Public Employees Retirement Association of Minnesota

General Employees Retirement Plan
Actuarial Valuation Report as of July 1, 2018

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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, 2018 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 and only with permission of the Board. 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, 2018 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.

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 a 2018 analysis of long-term rate of investment return and inflation assumptions, GRS suggested that an investment return assumption in the range of 6.64% to 7.56% would be reasonable. Please see our letter dated October 3, 2018 for additional information. The current assumed rate, which is mandated by Minnesota Statutes, is 7.5% and is at the upper end of the reasonable range. This report also concluded that the probability of exceeding the current 7.5% assumption over 20 years is only 39%. If capital market assumptions decline further from present levels, the 7.5% return assumption might not comply with actuarial standards for the July 1, 2019 valuation. For informational purposes, results based on a 6.5% assumption 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 6 – 9, 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.

The valuation assumed the continuing ability of the plan sponsor to make the contributions necessary to fund this plan. A determination regarding whether or not the plan sponsor is actually able to do so is outside our scope of expertise and was not performed.

The findings in this report are based on data and other information through June 30, 2018. 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 individuals 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

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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 7.50%), it is expected that:

(1) The normal cost of the plan is expected to remain approximately level as a percent of pay,
(2) The funded status of the plan is expected to gradually improve and is expected to be 100% funded within the next 30 years, and
(3) The unfunded liability will grow initially as a dollar amount before beginning to decline.

Limitations of Funded Status Measurements

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

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

Limitations of Project Scope

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

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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, 2018	Actuarial Valuation as of July 1, 2017
Statutory Contributions - Chapter 353 (% of Payroll)	14.58%	14.60%
Required Contributions - Chapter 356 (% of Payroll)	13.45%	16.18%
Sufficiency/(Deficiency)	1.13 %	(1.58)%

The statutory contribution sufficiency/(deficiency) improved from a deficiency of (1.58)% of payroll to a sufficiency of 1.13% of payroll. The primary reason for the change in contribution sufficiency/(deficiency) was the extension in the statutory amortization period, from a closed period ending June 30, 2033 to a closed period ending June 30, 2048. The impact of plan provision and assumption changes is described on page three.

Based on the actuarial value of assets, scheduled contribution rates, and actuarial assumptions described in this report, statutory contributions are expected to bring the plan to full funding within the 30-year amortization period.

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 10.4% for the plan year ending June 30, 2018. The AVA earned approximately 9.2% for the plan year ending June 30, 2018 as compared to the assumed rate of 8.00%. The assumed rate is mandated by Minnesota Statutes, and was recently lowered to 7.50%.

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, 2018	July 1, 2017
Contributions (*% of Payroll*)		
Statutory - Chapter 353	14.58%	14.60%
Required - Chapter 356	13.45%	16.18%
Sufficiency/(Deficiency)	1.13 %	(1.58)%
Funding Ratios (*dollars in thousands*)		
Accrued Benefit Funding Ratio		
- Current assets (AVA)	$ 21,129,746	$ 19,916,322
- Current benefit obligations	$ 25,794,566	$ 24,254,435
- Funding ratio	81.92%	82.11%
Accrued Liability Funding Ratio		
- Current assets (AVA)	$ 21,129,746	$ 19,916,322
- Market value of assets (MVA)	$ 21,553,477	$ 20,100,579
- Actuarial accrued liability	$ 27,101,067	$ 25,615,722
- Funding ratio (AVA)	77.97%	77.75%
- Funding ratio (MVA)	79.53%	78.47%
Projected Benefit Funding Ratio		
- Current and expected future assets	$ 32,013,386	$ 28,125,034
- Current and expected future benefit obligations	$ 30,786,600	$ 29,242,236
- Projected benefit funding ratio	103.98%	96.18%
Participant Data		
Active members		
- Number	153,059	152,867
- Annual valuation earnings *(000s)*	$ 6,069,708	$ 5,897,762
- Projected annual earnings *(000s)*	$ 6,366,884	$ 6,201,854
- Average projected annual earnings	$ 41,598	$ 40,570
- Average age	46.3	46.3
- Average service	9.7	9.8
Service retirements	89,313	85,777
Survivors	8,701	8,645
Disability retirements	3,758	3,779
Deferred retirements	61,066	52,274
Terminated other non-vested	138,768	138,335
Total	**454,665**	**441,677**

Summary of Valuation Results

Effects of Changes

The following changes in plan provisions, actuarial assumptions and methods were recognized as of July 1, 2018:

- Interest credited on member contributions decreased from 4.0% to 3.0%, beginning July 1, 2018;
- Post-retirement benefit increases were changed from 1.0% per year with a provision to increase to 2.5% upon attainment of 90% funding ratio to 50% of the Social Security Cost of Living Adjustment, not less than 1.0% and not more than 1.5%, beginning January 1, 2019;
- The augmentation adjustment in early retirement factors is eliminated over a five-year period starting July 1, 2019, resulting in actuarial equivalence after June 30, 2024;
- For retirements on or after January 1, 2024, the first benefit increase is delayed until the retiree reaches Normal Retirement Age. Does not apply to Rule of 90 retirees, disability benefit recipients, or survivors;
- Contribution stabilizer provisions were repealed;
- Actuarial equivalent factors were updated to reflect revised mortality and interest assumptions;
- Deferred augmentation was changed to 0.0%, effective January 1, 2019;
- The assumed rate of investment return was reduced from 8.00% to 7.50%;
- The assumed rate of inflation decreased from 2.75% to 2.50%;
- Salary scale rates were reduced by 0.25% at each year of service;
- The payroll growth assumption was reduced from 3.50% to 3.25%;
- The mortality projection scale was updated from MP-2015 to MP-2017;
- The assumed benefit increase was changed from 1.00% per year through 2035 and 2.50% per year thereafter to 1.25% per year; and
- The amortization period was reset to 30 years.

Refer to the Actuarial Basis section of this report for a complete description of these changes. The combined impact of the above changes was to increase the accrued liability by $520 million and decrease the required contribution by 2.5% of pay, as follows:

($ in billions)	Before Changes	Reflecting Plan Provision Changes	Reflecting Plan Provision and Assumption Changes	Reflecting Plan Provision, Assumption, and Amortization Changes
Normal Cost Rate, % of Pay	7.9%	7.3%	7.8%	7.8%
Amortization of Unfunded Accrued Liability, % of Pay	7.9%	6.9%	8.5%	5.5%
Expenses (% of Pay)	0.2%	0.2%	0.2%	0.2%
Total Required Contribution, % of Pay	16.0%	14.4%	16.5%	13.5%
Accrued Liability Funding Ratio	79.5%	81.4%	78.0%	78.0%
Projected Benefit Funding Ratio	96.8%	100.4%	95.7%	104.0%
Unfunded Actuarial Accrued Liability	$5.5	$4.8	$6.0	$6.0

Summary of Valuation Results

Valuation of Future Post-Retirement Benefit Increases

The 2018 Omnibus Pension Bill, which was passed during the 2018 legislative session, revised the postretirement benefit increases payable to retirees in the General Employees Retirement Plan (GERP). Effective January 1, 2019, benefit recipients receive a future annual post-retirement benefit increase equal to 50% of the Social Security Cost of Living Adjustment, not less than 1% and not more than 1.5%.

To determine an assumption regarding a future change in the post-retirement benefit increase, we examined the capital market inflation assumptions for twelve investment consulting firms based on the GRS Capital Market Assumption Modeler (CMAM). Because GRS is a benefits consulting firm and does not develop or maintain its own capital market expectations, we request and monitor forward-looking expectations developed by several major investment consulting firms. We update our CMAM on an annual basis. The capital market assumptions in the 2018 CMAM are from the following investment consultants (in alphabetical order): Aon Hewitt, BNY Mellon, Callan, JPMorgan, Marquette Associates, Mercer, NEPC, PCA, RVK, Summit Strategies, Voya and Wilshire.

The average assumption for inflation was 2.20%, with a range of 1.95% to 2.50%, and the standard deviation was 1.69% (note that not every investment consulting firm provided a standard deviation). However, the investment consulting firms typically set their assumptions based on a shorter time horizon, while actuaries must make much longer projections.

We normalized these parameters slightly so that they would correspond to the current inflation assumption of 2.50%. Then, based on a Monte Carlo simulation (1,000 simulations) of the postretirement benefit increases as described above, we determined that an annual COLA assumption of 1.25% would be appropriate to model the effect of the post-retirement benefit increases. This is only an assumption; actual increases will depend on actual experience.

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 valuations. Per the LCPR's requirement, we have calculated the liabilities associated with the following scenarios:

1) 6.5% interest rate assumption
2) 8.5% interest rate assumption

We also included an alternate post-retirement benefit increase scenario for informational purposes. The maximum benefit increase paid under current plan provisions is 1.5% per year. The financial impact of a 1.5% post-retirement benefit increase compared to the baseline assumption of 1.25% is shown below.

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 8.5% interest rate assumption would not comply with Actuarial Standards of Practice.

$ in billions	**Final Valuation Assumptions**	**Final Valuation Assumptions with 6.5% interest**	**Final Valuation Assumptions with 8.5% interest**	**Final Valuation Assumptions with 1.5% COLA for all future years**
Normal Cost Rate, % of Pay	7.8%	9.6%	6.5%	7.9%
Amortization of Unfunded Accrued Liability, % of Pay	5.5%	7.7%	3.1%	6.0%
Expenses (% of Pay)	0.2%	0.2%	0.2%	0.2%
Total Required Contribution, % of Pay	13.5%	17.5%	9.8%	14.1%
Contribution Sufficiency/(Deficiency), % of Pay	1.1 %	(2.9)%	4.8 %	0.4 %
Accrued Liability Funding Ratio	78.0%	69.1%	87.2%	76.3%
Present Value of Projected Benefits	$30.8	$35.5	$27.1	$31.5
Present Value of Future Normal Costs	$3.7	$4.9	$2.9	$3.8
Actuarial Accrued Liability	$27.1	$30.6	$24.2	$27.7
Unfunded Accrued Liability	$6.0	$9.4	$3.1	$6.6

Summary of Valuation Results

Risks Associated with the Measuring the Accrued Liability and Actuarially Determined Contribution

The determination of the accrued liability and the actuarially determined contribution requires the use of assumptions regarding future economic and demographic experience. Risk measures, as illustrated in this report, are intended to aid in the understanding of the effects of future experience differing from the assumptions used in the course of the actuarial valuation. Risk measures may also help with illustrating the potential volatility in the accrued liability and the actuarially determined contribution that result from the differences between actual experience and the actuarial assumptions.

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 due to changing conditions; 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. The scope of an actuarial valuation does not include an analysis of the potential range of such future measurements.

Examples of risk that may reasonably be anticipated to significantly affect the plan's future financial condition include:

1. Investment risk – actual investment returns may differ from the expected returns;
2. Asset/Liability mismatch – changes in asset values may not match changes in liabilities, thereby altering the gap between the accrued liability and assets and consequently altering the funded status and contribution requirements;
3. Contribution risk – actual contributions may differ from expected future contributions. For example, actual contributions may not be made in accordance with the plan's funding policy or material changes may occur in the anticipated number of covered employees, covered payroll, or other relevant contribution base;
4. Salary and Payroll risk – actual salaries and total payroll may differ from expected, resulting in actual future accrued liability and contributions differing from expected;
5. Longevity risk – members may live longer or shorter than expected and receive pensions for a period of time other than assumed;
6. Other demographic risks – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future accrued liability and contributions differing from expected.

