June 30, 2041 to June 30, 2043 per Minnesota Statute 356.215, Subd. 11(c).

Refer to the Actuarial Basis section of this report for a complete description of these changes. The combined impact of the above change was to increase the accrued liability by $436.2 million and increase the required contribution by 3.2% of pay, as follows:

	Before Assumption Changes	Reflecting Assumption Changes	Reflecting Assumption Changes and Amortization Period Change
Normal Cost Rate, % of Pay	20.8%	21.3%	21.3%
Amortization of Unfunded Accrued Liability, % of pay	6.5%	9.6%	9.2%
Expenses (% of Pay)	0.1%	0.1%	0.1%
Total Required Contribution, % of Pay	27.4%	31.0%	30.6%
Accrued Liability Funding Ratio	89.5%	85.2%	85.2%
Projected Benefit Funding Ratio	102.6%	97.9%	98.4%
Unfunded Accrued Liability (in billions)	$0.9	$1.4	$1.4

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 2033, and that the plan would begin paying 2.50% benefit increases on January 1, 2034. This assumption is reflected in our calculations. This is only an assumption; actual timing will depend on actual experience.

As noted elsewhere in this report, we do not expect the earnings assumption of 8.00% to be met. The funding ratio threshold would be achieved later if it was based upon an investment return assumption that meets the requirements of ASOP No. 27.

Summary of Valuation Results

Sensitivity Tests

During the 2017 legislative session, the Legislative Commission on Pensions and Retirement (LCPR) enacted a new sensitivity disclosure requirement for PERA's 2017 valuations. Per the LCPR's requirement, we have calculated the liabilities associated with the following scenarios:

1) 7% interest rate assumption
2) 9% interest rate assumption
3) 1.0% post-retirement benefit increase for all future years
4) 2.5% post-retirement benefit increase for all future years

In each case, all other assumptions were unchanged from those used to develop the final valuation results in this report. Note that we believe the 9% interest rate assumption is an unrealistic assumption.

	Final Valuation Assumptions	Final Valuation Assumptions with 7% interest	Final Valuation Assumptions with 9% interest	Final Valuation Assumptions with 1.0% COLA for all future years	Final Valuation Assumptions with 2.5% COLA for all future years
Normal Cost Rate, % of Pay	21.3%	27.2%	16.9%	19.3%	22.2%
Amortization of Unfunded Accrued Liability, % of Pay	9.2%	15.8%	2.7%	6.6%	15.2%
Expenses (% of Pay)	0.1%	0.1%	0.1%	0.1%	0.1%
Total Required Contribution, % of Pay	30.6%	43.1%	19.7%	26.0%	37.5%
Contribution Sufficiency/(Deficiency), % of Pay	(1.2)%	(13.8)%	9.7 %	3.4 %	(8.1)%
Accrued Liability Funding Ratio	85.2%	75.2%	95.7%	89.3%	77.8%
Actuarial Accrued Liability (in billions)	$9.2	$10.4	$8.2	$8.8	$10.1
Unfunded Accrued Liability (in billions)	$1.4	$2.6	$0.4	$0.9	$2.2

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%
2015	$ 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%
2017	$ 9,199,208	$ 7,918,879	$ 1,280,329	$ 944,296	86.1%	$ 5,532,560	60.1%	974.2%	838.6%

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%
2017	14.1%	118.2%	135.6%	$ (238,177)	-3.0%	15.2%	10.2%

(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, 2017**	**June 30, 2016**
Cash, equivalents, short term securities	$ 190,809	$ 145,521
Fixed income	$ 1,535,288	$ 1,751,552
Equity	$ 5,141,012	$ 4,282,601
SBI alternative	$ 1,038,994	$ 908,179
Other	$ -	$ -
Total Assets in Trust	**$ 7,906,103**	**$ 7,087,853**
Assets receivable	$ 18,348 *	$ 15,918 **
Amounts payable	$ (5,572)	$ (5,681)
Net Assets Held in Trust for Pension Benefits	**$ 7,918,879**	**$ 7,098,090**

* *Includes $13.648 million contribution from Minneapolis to be paid by July 15, 2017.*
** *Includes $13.648 million contribution from Minneapolis paid by July 15, 2016.*

