Public Employees Retirement Association of Minnesota

Local Government Correctional Service Retirement Plan

Actuarial Valuation Report as of July 1, 2017

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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.

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, FSA, EA, FCA, MAAA

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)*

Assets in Trust	Market Value June 30, 2017	Market Value 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)*

	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%

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 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.

Actuarial Basis

Summary of Plan Provisions (Continued)

Retirement (Continued)

Early Retirement	
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).
Form of payment	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.
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) 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

Duty Disability	
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.
Regular Disability	
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.

Actuarial Basis

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.