The effects of certain trends in experience can generally be anticipated. For example if the investment return since the most recent actuarial valuation is less (or more) than the assumed rate, the cost of the plan can be expected to increase (or decrease). Likewise if longevity is improving (or worsening), increases (or decreases) in cost can be anticipated.

Summary of Valuation Results

The Required Contribution rate shown on page 1 may be considered as a minimum contribution rate that complies with Minnesota Statutes and the requirements of the Standards for Actuarial Work published by the LCPR. The timely receipt of the actuarially determined contributions is critical to support the financial health of the plan. Users of this report should be aware that contributions made at the actuarially determined rate do not necessarily guarantee benefit security.

PLAN MATURITY MEASURES

Risks facing a pension plan evolve over time. A young plan with virtually no investments and paying few benefits may experience little investment risk. An older plan with a large number of members in pay status and a significant trust may be much more exposed to investment risk. Generally accepted plan maturity measures include the following. Additional maturity measures are shown on page nine.

	2018	**2017**
Ratio of market value of assets to total payroll	3.42	3.26
Ratio of actuarial accrued liability to total payroll	4.30	4.16
Ratio of actives to retirees and beneficiaries	1.50	1.50
Ratio of net cash flow to market value of assets	-2.8%	-2.9%
Approximate modified duration* of:		
▪ Total projected benefits:	13.65	13.97
▪ Actuarial accrued liability:	11.68	11.93

* *Approximate modified duration of total projected benefits based on 7.5% interest for 2018 and 8.0% interest for 2017*

RATIO OF MARKET VALUE OF ASSETS TO PAYROLL

The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. For example, if the market value of assets is 5.0 times the payroll, a return on assets 5% different than assumed would equal 25% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in plan sponsor contributions as a percentage of payroll.

RATIO OF ACTUARIAL ACCRUED LIABILITY TO PAYROLL

The relationship between actuarial accrued liability and payroll is a useful indicator of the potential volatility of contributions for a fully funded plan. A funding policy that targets a funded ratio of 100% is expected to result in the ratio of assets to payroll and the ratio of liability to payroll converging over time.

The ratio of liability to payroll may also be used as a measure of sensitivity of contribution rates to liability gains and losses. For example, if the actuarial accrued liability is 5.0 times the payroll, a change in liability 2% other than assumed would equal 10% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in liability (and also plan sponsor contributions) as a percentage of payroll.

Summary of Valuation Results

RATIO OF ACTIVES TO RETIREES AND BENEFICIARIES

A young plan with many active members and few retirees will have a high ratio of active to retirees. A mature open plan may have close to the same number of actives to retirees resulting in a ratio near 1.0. A super-mature or closed plan may have significantly more retirees than actives resulting in a ratio below 1.0.

RATIO OF NET CASH FLOW TO MARKET VALUE OF ASSETS

A positive net cash flow means contributions exceed benefits and expenses. A negative cash flow means existing funds are being used to make payments. A certain amount of negative net cash flow is generally expected to occur when benefits are prefunded through a qualified trust. Large negative net cash flows as a percent of assets may indicate a super-mature plan or a need for additional contributions.

DURATION OF ACTUARIAL ACCRUED LIABILITY

The modified duration (as opposed to the McCaulay duration) may be used to approximate the sensitivity of the accrued liability to a small change in the assumed rate of return. For example, a modified duration of 10 indicates that the liability would change by approximately 10% if the assumed rate of return were changed by 1% (i.e. from 7.5% to 6.5%).

ADDITIONAL RISK ASSESSMENT

Additional risk assessment is outside the scope of the annual actuarial valuation. Additional assessment may include scenario tests, sensitivity tests, stochastic modeling, stress tests, and a comparison of the present value of accrued benefits at low-risk discount rates with the actuarial accrued liability.

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%
2018	$27,101,067	$ 21,553,477	$5,547,590	$ 6,298,815	79.5%	$15,150,455	55.9%	430.3%	342.2%

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	(17) 10-Year Trailing Average
2010			121.6%	$ (298,297)	-2.6%	15.7%	N/A	N/A
2011			84.3%	$ (329,963)	-2.4%	23.0%	N/A	N/A
2012			97.6%	$ (359,950)	-2.7%	2.3%	2.3%	N/A
2013			81.9%	$ (396,791)	-2.6%	14.2%	6.2%	N/A
2014			72.5%	$ (441,245)	-2.5%	18.5%	14.5%	N/A
2015	14.1%	47.2%	89.7%	$ (492,445)	-2.7%	4.4%	12.2%	N/A
2016	14.1%	43.9%	118.7%	$ (566,466)	-3.1%	-0.2%	7.6%	N/A
2017	14.1%	46.0%	89.6%	$ (577,882)	-2.9%	15.1%	10.2%	6.2%
2018	14.1%	48.2%	88.1%	$ (610,740)	-2.8%	10.4%	9.4%	7.8%

(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),(16, and (17) Investment return is probably the largest single risk that most systems face. The year by year return and the 5-year and 10-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, 2018**	**June 30, 2017**
Cash, equivalents, short term securities	$ 237,529	$ 491,850
Fixed income	$ 5,230,420	$ 3,895,018
Equity	$ 13,073,271	$ 13,042,724
SBI Alternative	$ 2,976,338	$ 2,635,922
Other	$ 6,504	$ 6,906
Total Assets in Trust	**$ 21,524,062**	**$ 20,072,420**
Assets Receivable*	$ 42,026	$ 40,865
Amounts Payable	$ (12,611)	$ (12,706)
Net Assets Held in Trust for Pension Benefits	**$ 21,553,477**	**$ 20,100,579**

** Includes $21 million Employer Supplemental Contribution receivable to be paid in July and December.*

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, 2018**	**June 30, 2017**
1. Fund balance at market value at beginning of year	$ 20,100,579	$ 17,994,909
2. Adjustment to match restated PERA fund balance	$ -	$ 240
3. Fund balance at market value at beginning of year, as restated	$ 20,100,579	$ 17,995,149
4. Contributions		
a. Member	$ 409,423	$ 400,204
b. Employer*	$ 488,819	$ 477,888
c. Other sources	$ 16,000	$ 6,000
d. Total contributions	$ 914,242	$ 884,092
5. Investment income		
a. Investment income/(loss)	$ 2,086,246	$ 2,703,723
b. Investment expenses	$ (22,664)	$ (20,822)
c. Net subtotal	$ 2,063,582	$ 2,682,901
6. Other	$ 56	$ 411
7. Total income: *(4.d.) + (5.c.) + (6.)*	**$ 2,977,880**	**$ 3,567,404**
8. Benefits Paid		
a. Annuity benefits	$ (1,470,450)	$ (1,413,448)
b. Refunds	$ (42,589)	$ (37,234)
c. Total benefits paid	$ (1,513,039)	$ (1,450,682)
9. Expenses		
a. Other	$ -	$ -
b. Administrative	$ (11,943)	$ (11,292)
c. Total expenses	$ (11,943)	$ (11,292)
10. Total disbursements: *(8.c.) + (9.c.)*	**$ (1,524,982)**	**$ (1,461,974)**
11. Transfer between funds	**$ -**	**$ -**
12. Fund balance at market value at end of year	**$ 21,553,477**	**$ 20,100,579**
13. Approximate return on market value of assets	10.4%	15.1 %

** Includes $21 million Employer Supplemental Contribution receivable to be paid in July and December.*

Plan Assets

Actuarial Asset Value *(Dollars in Thousands)*

		June 30, 2018	June 30, 2017
1. Market value of assets available for benefits		$ 21,553,477	$ 20,100,579
2. Determination of average balance			
a. Total assets available at beginning of year		$ 20,100,579	$ 17,995,149
b. Total assets available at end of year		$ 21,553,477	$ 20,100,579
c. Net investment income for fiscal year		$ 2,063,582	$ 2,682,901
d. Average balance *[a. + b. - c.] / 2*		$ 19,795,237	$ 17,706,413
3. Expected return *[8.0% * 2.d.]*		$ 1,583,619	$ 1,416,513
4. Actual return		$ 2,063,582	$ 2,682,901
5. Current year asset gain/(loss) *[4. - 3.]*		$ 479,963	$ 1,266,388
6. Unrecognized asset returns			
	Original Amount	**Unrecognized Amount**	
a. Year ended June 30, 2018	$ 479,963	$ 383,971	N/A
b. Year ended June 30, 2017	$ 1,266,388	$ 759,833	$ 1,013,111
c. Year ended June 30, 2016	$ (1,484,753)	$ (593,901)	$ (890,851)
d. Year ended June 30, 2015	$ (630,861)	$ (126,172)	$ (252,344)
e. Year ended June 30, 2014	$ 1,571,711	N/A	$ 314,341
f. Unrecognized return adjustment		$ 423,731	$ 184,257
7. **Actuarial value at end of year** *(1. - 6.f.)*		**$ 21,129,746**	**$ 19,916,322**
8. Approximate return on actuarial value of assets during fiscal year		9.2%	9.3%
9. Ratio of actuarial value of assets to market value of assets		0.98	0.99

Membership Data

Distribution of Active Members (Total)

Age	Years of Service as of June 30, 2018 <3*	3 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35+	Total
< 25	6,568	361	18							**6,947**
Avg. Earnings	$ 15,321	$ 25,315	$ 29,988							**$ 15,879**
25 - 29	8,976	2,592	1,053	17						**12,638**
Avg. Earnings	$ 25,347	$ 36,612	$ 39,855	$ 41,473						**$ 28,888**
30 - 34	7,176	3,212	3,392	955	20					**14,755**
Avg. Earnings	$ 29,551	$ 42,086	$ 47,186	$ 50,999	$ 45,209					**$ 37,743**
35 - 39	6,491	2,905	3,428	2,727	745	11				**16,307**
Avg. Earnings	$ 27,720	$ 41,960	$ 49,507	$ 58,912	$ 57,385	$ 52,177				**$ 41,425**
40 - 44	5,091	2,545	3,157	2,555	2,074	487	7			**15,916**
Avg. Earnings	$ 26,209	$ 36,746	$ 43,627	$ 58,347	$ 64,933	$ 64,314	$ 55,748			**$ 42,733**
45 - 49	4,315	2,282	3,486	2,862	2,467	1,765	419	11		**17,607**
Avg. Earnings	$ 26,279	$ 35,820	$ 37,545	$ 49,500	$ 62,569	$ 68,077	$ 64,616	$ 50,328		**$ 43,723**
50 - 54	3,566	1,915	3,351	3,556	2,969	2,238	1,566	674	7	**19,842**
Avg. Earnings	$ 27,053	$ 33,920	$ 35,475	$ 41,744	$ 50,208	$ 62,703	$ 69,454	$ 65,740	$ 71,795	**$ 43,933**
55 - 59	3,210	1,615	2,931	3,565	3,994	3,004	2,231	1,734	607	**22,891**
Avg. Earnings	$ 24,656	$ 32,977	$ 36,116	$ 39,102	$ 44,225	$ 51,971	$ 63,795	$ 70,873	$ 65,422	**$ 44,356**
60 - 64	2,316	1,224	2,017	2,252	2,761	2,601	2,087	1,204	1,161	**17,623**
Avg. Earnings	$ 21,965	$ 31,442	$ 34,671	$ 40,780	$ 42,908	$ 45,311	$ 54,766	$ 65,865	$ 70,229	**$ 43,272**
65 - 69	1,155	557	886	770	795	670	500	321	306	**5,960**
Avg. Earnings	$ 14,459	$ 21,807	$ 26,233	$ 36,815	$ 42,203	$ 43,140	$ 49,759	$ 60,836	$ 73,021	**$ 35,175**
70+	720	347	491	383	244	136	102	55	95	**2,573**
Avg. Earnings	$ 10,080	$ 13,640	$ 14,243	$ 21,362	$ 29,889	$ 38,021	$ 43,914	$ 44,574	$ 63,839	**$ 20,453**
Total	**49,584**	**19,555**	**24,210**	**19,642**	**16,069**	**10,912**	**6,912**	**3,999**	**2,176**	153,059
Avg. Earnings	**$ 24,552**	**$ 36,305**	**$ 39,892**	**$ 46,686**	**$ 50,887**	**$ 55,025**	**$ 61,084**	**$ 67,276**	**$ 69,007**	$ 39,656