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, 2017**		**June 30, 2016**	
1.	Fund balance at market value at beginning of year	**$ 7,098,090**		**$ 7,348,704**	
2.	Contributions				
	a. Member	$ 101,984		$ 95,172	
	b. Employer	$ 166,329	*	$ 156,065	**
	c. Other sources (state contribution)	$ 9,000		$ 9,000	
	d. Total contributions	$ 277,313		$ 260,237	
3.	Investment income				
	a. Investment income/(loss)	$ 1,067,162		$ 549	
	b. Investment expenses	$ (8,220)		$ (9,498)	
	c. Net subtotal	$ 1,058,942		$ (8,949)	
4.	Other	$ 24		$ 3	
5.	**Total income:** *(2.d.) + (3.c.) + (4.)*	**$ 1,336,279**		**$ 251,291**	
6.	Benefits Paid				
	a. Annuity benefits	$ (512,379)		$ (498,608)	
	b. Refunds	$ (2,119)		$ (2,391)	
	c. Total benefits paid	$ (514,498)		$ (500,999)	
7.	Expenses				
	a. Other	$ -		$ -	
	b. Administrative	$ (992)		$ (906)	
	c. Total expenses	$ (992)		$ (906)	
8.	**Total disbursements:** *(6.c.) + (7.c.)*	**$ (515,490)**		**$ (501,905)**	
9.	**Fund balance at market value at end of year**	**$ 7,918,879**		**$ 7,098,090**	
10.	Approximate return on market value of assets	15.2%		-0.1%	

**   Includes $13.648 million contribution from Minneapolis to be paid by July 15, 2017.*
*** Includes $13.648 million contribution from Minneapolis paid by July 15, 2016.*

Plan Assets

Actuarial Asset Value *(Dollars in Thousands)*

		June 30, 2017	June 30, 2016
1. Market value of assets available for benefits		**$ 7,918,879**	**$ 7,098,090**
2. Determination of average balance			
a. Total assets available at beginning of year		$ 7,098,090	$ 7,348,704
b. Total assets available at end of year		$ 7,918,879	$ 7,098,090
c. Net investment income for fiscal year		$ 1,058,942	$ (8,949)
d. Average balance *[a. + b. - c.] / 2*		$ 6,979,014	$ 7,227,871
3. Expected return *[8.0% * 2.d.]*		$ 558,321	$ 578,230
4. Actual return		$ 1,058,942	$ (8,949)
5. Current year asset gain/(loss) *[4. - 3.]*		$ 500,621	$ (587,179)
6. Unrecognized asset returns			
	Original Amount	**Unrecognized Amount**	
a. Year ended June 30, 2017	$ 500,621	$ 400,497	N/A
b. Year ended June 30, 2016	$ (587,179)	$ (352,307)	$ (469,743)
c. Year ended June 30, 2015	$ (254,614)	$ (101,846)	$ (152,768)
d. Year ended June 30, 2014	$ 659,930	$ 131,986	$ 263,972
e. Year ended June 30, 2013	$ 354,260	N/A	$ 70,852
f. Unrecognized return adjustment		$ 78,330	$ (287,687)
7. **Actuarial value at end of year** *(1. - 6.f.)*		**$ 7,840,549**	**$ 7,385,777**
8. Approximate return on actuarial value of assets during fiscal year		9.5%	7.9%
9. Ratio of actuarial value of assets to market value of assets		0.99	1.04