* *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, 2018									
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									$ 73,142	**$ 73,142**
70+									2	**2**
Avg. Earnings									$ 62,950	**$ 62,950**
Total									**3**	**3**
Avg. Earnings									**$ 66,347**	**$ 66,347**

* *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)

	Years of Service as of June 30, 2018									
Age	**<3***	**3 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25 - 29**	**30 - 34**	**35+**	**Total**
< 25	6,568	361	18							**6,947**
Avg. Earnings	$ 15,321	$ 25,315	$ 29,988							**$ 15,879**
25 - 29	8,976	2,592	1,053	17						**12,638**
Avg. Earnings	$ 25,347	$ 36,612	$ 39,855	$ 41,473						**$ 28,888**
30 - 34	7,176	3,212	3,392	955	20					**14,755**
Avg. Earnings	$ 29,551	$ 42,086	$ 47,186	$ 50,999	$ 45,209					**$ 37,743**
35 - 39	6,491	2,905	3,428	2,727	745	11				**16,307**
Avg. Earnings	$ 27,720	$ 41,960	$ 49,507	$ 58,912	$ 57,385	$ 52,177				**$ 41,425**
40 - 44	5,091	2,545	3,157	2,555	2,074	487	7			**15,916**
Avg. Earnings	$ 26,209	$ 36,746	$ 43,627	$ 58,347	$ 64,933	$ 64,314	$ 55,748			**$ 42,733**
45 - 49	4,315	2,282	3,486	2,862	2,467	1,765	419	11		**17,607**
Avg. Earnings	$ 26,279	$ 35,820	$ 37,545	$ 49,500	$ 62,569	$ 68,077	$ 64,616	$ 50,328		**$ 43,723**
50 - 54	3,566	1,915	3,351	3,556	2,969	2,238	1,566	674	7	**19,842**
Avg. Earnings	$ 27,053	$ 33,920	$ 35,475	$ 41,744	$ 50,208	$ 62,703	$ 69,454	$ 65,740	$ 71,795	**$ 43,933**
55 - 59	3,210	1,615	2,931	3,565	3,994	3,004	2,231	1,734	607	**22,891**
Avg. Earnings	$ 24,656	$ 32,977	$ 36,116	$ 39,102	$ 44,225	$ 51,971	$ 63,795	$ 70,873	$ 65,422	**$ 44,356**
60 - 64	2,316	1,224	2,017	2,252	2,761	2,601	2,087	1,204	1,156	**17,618**
Avg. Earnings	$ 21,965	$ 31,442	$ 34,671	$ 40,780	$ 42,908	$ 45,311	$ 54,766	$ 65,865	$ 70,228	**$ 43,264**
65 - 69	1,155	557	886	770	795	670	500	321	302	**5,956**
Avg. Earnings	$ 14,459	$ 21,807	$ 26,233	$ 36,815	$ 42,203	$ 43,140	$ 49,759	$ 60,836	$ 73,001	**$ 35,149**
70+	720	347	491	383	244	136	102	55	92	**2,570**
Avg. Earnings	$ 10,080	$ 13,640	$ 14,243	$ 21,362	$ 29,889	$ 38,021	$ 43,914	$ 44,574	$ 63,669	**$ 20,396**
Total	**49,584**	**19,555**	**24,210**	**19,642**	**16,069**	**10,912**	**6,912**	**3,999**	**2,164**	153,047
Avg. Earnings	**$ 24,552**	**$ 36,305**	**$ 39,892**	**$ 46,686**	**$ 50,887**	**$ 55,025**	**$ 61,084**	**$ 67,276**	**$ 68,993**	$ 39,654

* *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, 2018									
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									5	**5**
Avg. Earnings									$ 70,453	**$ 70,453**
65 - 69									3	**3**
Avg. Earnings									$ 74,945	**$ 74,945**
70+									1	**1**
Avg. Earnings									$ 81,245	**$ 81,245**
Total									**9**	**9**
Avg. Earnings									**$ 73,150**	**$ 73,150**

* *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, 2018							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<50								
Avg. Benefit								
50 - 54	6	12						**18**
Avg. Benefit	$ 13,462	$ 10,510						**$ 11,494**
55 - 59	713	1,354	33	1				**2,101**
Avg. Benefit	$ 16,203	$ 12,903	$ 13,945	$ 41,292				**$ 14,053**
60 - 64	2,281	5,563	2,419	127	16			**10,406**
Avg. Benefit	$ 16,400	$ 16,065	$ 13,489	$ 27,631	$ 40,845			**$ 15,719**
65 - 69	2,527	11,010	7,096	2,759	194	5		**23,591**
Avg. Benefit	$ 15,139	$ 14,991	$ 15,322	$ 13,687	$ 34,687	$ 34,308		**$ 15,120**
70 - 74	374	3,571	8,699	5,540	2,325	82	2	**20,593**
Avg. Benefit	$ 11,018	$ 13,189	$ 13,751	$ 14,663	$ 15,691	$ 47,715	$ 35,656	**$ 14,206**
75 - 79	83	657	2,134	5,265	4,271	1,590	19	**14,019**
Avg. Benefit	$ 8,258	$ 8,750	$ 10,845	$ 11,656	$ 14,165	$ 15,987	$ 41,918	**$ 12,673**
80 - 84	39	209	529	1,185	3,739	2,967	768	**9,436**
Avg. Benefit	$ 5,225	$ 6,268	$ 7,175	$ 8,836	$ 11,774	$ 18,245	$ 19,950	**$ 13,699**
85 - 89	7	50	193	276	710	2,648	1,841	**5,725**
Avg. Benefit	$ 1,986	$ 6,340	$ 6,198	$ 5,862	$ 9,092	$ 16,443	$ 22,450	**$ 16,502**
90+	1	6	16	75	163	476	2,687	**3,424**
Avg. Benefit	$ 3,870	$ 2,118	$ 7,226	$ 5,853	$ 6,317	$ 14,736	$ 20,217	**$ 18,382**
Total	**6,031**	**22,432**	**21,119**	**15,228**	**11,418**	**7,768**	**5,317**	**89,313**
Avg. Benefit	**$ 15,308**	**$ 14,555**	**$ 13,717**	**$ 12,900**	**$ 13,652**	**$ 17,275**	**$ 21,035**	**$ 14,632**

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, 2018							
Age	**<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			3	9	3			**15**
Avg. Benefit			$ 35,207	$ 43,985	$ 18,218			**$ 37,076**
70 - 74		6	21	61	172	13		**273**
Avg. Benefit		$ 46,690	$ 26,008	$ 38,532	$ 44,143	$ 42,787		**$ 41,485**
75 - 79	1		14	70	296	253	5	**639**
Avg. Benefit	$ 111,677		$ 25,470	$ 30,922	$ 40,210	$ 47,034	$ 32,497	**$ 41,623**
80 - 84		1	4	17	160	508	196	**886**
Avg. Benefit		$ 68,770	$ 28,892	$ 42,532	$ 29,979	$ 45,569	$ 45,656	**$ 42,666**
85 - 89			2	4	30	326	506	**868**
Avg. Benefit			$ 75,925	$ 17,894	$ 34,960	$ 39,170	$ 44,354	**$ 42,033**
90+				1	5	59	787	**852**
Avg. Benefit				$ 27,705	$ 25,600	$ 35,925	$ 36,268	**$ 36,172**
Total	**1**	**7**	**44**	**162**	**666**	**1,159**	**1,494**	**3,533**
Avg. Benefit	**$ 111,677**	**$ 49,844**	**$ 28,995**	**$ 35,390**	**$ 38,322**	**$ 43,567**	**$ 40,226**	**$ 40,641**

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)

Age	Years Retired as of June 30, 2018 <1	1 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25+	Total
<50								
Avg. Benefit								
50 - 54	6	12						**18**
Avg. Benefit	$ 13,462	$ 10,510						**$ 11,494**
55 - 59	713	1,352	32					**2,097**
Avg. Benefit	$ 16,203	$ 12,844	$ 12,150					**$ 13,976**
60 - 64	2,276	5,535	2,394	55				**10,260**
Avg. Benefit	$ 16,327	$ 15,944	$ 13,189	$ 11,047				**$ 15,360**
65 - 69	2,525	10,971	7,013	2,573	47			**23,129**
Avg. Benefit	$ 15,148	$ 14,951	$ 15,107	$ 11,822	$ 10,949			**$ 14,664**
70 - 74	373	3,550	8,613	5,305	1,910	9		**19,760**
Avg. Benefit	$ 10,957	$ 13,038	$ 13,587	$ 13,612	$ 9,405	$ 22,315		**$ 13,045**
75 - 79	81	653	2,099	5,135	3,775	1,254	1	**12,998**
Avg. Benefit	$ 6,012	$ 8,421	$ 10,577	$ 11,224	$ 10,946	$ 7,241	$ 19,814	**$ 10,482**
80 - 84	39	207	521	1,152	3,491	2,309	524	**8,243**
Avg. Benefit	$ 5,225	$ 5,879	$ 6,816	$ 8,103	$ 10,443	$ 11,111	$ 7,336	**$ 9,737**
85 - 89	7	50	191	266	663	2,205	1,181	**4,563**
Avg. Benefit	$ 1,986	$ 6,340	$ 5,468	$ 5,269	$ 7,631	$ 12,071	$ 10,712	**$ 10,323**
90+	1	6	16	72	149	396	1,656	**2,296**
Avg. Benefit	$ 3,870	$ 2,118	$ 7,226	$ 4,471	$ 4,592	$ 10,631	$ 10,486	**$ 9,893**
Total	**6,021**	**22,336**	**20,879**	**14,558**	**10,035**	**6,173**	**3,362**	**83,364**
Avg. Benefit	**$ 15,253**	**$ 14,465**	**$ 13,499**	**$ 11,810**	**$ 10,165**	**$ 10,653**	**$ 10,077**	**$ 12,840**

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, 2018							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<50								
Avg. Benefit								
50 - 54								
Avg. Benefit								
55 - 59		2	1	1				**4**
Avg. Benefit		$ 52,630	$ 71,365	$ 41,292				**$ 54,479**
60 - 64	5	28	25	72	16			**146**
Avg. Benefit	$ 49,540	$ 39,972	$ 42,215	$ 40,300	$ 40,845			**$ 40,941**
65 - 69	2	39	80	177	144	5		**447**
Avg. Benefit	$ 3,504	$ 26,261	$ 33,406	$ 39,258	$ 42,778	$ 34,308		**$ 37,995**
70 - 74	1	15	65	174	243	60	2	**560**
Avg. Benefit	$ 33,729	$ 35,409	$ 31,525	$ 38,355	$ 44,958	$ 52,593	$ 35,656	**$ 41,856**
75 - 79	1	4	21	60	200	83	13	**382**
Avg. Benefit	$ 86,739	$ 62,435	$ 27,963	$ 26,170	$ 36,378	$ 53,480	$ 47,241	**$ 38,802**
80 - 84		1	4	16	88	150	48	**307**
Avg. Benefit		$ 24,228	$ 32,120	$ 25,822	$ 31,467	$ 35,526	$ 52,681	**$ 36,458**
85 - 89				6	17	117	154	**294**
Avg. Benefit				$ 24,109	$ 20,425	$ 35,506	$ 40,507	**$ 37,021**
90+				2	9	21	244	**276**
Avg. Benefit				$ 44,684	$ 24,169	$ 32,608	$ 34,488	**$ 34,082**
Total	**9**	**89**	**196**	**508**	**717**	**436**	**461**	**2,416**
Avg. Benefit	**$ 41,686**	**$ 34,312**	**$ 33,490**	**$ 36,973**	**$ 39,537**	**$ 41,133**	**$ 38,758**	**$ 38,462**

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, 2018							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<45	18	94	47	15	14	3	3	**194**
Avg. Benefit	$ 7,843	$ 6,199	$ 4,396	$ 4,747	$ 6,822	$ 17,127	$ 11,389	**$ 6,097**
45 - 49	6	28	32	8	7	6	7	**94**
Avg. Benefit	$ 3,207	$ 6,883	$ 9,163	$ 6,204	$ 6,201	$ 5,925	$ 15,763	**$ 7,916**
50 - 54	11	52	37	20	8	7	8	**143**
Avg. Benefit	$ 14,653	$ 7,069	$ 5,685	$ 8,754	$ 8,811	$ 7,669	$ 4,788	**$ 7,529**
55 - 59	36	141	80	34	16	11	7	**325**
Avg. Benefit	$ 13,897	$ 9,813	$ 9,648	$ 6,890	$ 8,068	$ 11,169	$ 18,644	**$ 10,069**
60 - 64	61	219	169	98	38	30	10	**625**
Avg. Benefit	$ 13,160	$ 13,523	$ 9,416	$ 12,181	$ 8,778	$ 14,863	$ 15,442	**$ 11,973**
65 - 69	79	315	257	137	84	40	32	**944**
Avg. Benefit	$ 15,498	$ 11,542	$ 11,976	$ 12,689	$ 14,453	$ 18,408	$ 23,326	**$ 13,107**
70 - 74	97	346	290	171	96	46	53	**1,099**
Avg. Benefit	$ 15,370	$ 12,665	$ 12,854	$ 12,265	$ 13,829	$ 20,553	$ 20,606	**$ 13,706**
75 - 79	87	334	297	171	139	84	108	**1,220**
Avg. Benefit	$ 13,674	$ 14,761	$ 13,592	$ 12,536	$ 14,503	$ 20,396	$ 22,603	**$ 15,140**
80 - 84	108	327	304	184	173	114	194	**1,404**
Avg. Benefit	$ 14,639	$ 17,115	$ 14,883	$ 18,067	$ 17,204	$ 19,612	$ 24,466	**$ 17,795**
85 - 89	68	282	288	179	153	126	253	**1,349**
Avg. Benefit	$ 20,001	$ 21,335	$ 21,248	$ 17,554	$ 22,361	$ 20,970	$ 21,925	**$ 20,940**
90+	41	170	225	197	165	149	357	**1,304**
Avg. Benefit	$ 16,336	$ 21,329	$ 18,364	$ 19,417	$ 21,375	$ 21,607	$ 24,347	**$ 21,236**
Total	**612**	**2,308**	**2,026**	**1,214**	**893**	**616**	**1,032**	**8,701**
Avg. Benefit	**$ 14,935**	**$ 14,591**	**$ 14,161**	**$ 14,823**	**$ 16,970**	**$ 19,808**	**$ 22,997**	**$ 16,158**

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, 2018							
	<1	1 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25+	Total
<45								
Avg. Benefit								
45 - 49			1			1	4	**6**
Avg. Benefit			$ 52,611			$ 8,059	$ 24,020	**$ 26,125**
50 - 54	1					1		**2**
Avg. Benefit	$ 17,506					$ 4,841		**$ 11,174**
55 - 59		2			2		1	**5**
Avg. Benefit		$ 24,850			$ 8,428		$ 37,798	**$ 20,871**
60 - 64		2	4		1	2	2	**11**
Avg. Benefit		$ 11,281	$ 13,748		$ 2,097	$ 12,880	$ 33,662	**$ 15,703**
65 - 69	2	4	4	3	5	4	11	**33**
Avg. Benefit	$ 38,626	$ 22,297	$ 14,253	$ 12,298	$ 14,976	$ 28,787	$ 31,152	**$ 24,032**
70 - 74	8	20	19	15	11	4	17	**94**
Avg. Benefit	$ 23,327	$ 26,850	$ 28,685	$ 30,165	$ 35,784	$ 34,550	$ 31,531	**$ 29,670**
75 - 79	15	58	45	34	28	18	47	**245**
Avg. Benefit	$ 29,474	$ 29,369	$ 28,722	$ 25,989	$ 29,070	$ 39,042	$ 27,957	**$ 29,193**
80 - 84	20	66	73	58	51	30	64	**362**
Avg. Benefit	$ 27,696	$ 35,152	$ 27,624	$ 34,627	$ 34,654	$ 34,733	$ 32,528	**$ 32,569**
85 - 89	21	87	113	63	68	51	96	**499**
Avg. Benefit	$ 32,567	$ 36,319	$ 35,340	$ 33,035	$ 37,802	$ 33,895	$ 27,853	**$ 33,850**
90+	7	69	74	95	80	76	149	**550**
Avg. Benefit	$ 29,204	$ 31,496	$ 31,642	$ 30,205	$ 32,891	$ 29,985	$ 25,564	**$ 29,650**
Total	**74**	**308**	**333**	**268**	**246**	**187**	**391**	**1,807**
Avg. Benefit	**$ 29,267**	**$ 32,646**	**$ 31,092**	**$ 31,090**	**$ 33,620**	**$ 32,322**	**$ 28,027**	**$ 31,090**

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)

Age	Years Since Death as of June 30, 2018 <1	1 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25+	Total
<45	16	93	47	15	14	3	3	**191**
Avg. Benefit	$ 5,759	$ 5,891	$ 4,396	$ 4,747	$ 6,822	$ 17,127	$ 11,389	**$ 5,754**
45 - 49	6	28	30	8	7	5	3	**87**
Avg. Benefit	$ 3,207	$ 6,883	$ 7,370	$ 6,204	$ 6,201	$ 5,498	$ 4,754	**$ 6,527**
50 - 54	10	52	36	20	8	6	8	**140**
Avg. Benefit	$ 14,368	$ 7,069	$ 4,868	$ 8,754	$ 8,811	$ 8,140	$ 4,788	**$ 7,280**
55 - 59	35	137	80	33	14	10	6	**315**
Avg. Benefit	$ 13,201	$ 9,370	$ 9,648	$ 6,084	$ 8,017	$ 9,117	$ 15,451	**$ 9,570**
60 - 64	60	213	162	94	33	24	6	**592**
Avg. Benefit	$ 13,037	$ 13,446	$ 8,800	$ 10,644	$ 7,023	$ 10,058	$ 9,594	**$ 11,154**
65 - 69	76	299	247	129	69	24	14	**858**
Avg. Benefit	$ 14,786	$ 10,434	$ 11,275	$ 11,804	$ 11,988	$ 12,267	$ 12,783	**$ 11,482**
70 - 74	82	309	259	155	79	34	19	**937**
Avg. Benefit	$ 13,743	$ 10,242	$ 10,875	$ 10,151	$ 8,639	$ 14,601	$ 10,356	**$ 10,800**
75 - 79	67	259	239	136	103	53	37	**894**
Avg. Benefit	$ 9,100	$ 10,028	$ 9,622	$ 9,137	$ 9,365	$ 9,972	$ 9,146	**$ 9,598**
80 - 84	80	238	224	125	117	71	75	**930**
Avg. Benefit	$ 8,671	$ 10,191	$ 9,284	$ 10,068	$ 9,177	$ 10,126	$ 10,414	**$ 9,711**
85 - 89	44	168	166	116	84	70	91	**739**
Avg. Benefit	$ 9,641	$ 10,419	$ 10,511	$ 9,147	$ 10,011	$ 10,847	$ 8,219	**$ 9,917**
90+	28	83	140	102	85	70	99	**607**
Avg. Benefit	$ 10,150	$ 10,387	$ 10,354	$ 9,365	$ 10,537	$ 11,153	$ 11,009	**$ 10,374**
Total	**504**	**1,879**	**1,630**	**933**	**613**	**370**	**361**	**6,290**
Avg. Benefit	**$ 11,432**	**$ 10,205**	**$ 9,801**	**$ 9,809**	**$ 9,524**	**$ 10,915**	**$ 9,889**	**$ 10,097**

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, 2018							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<45	2	1						**3**
Avg. Benefit	$ 24,513	$ 34,849						**$ 27,958**
45 - 49			1					**1**
Avg. Benefit			$ 19,511					**$ 19,511**
50 - 54			1					**1**
Avg. Benefit			$ 35,100					**$ 35,100**
55 - 59	1	2		1		1		**5**
Avg. Benefit	$ 38,255	$ 25,138		$ 33,481		$ 31,685		**$ 30,740**
60 - 64	1	4	3	4	4	4	2	**22**
Avg. Benefit	$ 20,522	$ 18,737	$ 36,860	$ 48,280	$ 24,933	$ 44,685	$ 14,764	**$ 32,144**
65 - 69	1	12	6	5	10	12	7	**53**
Avg. Benefit	$ 23,310	$ 35,582	$ 39,311	$ 35,737	$ 31,193	$ 27,232	$ 32,115	**$ 32,611**
70 - 74	7	17	12	1	6	8	17	**68**
Avg. Benefit	$ 25,337	$ 39,409	$ 29,597	$ 30,907	$ 41,908	$ 38,850	$ 21,136	**$ 31,690**
75 - 79	5	17	13	1	8	13	24	**81**
Avg. Benefit	$ 27,567	$ 37,029	$ 34,207	$ 17,294	$ 29,673	$ 37,078	$ 32,864	**$ 33,796**
80 - 84	8	23	7	1	5	13	55	**112**
Avg. Benefit	$ 41,676	$ 37,001	$ 61,183	$ 57,521	$ 27,060	$ 36,524	$ 34,247	**$ 37,178**
85 - 89	3	27	9		1	5	66	**111**
Avg. Benefit	$ 83,986	$ 40,972	$ 42,335		$ 9,822	$ 30,868	$ 32,198	**$ 36,293**
90+	6	18	11			3	109	**147**
Avg. Benefit	$ 30,189	$ 33,388	$ 31,931			$ 53,295	$ 34,800	**$ 34,602**
Total	**34**	**121**	**63**	**13**	**34**	**59**	**280**	**604**
Avg. Benefit	**$ 35,671**	**$ 36,733**	**$ 37,483**	**$ 39,308**	**$ 30,753**	**$ 35,916**	**$ 32,872**	**$ 34,601**

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)