Membership Data

Distribution of Active Members**

Age	Years of Service as of June 30, 2017 <3*	3 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35+	Total
< 25	330	8								**338**
Avg. Earnings	$43,031	$64,898								**$ 43,549**
25 - 29	766	333	121							**1,220**
Avg. Earnings	$53,743	$67,692	$70,231							**$ 59,186**
30 - 34	457	355	760	281						**1,853**
Avg. Earnings	$54,806	$69,551	$75,869	$80,322						**$ 70,139**
35 - 39	242	202	447	881	207					**1,979**
Avg. Earnings	$54,823	$68,772	$77,868	$82,483	$ 87,242					**$ 77,157**
40 - 44	101	82	202	530	863	148	1			**1,927**
Avg. Earnings	$55,555	$69,131	$74,600	$82,853	$ 89,052	$90,276	$ 85,746			**$ 83,321**
45 - 49	43	62	131	284	700	789	131			**2,140**
Avg. Earnings	$62,046	$65,433	$70,002	$82,455	$ 89,156	$95,906	$ 99,666			**$ 88,994**
50 - 54	30	27	49	111	286	430	430	85		**1,448**
Avg. Earnings	$62,942	$72,794	$73,129	$81,424	$ 88,366	$96,044	$ 102,115	$ 99,864		**$ 93,539**
55 - 59	17	8	15	53	92	125	114	60	7	**491**
Avg. Earnings	$58,375	$56,887	$89,292	$87,494	$ 86,269	$93,833	$ 105,203	$ 101,971	$113,269	**$ 93,675**
60 - 64	1	1	6	17	19	18	18	12	7	**99**
Avg. Earnings	$17,919	$70,236	$58,969	$83,024	$ 90,247	$81,208	$ 104,756	$ 102,906	$115,809	**$ 90,515**
65 - 69			5	3	6	2	2	2	2	**22**
Avg. Earnings			$30,650	$80,728	$ 95,053	$85,981	$ 87,086	$ 104,766	$105,948	**$ 78,787**
70+										
Avg. Earnings										
Total	**1,987**	**1,078**	**1,736**	**2,160**	**2,173**	**1,512**	**696**	**159**	**16**	**11,517**
Avg. Earnings	**$52,772**	**$68,515**	**$75,250**	**$82,359**	**$ 88,732**	**$95,035**	**$ 102,161**	**$ 100,950**	**$113,465**	**$ 79,250**

* *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 five members who were merged into PERA P&F in 2012 from the Minneapolis Fire Retirement Fund 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, 2017							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<50								
Avg. Benefit								
50 - 54	93	318						**411**
Avg. Benefit	$ 49,265	$ 47,107						**$ 47,596**
55 - 59	177	605	372	1				**1,155**
Avg. Benefit	$ 64,822	$ 58,039	$ 50,131	$ 61,005				**$ 56,534**
60 - 64	44	318	615	420	5			**1,402**
Avg. Benefit	$ 59,573	$ 59,566	$ 57,453	$ 49,197	$ 62,371			**$ 55,543**
65 - 69	17	123	256	578	481	2	2	**1,459**
Avg. Benefit	$ 51,712	$ 48,021	$ 51,212	$ 54,328	$ 50,581	$ 54,043	$ 65,286	**$ 51,998**
70 - 74	1	15	99	175	771	122	2	**1,185**
Avg. Benefit	$ 27,053	$ 49,819	$ 40,546	$ 45,862	$ 55,912	$ 46,516	$ 65,286	**$ 52,091**
75 - 79	1	3	10	49	353	362	38	**816**
Avg. Benefit	$ 4,401	$ 40,086	$ 29,668	$ 38,555	$ 57,118	$ 62,770	$ 45,537	**$ 57,508**
80 - 84		1	4	4	147	233	132	**521**
Avg. Benefit		$ 67,597	$ 26,228	$ 50,909	$ 53,565	$ 60,795	$ 52,205	**$ 56,251**
85 - 89		1	2		33	111	155	**302**
Avg. Benefit		$ 21,048	$ 34,827		$ 56,108	$ 55,835	$ 57,454	**$ 56,441**
90+			1		23	57	76	**157**
Avg. Benefit			$ 22,977		$ 56,684	$ 58,252	$ 51,841	**$ 54,694**
Total	**333**	**1,384**	**1,359**	**1,227**	**1,813**	**887**	**405**	**7,408**
Avg. Benefit	**$ 58,820**	**$ 54,840**	**$ 52,686**	**$ 50,729**	**$ 54,573**	**$ 58,838**	**$ 53,649**	**$ 54,291**