	Years Disabled* as of June 30, 2018							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
< 45	2	11	9	1	1			**24**
Avg. Benefit	$ 12,863	$ 7,461	$ 5,789	$ 2,293	$ 1,863			**$ 6,836**
45 - 49	5	23	13	6	1			**48**
Avg. Benefit	$ 12,874	$ 11,227	$ 6,910	$ 7,871	$ 1,993			**$ 9,617**
50 - 54	14	62	42	23	13	1		**155**
Avg. Benefit	$ 13,457	$ 10,993	$ 8,595	$ 6,731	$ 4,000	$ 5,006		**$ 9,308**
55 - 59	26	151	101	67	40	18	5	**408**
Avg. Benefit	$ 13,290	$ 16,040	$ 11,155	$ 9,651	$ 6,959	$ 6,446	$ 6,453	**$ 12,175**
60 - 64	39	246	206	157	88	44	15	**795**
Avg. Benefit	$ 17,593	$ 18,127	$ 13,497	$ 11,410	$ 8,887	$ 9,414	$ 7,268	**$ 13,865**
65 - 69	168	568	78	31	19	15	9	**888**
Avg. Benefit	$ 13,386	$ 13,831	$ 12,234	$ 10,856	$ 6,787	$ 12,759	$ 24,113	**$ 13,438**
70 - 74		143	525	17	7	9	12	**713**
Avg. Benefit		$ 11,380	$ 14,011	$ 12,432	$ 19,963	$ 36,560	$ 28,487	**$ 14,033**
75+			69	334	183	83	58	**727**
Avg. Benefit			$ 10,339	$ 13,457	$ 17,163	$ 19,201	$ 22,442	**$ 15,466**
Total	**254**	**1,204**	**1,043**	**636**	**352**	**170**	**99**	**3,758**
Avg. Benefit	**$ 14,012**	**$ 14,441**	**$ 12,880**	**$ 12,083**	**$ 12,857**	**$ 15,585**	**$ 20,220**	**$ 13,635**

** 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, 2018							
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			12					**12**
Avg. Benefit			$ 44,690					**$ 44,690**
75+			2	17	20	18	13	**70**
Avg. Benefit			$ 24,444	$ 46,454	$ 43,731	$ 40,019	$ 37,767	**$ 41,779**
Total			**14**	**17**	**20**	**18**	**13**	**82**
Avg. Benefit			**$ 41,797**	**$ 46,454**	**$ 43,731**	**$ 40,019**	**$ 37,767**	**$ 42,205**

** 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, 2018							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
< 45	2	11	9	1	1			**24**
Avg. Benefit	$ 12,863	$ 7,461	$ 5,789	$ 2,293	$ 1,863			**$ 6,836**
45 - 49	5	23	13	6	1			**48**
Avg. Benefit	$ 12,874	$ 11,227	$ 6,910	$ 7,871	$ 1,993			**$ 9,617**
50 - 54	14	62	42	23	13	1		**155**
Avg. Benefit	$ 13,457	$ 10,993	$ 8,595	$ 6,731	$ 4,000	$ 5,006		**$ 9,308**
55 - 59	26	151	101	67	40	18	5	**408**
Avg. Benefit	$ 13,290	$ 16,040	$ 11,155	$ 9,651	$ 6,959	$ 6,446	$ 6,453	**$ 12,175**
60 - 64	39	241	206	157	88	44	15	**790**
Avg. Benefit	$ 17,593	$ 18,063	$ 13,497	$ 11,410	$ 8,887	$ 9,414	$ 7,268	**$ 13,818**
65 - 69	168	565	74	31	19	12	2	**871**
Avg. Benefit	$ 13,386	$ 13,797	$ 11,487	$ 10,856	$ 6,787	$ 7,662	$ 15,941	**$ 13,184**
70 - 74		143	513	17	3			**676**
Avg. Benefit		$ 11,380	$ 13,293	$ 12,432	$ 3,228			**$ 12,822**
75+			67	317	158	62	20	**624**
Avg. Benefit			$ 9,918	$ 11,687	$ 13,744	$ 12,673	$ 10,019	**$ 12,063**
Total	**254**	**1,196**	**1,025**	**619**	**323**	**137**	**42**	**3,596**
Avg. Benefit	**$ 14,012**	**$ 14,398**	**$ 12,433**	**$ 11,139**	**$ 10,608**	**$ 10,313**	**$ 8,894**	**$ 12,689**

** 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, 2018							
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		5						**5**
Avg. Benefit		$ 21,213						**$ 21,213**
65 - 69		3	4			3	7	**17**
Avg. Benefit		$ 20,329	$ 26,051			$ 33,148	$ 26,447	**$ 26,457**
70 - 74					4	9	12	**25**
Avg. Benefit					$ 32,514	$ 36,560	$ 28,487	**$ 32,038**
75+					5	3	25	**33**
Avg. Benefit					$ 18,920	$ 29,209	$ 24,412	**$ 24,016**
Total		**8**	**4**		**9**	**15**	**44**	**80**
Avg. Benefit		**$ 20,881**	**$ 26,051**		**$ 24,962**	**$ 34,407**	**$ 25,847**	**$ 26,866**

** 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 7/1/2017	**152,867**	**52,274**	**138,335**	**85,777**	**3,779**	**8,645**	**441,677**
New members	18,430	0	0	0	0	0	**18,430**
Return to active	2,907	(816)	(2,091)	0	0	0	**0**
Terminated non-vested	(10,003)	0	10,003	0	0	0	**0**
Service retirements	(3,534)	(2,141)	0	5,675	0	0	**0**
Terminated deferred	(4,976)	4,976	0	0	0	0	**0**
Terminated refund/transfer	(2,300)	(1,006)	(1,596)	0	0	0	**(4,902)**
Deaths	(231)	(148)	(324)	(2,343)	(176)	(563)	**(3,785)**
New beneficiary	0	0	0	0	0	657	**657**
Disabled	(102)	0	0	0	102	0	**0**
Data adjustments	1	7,927	(5,559)	204	53	(38)	**2,588**
Net change	192	8,792	433	3,536	(21)	56	**12,988**
GERP Members on 6/30/2018	**153,059**	**61,066**	**138,768**	**89,313**	**3,758**	**8,701**	**454,665**

Summary of Membership

Active Member Statistics	**Basic Members**	**Coordinated Members**	**MERF Members**	**Total**
Number	3	153,047	9	153,059
Average age	70.8	46.3	64.9	46.3
Average service	50.8	9.7	42.7	9.7
Average salary	$ 66,347	$ 39,654	$ 73,150	$ 39,656

Deferred Retirement Terminated Member Statistics	**Basic Members**	**Coordinated Members**	**MERF Members**	**Total**
Number	18	61,034	14	61,066
Average age	75.7	50.3	64.2	50.3
Average service	4.2	6.6	7.2	6.6
Average annual benefit, with augmentation to December 31, 2018 and 15% CSA load	$ 13,111	$ 5,786	$ 11,550	$ 5,789
Average refund value, with 15% CSA load	$ 362	$ 10,863	$ 18,752	$ 10,861

Other Non-Vested Terminated Member Statistics	**Basic Members**	**Coordinated Members**	**MERF Members**	**Total**
Number	2,462	136,306	-	138,768
Average age	80.4	47.0	N/A	47.6
Average service	0.1	1.0	N/A	1.0
Average refund value, with 3% CSA load	$ 87	$ 795	N/A	$ 783

Membership Data

Summary of Membership

Service Retiree Member Statistics	Basic Members	Coordinated Members	MERF Members	Total
Number	3,533	83,364	2,416	89,313
Average age	84.3	72.2	76.8	72.8
Average benefit	$ 40,641	$ 12,840	$ 38,462	$ 14,632

Disabled Retiree Member Statistics	Basic Members	Coordinated Members	MERF Members	Total
Number	82	3,596	80	3,758
Average age	82.5	66.9	74.5	67.4
Average benefit	$ 42,205	$ 12,689	$ 26,866	$ 13,635

Survivor Member Statistics	Basic Members	Coordinated Members	MERF Members	Total
Number	1,807	6,290	604	8,701
Average age	85.1	73.5	81.3	76.5
Average benefit	$ 31,090	$ 10,097	$ 34,601	$ 16,158

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, 2018
A. Actuarial Value of Assets					$	21,129,746
B. Expected Future Assets						
1. Present value of expected future statutory supplemental contributions*					$	7,198,107
2. Present value of future normal cost contributions					$	3,685,533
3. Total expected future assets: *(1.) + (2.)*					$	10,883,640
C. Total Current and Expected Future Assets *(A.+ B.3)*					$	32,013,386
D. Current Benefit Obligations**						
1. Benefit recipients		**Non-Vested**		**Vested**		**Total**
a. Service retirements	$	-	$	13,562,936	$	13,562,936
b. Disability retirements	$	-	$	495,151	$	495,151
c. Survivors	$	-	$	1,092,368	$	1,092,368
2. Deferred retirements with augmentation	$	-	$	1,988,307	$	1,988,307
3. Former members without vested rights	$	46,492	$	-	$	46,492
4. Active members	$	307,594	$	8,301,718	$	8,609,312
5. Total Current Benefit Obligations	$	354,086	$	25,440,480	$	25,794,566
E. Expected Future Benefit Obligations					$	4,992,034
F. Total Current and Expected Future Benefit Obligations***					$	30,786,600
G. Unfunded Current Benefit Obligations: *(D.5.) - (A.)*					$	4,664,820
H. Unfunded Current and Future Benefit Obligations: *(F.) - (C.)*					$	(1,226,786)
I. Accrued Benefit Funding Ratio: *(A.)/(D.)*						81.92%
J. Projected Benefit Funding Ratio: *(C.)/(F.)*						103.98%

* *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	$ 12,361,765	$ 2,541,908	$ 9,819,857
b. Disability benefits	$ 336,101	$ 119,590	$ 216,511
c. Survivor's benefits	$ 178,593	$ 46,943	$ 131,650
d. Deferred retirements	$ 631,114	$ 698,972	$ (67,858)
e. Refunds*	$ 93,773	$ 278,120	$ (184,347)
f. Total	$ 13,601,346	$ 3,685,533	$ 9,915,813
2. Deferred retirements with future augmentation	$ 1,988,307	$ -	$ 1,988,307
3. Former members without vested rights	$ 46,492	$ -	$ 46,492
4. Annuitants	$ 15,150,455	$ -	$ 15,150,455
5. Total	$ 30,786,600	$ 3,685,533	$ 27,101,067
B. Determination of Unfunded Actuarial Accrued Liability (UAAL)			
1. Actuarial accrued liability			$ 27,101,067
2. Current assets (AVA)			$ 21,129,746
3. Unfunded actuarial accrued liability			$ 5,971,321
C. Determination of Supplemental Contribution Rate**			
1. Present value of future payrolls through the amortization date of June 30, 2048			$ 108,732,731
2. Supplemental contribution rate: *(B.3.) / (C.1.)*			5.49 % ***

* *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, 2018 is 17.0779.*

Development of Costs

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

	Year Ending June 30, 2018		
	Actuarial Accrued Liability	Current Assets	Unfunded Actuarial Accrued Liability
A. At beginning of year	$ 25,615,722	$ 19,916,322	$ 5,699,400
B. Changes due to interest requirements and current rate of funding			
1. Normal cost, including expenses	$ 501,917	$ -	$ 501,917
2. Benefit payments	$ (1,513,039)	$ (1,513,039)	$ -
3. Contributions	$ -	$ 914,242	$ (914,242)
4. Interest on A., B.1., B.2., and B.3.	$ 2,008,813	$ 1,569,354	$ 439,459
5. Total *(B.1. + B.2. + B.3. + B.4.)*	$ 997,691	$ 970,557	$ 27,134
C. Expected unfunded actuarial accrued liability at end of year *(A. + B.5.)*			$ 5,726,534
D. Increase (decrease) due to actuarial losses (gains) because of experience deviations from expected			
1. Age and service retirements			$ 27,441
2. Disability retirements			$ (586)
3. Death-in-service benefits			$ (10,198)
4. Withdrawals			$ (53,195)
5. Salary increases			$ (6,380)
6. Investment income			$ (242,867)
7. Mortality of annuitants			$ (42,575)
8. Other items			$ 53,639
9. Total			$ (274,721)
E. Unfunded actuarial accrued liability at end of year before plan amendments and changes in actuarial assumptions *(C. + D.9.)*			$ 5,451,813
F. Change in unfunded actuarial accrued liability due to changes in plan provisions			$ (631,888)
G. Change in unfunded actuarial accrued liability due to changes in actuarial assumptions			$ 1,151,396
H. Change in unfunded actuarial accrued liability due to changes in methodology			$ -
I. Unfunded actuarial accrued liability at end of year *(E. + F. + G. + H.)**			$ 5,971,321

** The unfunded actuarial accrued liability on a market value of assets basis is $5,547,590.*

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. The exhibit below is a compilation of the results for Basic, Coordinated and MERF members, presented on subsequent pages.

	Percent-of-Payroll	Dollar Amount
A. Statutory Contributions - Chapter 353		
1. Employee contributions	6.50%	$ 413,876
2. Employer contributions	7.50%	$ 477,541
3. Employer supplemental contributions	0.49%	$ 31,000
4. State contributions	0.09%	$ 6,000
5. Total	14.58%	$ 928,417
B. Required Contributions - Chapter 356		
1. Normal cost		
a. Retirement benefits	5.56%	$ 353,999
b. Disability benefits	0.23%	$ 14,660
c. Survivors	0.10%	$ 6,368
d. Deferred retirement benefits	1.32%	$ 84,054
e. Refunds*	0.56%	$ 35,656
f. Total	7.77%	$ 494,737
2. Supplemental Contribution Amortization of Unfunded Actuarial Accrued Liability by June 30, 2048	5.49%	$ 349,542
3. Allowance for Expenses	0.19%	$ 12,097
4. Total	13.45% **	$ 856,376
C. Contribution Sufficiency/(Deficiency) *(A.5. - B.4.)*	1.13 %	$ 72,041

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

*** The required contribution on a market value of assets basis is 13.06% of payroll.*

Note: Projected annual payroll for fiscal year beginning on the valuation date: $6,366,884 (determined according to requirements of the LCPR Standards for Actuarial Work).

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%	$ 19
2. Employer contributions	11.78%	$ 24
3. Total	20.88%	$ 43
B. Required contributions - Chapter 356		
1. Normal cost		
a. Retirement benefits	4.08%	$ 8
b. Disability benefits	0.19%	$ -
c. Survivors	0.05%	$ -
d. Deferred retirement benefits	2.72%	$ 6
e. Refunds*	0.65%	$ 1
f. Total	7.69%	$ 15

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

Note: Projected annual payroll for fiscal year beginning on the valuation date: $206.

Development of Costs

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

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

	Percent-of-Payroll		Dollar Amount
A. Statutory contributions - Chapter 353			
1. Employee contributions	6.50%	$	413,790
2. Employer contributions	7.50%	$	477,450
3. Total	14.00%	$	891,240
B. Required contributions - Chapter 356			
1. Normal cost			
a. Retirement benefits	5.56%	$	353,949
b. Disability benefits	0.23%	$	14,642
c. Survivors	0.10%	$	6,366
d. Deferred retirement benefits	1.32%	$	84,031
e. Refunds*	0.56%	$	35,650
f. Total	7.77%	$	494,638

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

Note: Projected annual payroll for fiscal year beginning on the valuation date: $6,365,995.

Development of Costs

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

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

	Percent-of-Payroll	Dollar Amount
A. Statutory contributions - Chapter 353		
1. Employee contributions	9.75%	$ 67
2. Employer contributions	9.75%	$ 67
3. Employer supplemental contributions	4,538.80%	$ 31,000
4. State contributions	878.48%	$ 6,000
5. Total	5,436.78%	$ 37,134
B. Required contributions - Chapter 356		
1. Normal cost		
a. Retirement benefits	6.08%	$ 42
b. Disability benefits	2.68%	$ 18
c. Survivors	0.23%	$ 2
d. Deferred retirement benefits	2.53%	$ 17
e. Refunds*	0.79%	$ 5
f. Total	12.31%	$ 84

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

Note: Projected annual payroll for fiscal year beginning on the valuation date: $683.

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, 2018

Group	Number	Average Annual Benefits	Average Age	Actuarial Accrued Liability (000s)
Active Members	9	N/A	64.9	$ 7,069
Deferred Retirements	14	N/A	64.2	$ 1,910
Service Retirements	2,416	$ 38,462	76.8	$ 880,371
Disability Retirements	80	$ 26,866	74.5	$ 19,066
Survivors	604	$ 34,601	81.3	$ 156,877
Total	**3,123**	**$ 37,410**	**77.5**	**$ 1,065,293**

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

Benefit increases after retirement will equal 50% of the Social Security Cost of Living Adjustment, not less than 1.0% and not more than 1.5%, beginning January 1, 2019. Stochastic modeling was used to determine the assumption that benefit increases will equal 1.25% per year. This is only an assumption; actual increases will depend on actual experience.

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, 2048 assuming payroll increases of 3.25% 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 may be extended.

As required by the Standards for Actuarial Work, projected payroll is 1) determined by increasing reported payroll for each member by one full year's assumed pay increase according to the actuarial salary scale and 2) multiplied by 0.962 in the determination of the present value of future payroll to account for timing differences.

Changes in Methods since Prior Valuation
The amortization period was reset to 30 years, ending in 2048.

Stochastic modeling was used to determine the assumption that benefit increases will equal 1.25% per year.

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	7.50% per annum.
Benefit increases after retirement	1.25% 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	2.50% per year.
Payroll growth	3.25% per year.
Mortality rates	
Healthy pre-retirement	RP-2014 Employee Mortality Table, adjusted for white collar and mortality improvements using projection scale MP-2017, 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-2017, 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-2017, from a base year of 2014. Rates are set forward one year for males and set forward six years for females.
Notes	The RP-2014 Employee Mortality Table as published by the Society of Actuaries (SOA) contains mortality rates for ages 18 to 80 and the annuitant mortality table contains mortality rates for ages 50 to 120. We have extended the annuitant mortality table as needed for members younger than age 50 who are receiving a benefit by deriving rates based on the employee table and the juvenile table. Similarly, we have extended the employee table as needed for members older than age 80 by deriving rates based on the annuitant table.
Retirement	Members retiring from active status are assumed to retire according to the age related rates shown in the tables. Members who have attained the highest assumed retirement age are assumed to retire in one year. Note that significant plan changes reflected in this report may result in behavior changes that are not anticipated in the current retirement rates.
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 are assumed to take the larger of contributions accumulated with interest or the value of the 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.

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, based on average results for applicable members at the time of the last experience study, were applied: <u>Data for active members:</u> There were 3,646 members reported with a salary less than $100. We used prior year salary (2,259 members), if available; otherwise high five salary with a 10% load to account for salary increases (833 members). If neither prior year salary or high five salary was available, we assumed a value of $35,000. There were also 2,606 members reported without a gender and 167 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 (163 members), we assumed a value of $24,000. If credited service was not reported (151 members), we assumed credited service was elapsed time from hire to termination date (100 members); if elapsed time was not available, we assumed nine years. If termination date was invalid or not reported (126 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 99 members reported with an invalid date of birth and 442 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 119 members reported without a gender. We assumed retirees are female and beneficiaries are male. There were 6 members reported with an invalid date of birth. We assumed a date of birth of July 1, 1945. There were 527 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 2018 valuation as retirees with an estimated life only monthly benefit. Any members deemed not eligible for retirement were assumed to have taken a refund.

Actuarial Basis

Summary of Actuarial Assumptions – Basic and Coordinated (Continued)

Unknown data for certain members (Concluded)	<u>Data for retired members (Continued):</u> 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 2,089 retirees as disabled retirees in this valuation.
Changes in actuarial assumptions	The assumed investment return was lowered from 8.0% to 7.5%. The assumed rate of inflation decreased from 2.75% to 2.50%. The assumed payroll growth rate decreased from 3.50% to 3.25%. Salary increase rates were reduced by 0.25% at each year of service. The mortality projection scale was changed from MP-2015 to MP-2017. The assumed benefit increase was changed from 1.00% per year through 2035 and 2.50% per year thereafter to 1.25% per year.

Actuarial Basis

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 2018	Male	Female	Male	Female	Male	Female
20	0.03%	0.01%	0.03%	0.01%	0.06%	0.11%
25	0.05	0.02	0.03	0.01	0.25	0.26
30	0.07	0.04	0.03	0.02	0.58	0.49
35	0.10	0.07	0.04	0.02	1.00	0.75
40	0.15	0.11	0.05	0.03	1.40	1.00
45	0.21	0.14	0.07	0.05	1.71	1.22
50	0.30	0.18	0.12	0.08	2.00	1.46
55	0.43	0.25	0.21	0.13	2.34	1.78
60	0.60	0.36	0.37	0.20	2.76	2.25
65	0.92	0.58	0.65	0.28	3.33	2.99
70	1.50	0.91	1.13	0.47	4.17	4.27
75	2.55	1.52	1.96	0.82	5.58	6.36
80	4.56	2.66	3.55	1.44	7.95	9.50
85	8.48	4.82	7.45	3.49	11.92	14.06
90	15.37	8.85	13.87	8.27	18.22	20.71

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

	Rates of 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

Actuarial Basis

Summary of Actuarial Assumptions – Basic and Coordinated (Continued)

	Rates of Service 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			Rates of Termination	
Year	Increase	Year	Male	Female
1	11.25%	1	25.00%	25.00%
2	8.25	2	20.00	20.00
3	6.75	3	15.00	15.00
4	5.75	4	10.00	11.00
5	5.25	5	9.00	10.00
6	4.95	6	7.00	9.00
7	4.65	7	5.50	7.50
8	4.55	8	5.00	6.50
9	4.45	9	4.50	5.50
10	4.25	10	4.00	5.00
11	4.00	11	3.25	4.25
12	3.85	12	3.00	4.00
13	3.75	13	2.75	3.75
14	3.65	14	2.50	3.50
15	3.65	15	2.50	3.25
16	3.60	16	2.25	3.00
17	3.55	17	2.00	2.75
18	3.50	18	1.75	2.50
19	3.50	19	1.50	2.50
20	3.50	20	1.50	2.25
21	3.50	21	1.50	2.25
22	3.45	22	1.50	2.25
23	3.35	23	1.00	2.00
24	3.35	24	1.00	2.00
25	3.35	25	1.00	1.75
26+	3.25	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 5 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 was 1 member reported without a gender. We assumed male gender. 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 80 retirees as disabled retirees in this valuation.

Actuarial Basis

Summary of Actuarial Assumptions – MERF (Concluded)

	Rates of Termination		Rates of 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. Augmentation adjustment is phased out over a five-year period starting July 1, 2019, resulting in no augmentation adjustment after June 30, 2024.
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 will receive a future annual increase equal to 50% of the Social Security Cost of Living Adjustment, not less than 1.0% and not more than 1.5%, beginning January 1, 2019. For retirements on or after January 1, 2024, the first benefit increase is delayed until the retiree reaches Normal Retirement Age (not applicable to Rule of 90 retirees, disability benefit recipients, or survivors). 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.

Actuarial Basis

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, except benefit increases are paid prior to Normal Retirement.

Summary of Plan Provisions - Basic (Continued)

Disability (Concluded)

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, except benefit increases are paid prior to Normal Retirement.

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, except benefit increases are paid prior to Normal 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).

Summary of Plan Provisions - Basic (Continued)

Death (Concluded)

Surviving dependent children's benefit (Concluded)

Amount (Concluded)	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, except benefit increases are paid prior to Normal Retirement.

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, except benefit increases are paid prior to Normal 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% through June 30, 2018; 3.00% thereafter over any disability or survivor benefits paid.

Summary of Plan Provisions - Basic (Continued)

Termination

Refund of contributions

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

Deferred benefit

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;

(e.) 1.00% from January 1, 2012 through December 31, 2018; and

(f.) 0.00% from January 1, 2019, 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.