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

Age	Years Since Death as of June 30, 2017 <1	1 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25+	Total
<45	13	41	54	26	3	1		**138**
Avg. Benefit	$ 16,614	$ 14,858	$ 16,706	$ 17,823	$ 21,189	$ 6,296		**$ 16,311**
45 - 49	1	4	9	4	2	1		**21**
Avg. Benefit	$ 37,286	$ 39,559	$ 27,113	$ 41,459	$ 33,862	$ 31,477		**$ 33,551**
50 - 54	1	8	10	7	3	3	2	**34**
Avg. Benefit	$ 81,911	$ 46,649	$ 37,680	$ 30,506	$ 42,811	$ 46,011	$ 24,899	**$ 40,050**
55 - 59	3	11	19	8	3	3	5	**52**
Avg. Benefit	$ 19,274	$ 34,319	$ 40,120	$ 36,073	$ 26,906	$ 32,030	$ 37,331	**$ 35,570**
60 - 64	10	34	29	29	13	7	8	**130**
Avg. Benefit	$ 26,284	$ 32,547	$ 34,103	$ 34,084	$ 34,234	$ 43,009	$ 38,907	**$ 33,879**
65 - 69	13	48	29	27	26	14	17	**174**
Avg. Benefit	$ 30,745	$ 34,411	$ 34,211	$ 30,216	$ 32,945	$ 48,411	$ 34,904	**$ 34,408**
70 - 74	13	65	57	32	57	25	23	**272**
Avg. Benefit	$ 28,285	$ 34,841	$ 30,090	$ 34,111	$ 33,329	$ 36,775	$ 31,309	**$ 33,008**
75 - 79	14	56	49	25	55	19	23	**241**
Avg. Benefit	$ 30,228	$ 32,523	$ 33,585	$ 33,399	$ 36,039	$ 35,024	$ 34,397	**$ 33,875**
80 - 84	12	64	43	39	45	31	29	**263**
Avg. Benefit	$ 42,972	$ 31,152	$ 27,965	$ 36,945	$ 30,909	$ 33,078	$ 34,383	**$ 32,571**
85 - 89	8	42	53	37	64	57	31	**292**
Avg. Benefit	$ 33,468	$ 32,669	$ 32,630	$ 34,541	$ 31,118	$ 30,802	$ 26,433	**$ 31,555**
90+	8	17	30	30	66	49	44	**244**
Avg. Benefit	$ 32,489	$ 33,696	$ 28,429	$ 24,075	$ 31,548	$ 27,283	$ 24,629	**$ 28,322**
Total	**96**	**390**	**382**	**264**	**337**	**210**	**182**	**1,861**
Avg. Benefit	**$ 30,171**	**$ 31,541**	**$ 29,874**	**$ 31,452**	**$ 32,607**	**$ 33,112**	**$ 30,508**	**$ 31,385**

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, 2017							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
< 45	18	71	24	11				**124**
Avg. Benefit	$ 42,494	$ 39,688	$ 32,110	$ 30,024				**$ 37,771**
45 - 49	13	47	23	23	5	2		**113**
Avg. Benefit	$ 49,947	$ 45,018	$ 35,190	$ 33,858	$ 31,428	$ 27,272		**$ 40,398**
50 - 54	9	64	29	27	19	5		**153**
Avg. Benefit	$ 57,115	$ 49,325	$ 43,295	$ 38,840	$ 34,515	$ 35,476		**$ 44,498**
55 - 59	19	47	13	43	42	8		**172**
Avg. Benefit	$ 38,875	$ 46,577	$ 42,920	$ 41,056	$ 38,200	$ 42,421		**$ 41,831**
60 - 64	4	26	23	81	56	13		**203**
Avg. Benefit	$ 47,922	$ 44,748	$ 49,178	$ 48,851	$ 44,347	$ 46,946		**$ 46,980**
65 - 69	3	12	2	80	125	24		**246**
Avg. Benefit	$ 34,310	$ 46,706	$ 56,987	$ 47,948	$ 50,950	$ 49,610		**$ 49,404**
70 - 74		2	4	24	110	39		**179**
Avg. Benefit		$ 65,952	$ 57,066	$ 43,801	$ 53,131	$ 58,706		**$ 53,326**
75+			2	4	27	55	32	**120**
Avg. Benefit			$ 50,572	$ 62,612	$ 50,924	$ 52,117	$ 52,627	**$ 52,308**
Total	**66**	**269**	**120**	**293**	**384**	**146**	**32**	**1,310**
Avg. Benefit	**$ 44,871**	**$ 45,113**	**$ 41,400**	**$ 44,429**	**$ 48,148**	**$ 51,769**	**$ 52,627**	**$ 46,423**