Summary of Plan Provisions - Basic (Continued)

Termination (Concluded) Deferred benefit (Concluded)	
Amount (Concluded)	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	Effective July 1, 2019, actuarially equivalent factors based on the RP-2014 mortality table for healthy annuitants for a member turning age 62 in 2021, reflecting projected mortality improvements using Scale MP-2017, white collar adjustment, male rates set forward two years, female rates multiplied by 0.90, blended 40% males, 6.17% post-retirement interest, and 7.50% pre-retirement interest. Reflecting statutory requirements, joint and survivor factors are based on an interest assumption of 6.50%.
Combined service annuity	Members are eligible for combined service benefits if they: (a.) 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 benefits 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.

Actuarial Basis

Summary of Plan Provisions - Basic (Concluded)

Changes in plan provisions	The augmentation adjustment in early retirement factors is eliminated over a five-year period starting July 1, 2019, resulting in actuarial equivalence after June 30, 2024. Interest credited on member contributions decreased from 4.0% to 3.0%, beginning July 1, 2018. Deferred augmentation was changed to 0.0%, effective January 1, 2019. Augmentation that has already accrued for deferred members will still apply. Post-retirement benefit increases were changed from 1.0% per year with a provision to increase to 2.5% upon attainment of 90% funding ratio to 50% of the Social Security Cost of Living Adjustment, not less than 1.0% and not more than 1.5%, beginning January 1, 2019. For retirements on or after January 1, 2024, the first benefit increase is delayed until the retiree reaches Normal Retirement Age. Does not apply to Rule of 90 retirees, disability benefit recipients, or survivors. Actuarial equivalent factors were updated to reflect revised mortality and interest assumptions.

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 Effective date	Shown as a percent of salary:
	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. Augmentation adjustment is phased out over a five-year period starting July 1, 2019, resulting in no augmentation adjustment after June 30, 2024. First hired after June 30, 1989: (a.) 1.70% of Average Salary for each year of Allowable Service assuming augmentation to the age eligible for full Social Security retirement benefit (but not higher than age 66) at 3.00% (2.50% if hired after June 30, 2006) per year and actuarial reduction for each month the member is under the normal retirement age. Augmentation adjustment is phased out over a five-year period starting July 1, 2019, resulting in no augmentation adjustment after June 30, 2024.

Summary of Plan Provisions – Coordinated (Continued)

Retirement (Continued)	
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.
<u>Benefit increases</u>	Benefit recipients receive a future annual increase equal to 50% of the Social Security Cost of Living Adjustment, not less than 1.0% and not more than 1.5%, beginning January 1, 2019. For retirements on or after January 1, 2024, the first benefit increase is delayed until the retiree reaches Normal Retirement Age (not applicable to Rule of 90 retirees, disability benefit recipients, or survivors). 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 will 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	
<u>Disability benefit</u>	
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%.

Summary of Plan Provisions – Coordinated (Continued)

Disability (Concluded)	
Disability benefit (Concluded)	
Amount (Concluded)	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, except benefit increases are paid prior to Normal 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, except benefit increases are paid prior to Normal 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, except benefit increases are paid prior to Normal Retirement.

Actuarial Basis

Summary of Plan Provisions – Coordinated (Continued)

Death (Concluded)

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% through June 30, 2018; 3.00% thereafter over any disability or survivor benefits paid.

Termination

Refund of contributions

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

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 through December 31, 2018; and (f.) 0.00% from January 1, 2019, thereafter. Members who terminate after 2011 will receive no future augmentation.

Actuarial Basis

Summary of Plan Provisions – Coordinated (Continued)

Termination (Concluded)	
Deferred benefit (Concluded)	
Amount (Concluded)	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	Effective July 1, 2019, actuarially equivalent factors based on the RP-2014 mortality table for healthy annuitants for a member turning age 62 in 2021, reflecting projected mortality improvements using Scale MP-2017, white collar adjustment, male rates set forward two years, female rates multiplied by 0.90, blended 40% males, 6.17% post-retirement interest, and 7.50% pre-retirement interest. Reflecting statutory requirements, joint and survivor factors are based on an interest assumption of 6.50%.

Actuarial Basis

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 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	The augmentation adjustment in early retirement factors is eliminated over a five-year period starting July 1, 2019, resulting in actuarial equivalence after June 30, 2024. Interest credited on member contributions decreased from 4.0% to 3.0%, beginning July 1, 2018. Deferred augmentation was changed to 0.0%, effective January 1, 2019. Augmentation that has already accrued for deferred members will still apply. Contribution stabilizer provisions were repealed. Post-retirement benefit increases were changed from 1.0% per year with a provision to increase to 2.5% upon attainment of 90% funding ratio to 50% of the Social Security Cost of Living Adjustment, not less than 1.0% and not more than 1.5%, beginning January 1, 2019. For retirements on or after January 1, 2024, the first benefit increase is delayed until the retiree reaches Normal Retirement Age. Does not apply to Rule of 90 retirees, disability benefit recipients, or survivors. Actuarial equivalent factors were updated to reflect revised mortality and interest assumptions.

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.

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	
Pre-retirement survivor's spouse benefit	
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.
Pre-retirement survivor's spouse annuity	
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.
Refund of accumulated city contributions	
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.
Lump sum	
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.
Refund of member contributions at death	
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.

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

Termination	
<u>Deferred benefit</u>	
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.
<u>Refund of member contributions upon termination</u>	
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 will receive a future annual increase equal to 50% of the Social Security Cost of Living Adjustment, not less than 1.0% and not more than 1.5%, beginning January 1, 2019. For retirements on or after January 1, 2024, the first benefit increase is delayed until the retiree reaches Normal Retirement Age (not applicable to Rule of 90 retirees, disability benefit recipients, or survivors).
Changes in plan provisions	Post-retirement benefit increases were changed from 1.0% per year with a provision to increase to 2.5% upon attainment of 90% funding ratio to 50% of the Social Security Cost of Living Adjustment, not less than 1.0% and not more than 1.5%, beginning January 1, 2019. For retirements on or after January 1, 2024, the first benefit increase is delayed until the retiree reaches Normal Retirement Age. Does not apply to Rule of 90 retirees, disability benefit recipients, or survivors.

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)
7-1-1996	$ 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
7-1-2018	$ 21,129,746	$ 27,101,067	$ 5,971,321	77.97	$ 6,298,815 [5]	94.80

[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)
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	$ 6,298,815	6	$ 409,423	$ 609,725	$ 504,819	82.79
2019	13.45						

[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, 2018

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November 28, 2018

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, 2018 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 and only with permission of the Board. 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, 2018 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.

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 a 2018 analysis of long-term rate of investment return and inflation assumptions, GRS suggested that an investment return assumption in the range of 6.64% to 7.56% would be reasonable. Please see our letter dated October 3, 2018 for additional information. The current assumed rate, which is mandated by Minnesota Statutes, is 7.50% and is at the upper end of the reasonable range. This report also concluded that the probability of exceeding the current 7.50% assumption over 20 years is only 39%. If capital market assumptions decline further from present levels, the 7.5% return assumption might not comply with actuarial standards for the July 1, 2019 valuation. For informational purposes, results based on a 6.5% assumption 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 6 – 9, 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.

The valuation assumed the continuing ability of the plan sponsor to make the contributions necessary to fund this plan. A determination regarding whether or not the plan sponsor is actually able to do so is outside our scope of expertise and was not performed.

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The findings in this report are based on data and other information through June 30, 2018. 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 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: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 7.50%), it is expected that:

(1) The normal cost of the plan is expected to remain approximately level as a percent of pay,
(2) The funded status of the plan is expected to gradually improve and is expected to be 100% funded within the next 30 years, and
(3) The unfunded liability will grow initially as a dollar amount before beginning to decline.

Limitations of Funded Status Measurements

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

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

Limitations of Project Scope

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

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, 2018	Actuarial Valuation as of July 1, 2017
Statutory Contributions - Chapter 353E (% of Payroll)	14.58%	14.58%
Required Contributions - Chapter 356 (% of Payroll)	14.92%	15.11%
Sufficiency / (Deficiency)	(0.34%)	(0.53%)

The contribution deficiency decreased from 0.53% of payroll to 0.34% of payroll. On a market value of assets basis, contributions are sufficient by 0.05% of payroll. The impact of plan provision and assumption changes is described on page three.

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 10.3% for the plan year ending June 30, 2018. The AVA earned approximately 9.2% for the plan year ending June 30, 2018 as compared to the assumed rate of 8.00%. The assumed rate is mandated by Minnesota Statutes and was recently lowered to 7.50%.

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, 2018	**July 1, 2017**
Contributions (*% of Payroll*)		
Statutory - Chapter 353E	14.58%	14.58%
Required - Chapter 356	14.92%	15.11%
Sufficiency / (Deficiency)	(0.34%)	(0.53%)
Funding Ratios (*dollars in thousands*)		
Assets		
- Current assets (AVA)	$ 666,012	$ 595,366
- Current assets (MVA)	$ 680,395	$ 602,460
Accrued Benefit Funding Ratio		
- Current benefit obligations	$ 645,693	$ 581,754
- Funding ratio (AVA)	103.15%	102.34%
- Funding ratio (MVA)	105.37%	103.56%
Accrued Liability Funding Ratio		
- Actuarial accrued liability	$ 696,842	$ 629,870
- Funding ratio (AVA)	95.58%	94.52%
- Funding ratio (MVA)	97.64%	95.65%
Projected Benefit Funding Ratio		
- Current and expected future assets	$ 918,801	$ 829,429
- Current and expected future benefit obligations	$ 931,405	$ 844,365
- Projected benefit funding ratio (AVA)	98.65%	98.23%
Participant Data		
Active members		
- Number	3,981	3,842
- Annual valuation earnings *(000s)*	$ 206,815	$ 197,630
- Projected annual earnings *(000s)*	$ 217,805	$ 208,531
- Average projected annual earnings	$ 54,711	$ 54,277
- Average age	38.8	39.3
- Average service	7.3	7.5
Service retirements	942	853
Survivors	61	54
Disability retirements	190	178
Deferred retirements	3,165	2,933
Terminated other non-vested	2,811	2,624
Total	**11,150**	**10,484**

Summary of Valuation Results

Effects of Changes

The following changes in plan provisions, actuarial assumptions, and methods were recognized as of July 1, 2018:

- The augmentation adjustment in early retirement factors is eliminated over a five-year period starting July 1, 2019, resulting in actuarial equivalence after June 30, 2024.
- Post-retirement benefit increases were changed from 2.5% per year with a provision to reduce to 1.0% if the funding status declines to a certain level, to 100% of the Social Security Cost of Living Adjustment, not less than 1.0% and not more than 2.5%, beginning January 1, 2019. If the funding status declines to 85% for two consecutive years or 80% for one year, the maximum increase will be lowered to 1.5%.
- Deferred augmentation was changed to 0.0%, effective January 1, 2019.
- Interest credited on member contributions decreased from 4.0% to 3.0%, beginning July 1, 2018.
- Actuarial equivalent factors were updated.
- The assumed investment return was lowered from 8.0% to 7.5%.
- The assumed rate of inflation decreased from 2.75% to 2.50%.
- The assumed payroll growth rate decreased from 3.50% to 3.25%.
- Salary increase rates were reduced by 0.25% at each year of service.
- The mortality projection scale was changed from MP-2016 to MP-2017.
- The assumed post-retirement benefit increase was changed from 2.50% to 2.00%.
- The amortization period was reset to 30 years.