** 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 7/1/2016	**11,398**	**1,490**	**1,059**	**7,222**	**1,257**	**1,873**	**24,299**
New members	656						656
Return to active	45	(24)	(21)	0	0	0	0
Terminated non-vested	(88)	0	88	0	0	0	0
Service retirements	(245)	(95)	0	340	0	0	0
Terminated deferred	(153)	153	0	0	0	0	0
Terminated refund/transfer	(30)	(28)	(14)	0	0	0	(72)
Deaths	(7)	(1)	(3)	(152)	(15)	(98)	(276)
New beneficiary	0	0	0	0	0	104	104
Disabled	(55)	0	0	0	55	0	0
Data adjustments	1	11	25	(2)	13	(18)	30
Net change	124	16	75	186	53	(12)	442
Members on 6/30/2017	**11,522**	**1,506**	**1,134**	**7,408**	**1,310**	**1,861**	**24,741**

Terminated Member Statistics	**Deferred Retirement**	**Other Non-Vested**	**Total**
Number	1,506	1,134	2,640
Average age	44.8	44.6	44.7
Average service	7.0	0.7	4.3
Average annual benefit, with augmentation to Normal Retirement Date and 33% Combined Service Annuity (CSA) load	$19,469	N/A	$19,469
Average refund value, with 33% CSA load (2% CSA load for Non-Vested)	$37,074	$2,371	$22,168

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 29.36% 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.

	Non-Vested	Vested	June 30, 2017
A. Actuarial Value of Assets			$ 7,840,549
B. Expected Future Assets			
1. Present value of expected future statutory supplemental contributions*			$ 1,178,899
2. Present value of future normal cost contributions			$ 1,852,004
3. Total expected future assets: *(1.) + (2.)*			$ 3,030,903
C. Total Current and Expected Future Assets *(A.+ B.3)*			$ 10,871,452
D. Current Benefit Obligations**			
1. Benefit recipients	**Non-Vested**	**Vested**	**Total**
a. Service retirements	$ -	$ 4,336,447	$ 4,336,447
b. Disability retirements	$ -	$ 729,385	$ 729,385
c. Survivors	$ -	$ 466,728	$ 466,728
2. Deferred retirements with augmentation	$ -	$ 210,569	$ 210,569
3. Former members without vested rights	$ 1,477	$ -	$ 1,477
4. Active members	$ 118,137	$ 3,006,499	$ 3,124,636
5. Total current benefit obligations	$ 119,614	$ 8,749,628	$ 8,869,242
E. Expected Future Benefit Obligations			$ 2,181,970
F. Total Current and Expected Future Benefit Obligations***			$ 11,051,212
G. Unfunded Current Benefit Obligations: *(D.5.) - (A.)*			$ 1,028,693
H. Unfunded Current and Future Benefit Obligations: *(F.) - (C.)*			$ 179,760
I. Accrued Benefit Funding Ratio: *(A.)/(D.5.)*			88.40%
J. Projected Benefit Funding Ratio: *(C.)/(F.)*			98.37%

* *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	$ 4,518,736	$ 1,353,362	$ 3,165,374
b. Disability benefits	$ 511,554	$ 301,297	$ 210,257
c. Survivor's benefits	$ 94,826	$ 54,694	$ 40,132
d. Deferred retirements	$ 175,549	$ 133,301	$ 42,248
e. Refunds*	$ 5,941	$ 9,350	$ (3,409)
f. Total	$ 5,306,606	$ 1,852,004	$ 3,454,602
2. Deferred retirements with future augmentation	$ 210,569	$ -	$ 210,569
3. Former members without vested rights	$ 1,477	$ -	$ 1,477
4. Annuitants	$ 5,532,560	$ -	$ 5,532,560
5. Total	$ 11,051,212	$ 1,852,004	$ 9,199,208

B. Determination of Unfunded Actuarial Accrued Liability (UAAL)	
1. Actuarial accrued liability	$ 9,199,208
2. Current assets (AVA)	$ 7,840,549
3. Unfunded actuarial accrued liability	$ 1,358,659
C. Determination of Supplemental Contribution Rate**	
1. Present value of future payrolls through the amortization date of June 30, 2043	$ 14,791,706
2. Supplemental contribution rate: *(B.3.) / (C.1.)*	9.19% ***

* *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, 2017 is 15.40466.*

Development of Costs

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

	Year Ending June 30, 2017		
	Actuarial Accrued Liability	**Current Assets**	**Unfunded Actuarial Accrued Liability**
A. Unfunded actuarial accrued liability at beginning of year	$ 8,417,621	$ 7,385,777	$ 1,031,844
B. Changes due to interest requirements and current rate of funding			
1. Normal cost, including expenses	$ 190,844	$ -	$ 190,844
2. Benefit payments	$ (514,498)	$ (514,498)	$ -
3. Contributions	$ -	$ 277,313	$ (277,313)
4. Interest on A., B.1., B.2. and B.3.	$ 660,464	$ 581,375	$ 79,089
5. Total *(B.1. + B.2. + B.3. + B.4.)*	$ 336,810	$ 344,190	$ (7,380)
C. Expected unfunded actuarial accrued liability at end of year *(A. + B.5.)*			$ 1,024,464
D. Increase (decrease) due to actuarial losses (gains) because of experience deviations from expected			
1. Age and service retirements			$ (1,565)
2. Disability retirements			$ 884
3. Death-in-service benefits			$ (598)
4. Withdrawals			$ (1,623)
5. Salary increases			$ 11,538
6. Investment income			$ (110,582)
7. Mortality of annuitants			$ 5,345
8. Other items			$ (5,430)
9. Total			$ (102,031)
E. Unfunded actuarial accrued liability at end of year before plan amendments and changes in actuarial assumptions *(C. + D.9.)*			$ 922,433
F. Change in unfunded actuarial accrued liability due to changes in plan provisions			$ -
G. Change in unfunded actuarial accrued liability due to changes in actuarial assumptions			$ 436,226
H. Change in unfunded actuarial accrued liability due to changes in decrement timing and miscellaneous methodology			$ -
I. Unfunded actuarial accrued liability at end of year *(E. + F. + G. + H.)**			$ 1,358,659

* *The unfunded actuarial accrued liability on a market value of assets basis is $1,280,329.*

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%	$	103,703
2. Employer contributions	16.20%	$	155,554
3. Minneapolis Police contributions***	0.93%	$	8,890
4. Minneapolis Fire contributions***	0.50%	$	4,757
5. Virginia Fire contributions	0.00%	$	30
6. State contributions****	0.93%	$	9,000
7. Total	29.36%	$	281,934
B. Required contributions - Chapter 356			
1. Normal cost			
a. Retirement benefits	15.59%	$	149,697
b. Disability benefits	3.47%	$	33,319
c. Survivors	0.66%	$	6,337
d. Deferred retirement benefits	1.46%	$	14,019
e. Refunds*	0.10%	$	960
f. Total	21.28%	$	204,332
2. Supplemental contribution amortization of Unfunded Actuarial Accrued Liability by June 30, 2043	9.19%	$	88,243
3. Allowance for expenses	0.11%	$	1,056
4. Total	30.58% **	$	293,631
C. Contribution Sufficiency/(Deficiency) *(A.7. - B.4.)*	(1.22)%	$	(11,697)

Note: Projected annual payroll for fiscal year beginning on the valuation date: $960,210.

* *Includes non-vested refunds and non-married survivor benefits only.*
** *The required contribution on a market value of assets basis is 30.05% of payroll.*
*** *Contributions due July 15, 2018. 2017 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, 2017

Group	Number	Annual Benefits	Average Age	Present Value of Projected Benefits
Active Members	0	N/A	N/A	$ -
Service Retirements	429	$ 26,885	75.5	$ 251,613
Disability Retirements	17	$ 959	72.1	$ 9,905
Survivors	206	$ 7,173	80.3	$ 50,262
Total	**652**	**$ 35,017**	**76.9**	**$ 311,780**

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, 2017

Group	Number	Annual Benefits	Average Age	Present Value of Projected Benefits
Active Members	5	N/A	61.6	$ 3,262
Service Retirements	261	$ 16,780	75.9	$ 150,926
Disability Retirements	37	$ 2,303	74.4	$ 21,865
Survivors	155	$ 5,523	80.5	$ 38,161
Total	**458**	**$ 24,606**	**77.2**	**$ 214,214**

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, 2017

Group	Number	Annual Benefits*	Average Age	Present Value of Projected Benefits
Service Retirements	5	$ 139	83.7	$ 900
Survivors	3	$ 46	88.2	$ 217
Total	**8**	**$ 185**	**85.4**	**$ 1,117**

* *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, 2017

Group	Number	Annual Benefits*	Average Age	Present Value of Projected Benefits
Service Retirements	8	$ 523	73.8	$ 5,072
Survivors	3	$ 118	86.8	$ 614
Total	**11**	**$ 641**	**77.3**	**$ 5,686**

* *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 Plan 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, 2043 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. Unless noted otherwise, the assumptions prescribed are based on the last experience study, dated August 30, 2016. The Allowance for Combined Service Annuity assumptions are based on an analysis completed by the LCPR actuary and documented in a report dated October 2016.

Investment return	8.00% per annum.
Benefit increases after retirement	1.00% per annum through 2033 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-2014 employee generational mortality table projected with mortality improvement scale MP-2016, from a base year of 2006.
Healthy post-retirement	RP-2014 annuitant generational mortality table projected with mortality improvement scale MP-2016 from a base year of 2006. Male rates are adjusted by a factor of 0.96.
Disabled	RP-2014 annuitant generational mortality table projected with mortality improvement scale MP-2016 from a base year of 2006. Male rates are adjusted by a factor of 0.96. 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.
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	3.00%
2	3.00%
3	3.00%

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 33.0% for vested members and 2.0% for non-vested members 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 60% of female active members are assumed to be married. Actual marital status is used for members in payment status.
Age of spouse	Males are assumed to be two years older than females. 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: 20% elect 25% Joint & Survivor option 20% elect 50% Joint & Survivor option 10% elect 75% Joint & Survivor option 20% 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 33 members reported with a salary less than $100. We used prior year salary (19 members), if available; otherwise high five salary with a 10% load to account for salary increases (14 members). If neither prior year salary nor high five salary was available, we assumed a value of $35,000. 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 123 members reported without a gender. We assumed male gender. There were 2 members 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 (2 members), we assumed a value of $24,000. If credited service was not reported (15 members), we used elapsed time from hire date to termination date (6 members); otherwise we assumed nine years of service. If termination date was invalid or not reported (8 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 6 members reported without a gender; male was assumed. There were no members reported without a date of birth. <u>Data for retired members:</u> There were no members with missing or invalid dates of birth. There were 20 members reported without a gender. We assumed retirees are male and beneficiaries are female. There were 20 members that were active last year and retirement eligible and no on the retiree data file this year. At the direction of PERA, we included these members in the 2017 valuation as retirees with an estimated life only monthly benefit.

Summary of Actuarial Assumptions (Continued)

Unknown data for certain members (Continued)	Data for retired members (Continued): Because PERA reclassifies disabled members as retirees once the member reaches Normal Retirement Age, we compare the members that PERA reports as retirees to our disabled group from the last valuation. If a member was disabled in the valuation, we reclassify that member as a disabled retiree in this year's valuation. We reclassified 192 retirees as disabled retirees in this valuation.
Changes in actuarial assumptions	Assumed salary increases were changed as recommended in the June 30, 2016 experience study. The net effect is proposed rates that average 0.34% lower than the previous rates. Assumed rates of retirement were changed, resulting in fewer retirements. The Combined Service Annuity (CSA) load was 30% for vested and non-vested, deferred members. The CSA has been changed to 33% for vested members and 2% for non-vested members. The base mortality table for healthy annuitants was changed from the RP-2000 fully generational table to the RP-2014 fully generational table (with a base year of 2006), with male rates adjusted by a factor of 0.96. The mortality improvement scale was changed from Scale AA to Scale MP-2016. The base mortality table for disabled annuitants was changed from the RP-2000 disabled mortality table to the mortality tables assumed for healthy retirees. Assumed termination rates were decreased to 3.0% for the first three years of service. Rates beyond the select period of three years were adjusted, resulting in more expected terminations overall. Assumed percentage of married female members was decreased from 65% to 60%. Assumed age difference was changed from separate assumptions for male members (wives assumed to be three years younger) and female members (husbands assumed to be four years older) to the assumption that males are two years older than females. The assumed percentage of female members electing Joint and Survivor annuities was increased. The assumed post-retirement benefit increase rate was changed from 1.00% per year through 2050 and 2.50% thereafter to 1.00% per year through 2033 and 2.50% thereafter. See page 4 for additional detail about this assumption.

Actuarial Basis

Summary of Actuarial Assumptions (Continued)

Age in 2017	Percentage of Members Dying Each Year*					
	Healthy Post-Retirement Mortality		Healthy Pre-Retirement Mortality		Disability Mortality	
	Males	Females	Males	Females	Males	Females
20	0.03%	0.02%	0.04%	0.02%	0.03%	0.02%
25	0.05	0.03	0.05	0.02	0.05	0.03
30	0.08	0.06	0.05	0.02	0.08	0.06
35	0.12	0.11	0.06	0.03	0.12	0.11
40	0.18	0.17	0.07	0.04	0.18	0.17
45	0.26	0.21	0.10	0.07	0.26	0.21
50	0.39	0.27	0.17	0.11	0.39	0.27
55	0.55	0.38	0.28	0.17	0.55	0.38
60	0.77	0.56	0.48	0.26	0.77	0.56
65	1.10	0.84	0.86	0.39	1.10	0.84
70	1.65	1.31	1.42	0.64	1.65	1.31

* *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.*

Age	Withdrawal Rates After Third Year		Disability Retirement	
	Males	Females	Males	Females
20	3.00%	3.00%	0.11%	0.11%
25	2.60	2.60	0.13	0.13
30	2.10	2.10	0.16	0.16
35	1.60	1.60	0.19	0.19
40	1.25	1.25	0.29	0.29
45	1.25	1.25	0.54	0.54
50	0.00	0.00	1.04	1.04
55	0.00	0.00	2.03	2.03
60	0.00	0.00	0.00	0.00

Actuarial Basis

Summary of Actuarial Assumptions (Concluded)

		Salary Scale	
Age	Retirement Rate	Year	Increase
50	10.00%	1	12.50%
51	7.00	2	10.75%
52	7.00	3	9.00%
53	10.00	4	8.00%
54	10.00	5	6.50%
55	25.00	6	6.00%
56	22.50	7	5.50%
57	22.50	8	5.25%
58	22.50	9	5.00%
59	20.00	10	4.75%
60	22.50	11	4.50%
61	25.00	12	4.40%
62	30.00	13	4.30%
63	30.00	14	4.20%
64	30.00	15	4.10%
65	50.00	16	4.00%
66	50.00	17	4.00%
67	50.00	18	4.00%
68	50.00	19	4.00%
69	50.00	20	4.00%
70+	100.00	21	3.90%
		22	3.80%
		23	3.70%
		24	3.60%
		25+	3.50%

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		**Member**	**Employer**
	Percent of Salary		
	January 1, 2015 & later	10.80	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

	Vesting Percent if First Hired		
Years of Service	**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

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.

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	60.0%, 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.

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.

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 the same percentage as the post-retirement benefit increase.

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 the same percentage as the post-retirement benefit increase.
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)
7-1-1995	$	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
7-1-2017	$	7,840,549	$	9,199,208	$	1,358,659	85.23	$	944,296	[5]	143.88

[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)
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	$ 944,296 [6]	$ 101,984	$ 165,252	$ 175,329	106.10
2018	30.58					

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 (comparable to a Projected Unit Credit measurement).
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.