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 $3.5 million and increase the required contribution by 0.2% of pay, as follows:

	Before Changes	Reflecting Plan Provision Changes	Reflecting Plan Provision and Assumption Changes	Reflecting Plan Provision, Assumption, and Amortization Changes
Normal Cost Rate, % of Pay	13.6%	12.8%	13.9%	13.9%
Amortization of Unfunded Accrued Liability, % of Pay	0.9%	(0.4%)	1.1%	0.8%
Expenses (% of Pay)	0.2%	0.2%	0.2%	0.2%
Total Required Contribution, % of Pay	14.7%	12.6%	15.2%	14.9%
Accrued Liability Funding Ratio	96.1%	102.2%	95.6%	95.6%
Projected Benefit Funding Ratio	99.8%	108.4%	98.2%	98.7%
Unfunded Accrued Liability (in millions)	$27.3	($14.2)	$30.8	$30.8

Summary of Valuation Results

Valuation of Future Post-Retirement Benefit Increases

The 2018 Omnibus Pension Bill, which was passed during the 2018 legislative session, revised the postretirement benefit increases payable to retirees in the Local Government Correctional Service Retirement Plan (LGCSRP). Effective January 1, 2019, benefit recipients receive a future annual post-retirement benefit increase equal to 100% of the Social Security Cost-of-Living Adjustment, not less than 1.0% and not more than 2.5%. If the funding status declines to 85% for two consecutive years or 80% for one year, the maximum increase will be lowered to 1.5%.

To determine an assumption regarding a future change in the post-retirement benefit increase, we examined the capital market inflation assumptions for twelve investment consulting firms based on the GRS Capital Market Assumption Modeler (CMAM). Because GRS is a benefits consulting firm and does not develop or maintain its own capital market expectations, we request and monitor forward-looking expectations developed by several major investment consulting firms. We update our CMAM on an annual basis. The capital market assumptions in the 2018 CMAM are from the following investment consultants (in alphabetical order): Aon Hewitt, BNY Mellon, Callan, JPMorgan, Marquette Associates, Mercer, NEPC, PCA, RVK, Summit Strategies, Voya and Wilshire.

The average assumption for inflation was 2.20%, with a range of 1.95% to 2.50%, and the standard deviation was 1.69% (note that not every investment consulting firm provided a standard deviation). However, the investment consulting firms typically set their assumptions based on a shorter time horizon, while actuaries must make much longer projections.

We normalized these parameters slightly so that they would correspond to the current inflation assumption of 2.50%. Then, based on a Monte Carlo simulation (1,000 simulations) of the postretirement benefit increases as described above, we determined that an annual COLA assumption of 2.00% would be appropriate to model the effect of the post-retirement benefit increases. This is only an assumption; actual increases will depend on actual experience.

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 valuations. Per the LCPR's requirement, we have calculated the liabilities associated with the following scenarios:

1) 6.5% interest rate assumption
2) 8.5% interest rate assumption

We also included two alternate post-retirement benefit increase scenarios for informational purposes. The maximum benefit increase paid under current plan provisions is 2.5% per year. If the funding status declines to a specified level, the maximum benefit increase will be lowered to 1.5% per year. The financial impact of a 1.5% or 2.5% post-retirement benefit increase compared to the baseline assumption of 2.0% is shown below.

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 8.5% interest rate assumption would not comply with Actuarial Standards of Practice.

$ in millions	Final Valuation Assumptions	Final Valuation Assumptions with 6.5% Interest	Final Valuation Assumptions with 8.5% Interest	Final Valuation Assumptions with 2.5% COLA for All Future Years	Final Valuation Assumptions with 1.5% COLA for All Future Years
Normal Cost Rate, % of Pay	13.9%	17.6%	11.3%	14.7%	13.2%
Amortization of Unfunded Accrued Liability, % of Pay	0.8%	3.7%	(2.1%)	1.9%	(0.1%)
Expenses (% of Pay)	0.2%	0.2%	0.2%	0.2%	0.2%
Total Required Contribution, % of Pay	14.9%	21.5%	9.4%	16.8%	13.3%
Contribution Sufficiency/(Deficiency)	(0.3%)	(6.9%)	5.2%	(2.2%)	1.3%
Accrued Liability Funding Ratio	95.6%	81.1%	111.5%	90.5%	100.8%
Present Value of Projected Benefits	$931.4	$1,143.0	$773.0	$983.5	$883.7
Present Value of Future Normal Costs	$234.6	$321.8	$175.6	$247.4	$222.9
Actuarial Accrued Liability	$696.8	$821.2	$597.4	$736.1	$660.8
Unfunded Accrued Liability	$30.8	$155.1	($68.6)	$70.1	($5.2)

Summary of Valuation Results

Risks Associated with the Measuring the Accrued Liability and Actuarially Determined Contribution

The determination of the accrued liability and the actuarially determined contribution requires the use of assumptions regarding future economic and demographic experience. Risk measures, as illustrated in this report, are intended to aid in the understanding of the effects of future experience differing from the assumptions used in the course of the actuarial valuation. Risk measures may also help with illustrating the potential volatility in the accrued liability and the actuarially determined contribution that result from the differences between actual experience and the actuarial assumptions.

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 due to changing conditions; 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. The scope of an actuarial valuation does not include an analysis of the potential range of such future measurements.

Examples of risk that may reasonably be anticipated to significantly affect the plan's future financial condition include:

1. Investment risk – actual investment returns may differ from the expected returns;
2. Asset/Liability mismatch – changes in asset values may not match changes in liabilities, thereby altering the gap between the accrued liability and assets and consequently altering the funded status and contribution requirements;
3. Contribution risk – actual contributions may differ from expected future contributions. For example, actual contributions may not be made in accordance with the plan's funding policy or material changes may occur in the anticipated number of covered employees, covered payroll, or other relevant contribution base;
4. Salary and Payroll risk – actual salaries and total payroll may differ from expected, resulting in actual future accrued liability and contributions differing from expected;
5. Longevity risk – members may live longer or shorter than expected and receive pensions for a period of time other than assumed;
6. Other demographic risks – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future accrued liability and contributions differing from expected.

The effects of certain trends in experience can generally be anticipated. For example if the investment return since the most recent actuarial valuation is less (or more) than the assumed rate, the cost of the plan can be expected to increase (or decrease). Likewise if longevity is improving (or worsening), increases (or decreases) in cost can be anticipated.

Summary of Valuation Results

The Required Contribution rate shown on page 1 may be considered as a minimum contribution rate that complies with Minnesota Statutes and the requirements of the Standards for Actuarial Work published by the LCPR. The timely receipt of the actuarially determined contributions is critical to support the financial health of the plan. Users of this report should be aware that contributions made at the actuarially determined rate do not necessarily guarantee benefit security.

PLAN MATURITY MEASURES

Risks facing a pension plan evolve over time. A young plan with virtually no investments and paying few benefits may experience little investment risk. An older plan with a large number of members in pay status and a significant trust may be much more exposed to investment risk. Generally accepted plan maturity measures include the following. Additional maturity measures are shown on the following page.

	2018	2017
Ratio of market value of assets to total payroll	3.32	3.01
Ratio of actuarial accrued liability to total payroll	3.40	3.15
Ratio of actives to retirees and beneficiaries	3.34	3.54
Ratio of net cash flow to market value of assets	2.2%	2.7%
Approximate modified duration* of:		
▪ Total projected benefits:	19.86	19.86
▪ Actuarial accrued liability:	16.06	16.27

* *Approximate modified duration of total projected benefits based on 7.5% interest for 2018 and 8.0% interest for 2017*

RATIO OF MARKET VALUE OF ASSETS TO PAYROLL

The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. For example, if the market value of assets is 5.0 times the payroll, a return on assets 5% different than assumed would equal 25% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in plan sponsor contributions as a percentage of payroll.

RATIO OF ACTUARIAL ACCRUED LIABILITY TO PAYROLL

The relationship between actuarial accrued liability and payroll is a useful indicator of the potential volatility of contributions for a fully funded plan. A funding policy that targets a funded ratio of 100% is expected to result in the ratio of assets to payroll and the ratio of liability to payroll converging over time. The ratio of liability to payroll may also be used as a measure of sensitivity of contribution rates to liability gains and losses. For example, if the actuarial accrued liability is 5.0 times the payroll, a change in liability 2% other than assumed would equal 10% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in liability (and also plan sponsor contributions) as a percentage of payroll.

Summary of Valuation Results

RATIO OF ACTIVES TO RETIREES AND BENEFICIARIES

A young plan with many active members and few retirees will have a high ratio of active to retirees. A mature open plan may have close to the same number of actives to retirees resulting in a ratio near 1.0. A super-mature or closed plan may have significantly more retirees than actives resulting in a ratio below 1.0.

RATIO OF NET CASH FLOW TO MARKET VALUE OF ASSETS

A positive net cash flow means contributions exceed benefits and expenses. A negative cash flow means existing funds are being used to make payments. A certain amount of negative net cash flow is generally expected to occur when benefits are prefunded through a qualified trust. Large negative net cash flows as a percent of assets may indicate a super-mature plan or a need for additional contributions.

DURATION OF ACTUARIAL ACCRUED LIABILITY

The modified duration (as opposed to the McCaulay duration) may be used to approximate the sensitivity of the accrued liability to a small change in the assumed rate of return. For example, a modified duration of 10 indicates that the liability would change by approximately 10% if the assumed rate of return were changed by 1% (i.e. from 7.5% to 6.5%).

ADDITIONAL RISK ASSESSMENT

Additional risk assessment is outside the scope of the annual actuarial valuation. Additional assessment may include scenario tests, sensitivity tests, stochastic modeling, stress tests, and a comparison of the present value of accrued benefits at low-risk discount rates with the actuarial accrued liability.

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%
2018	$ 696,842	$ 680,395	$ 16,447	$ 205,077	97.6%	$ 189,738	27.2%	339.8%	331.8%

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	(17) 10-Year Trailing Average
2010			24.2%	19,323	9.1%	15.7%	N/A	N/A
2011			2.8%	18,320	6.5%	23.0%	N/A	N/A
2012			23.0%	17,531	5.7%	2.3%	2.3%	N/A
2013			8.8%	16,964	4.6%	14.2%	6.2%	N/A
2014	14.1%		-15.5%	17,031	3.8%	18.5%	14.5%	N/A
2015	14.1%	38.5%	4.1%	17,127	3.5%	4.4%	12.2%	N/A
2016	14.1%	37.9%	24.4%	16,845	3.3%	0.0%	7.6%	N/A
2017	14.1%	42.5%	13.7%	16,314	2.7%	15.1%	10.2%	6.2%
2018	14.1%	46.8%	8.0%	14,972	2.2%	10.3%	9.4%	7.8%

(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), (16) and (17). Investment return is probably the largest single risk that most systems face. The year by year return and the 5-year and 10-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, 2018**	**June 30, 2017**
Cash, equivalents, short term securities	$ 8,046	$ 15,461
Fixed income	$ 165,171	$ 116,764
Equity	$ 412,840	$ 390,993
SBI Alternative	$ 93,990	$ 79,019
Other	$ -	$ -
Total Assets in Trust	**$ 680,047**	**$ 602,237**
Assets Receivable	$ 846	$ 718
Amounts Payable	$ (498)	$ (495)
Net Assets Held in Trust for Pension Benefits	**$ 680,395**	**$ 602,460**

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, 2018**	**June 30, 2017**
1. Fund balance at market value at end of prior year	$ 602,460	$ 507,783
2. Adjustment to match reported value	$ -	$ -
3. Fund balance at market value at beginning of year	$ 602,460	$ 507,783
4. Contributions		
a. Member	$ 11,956	$ 11,666
b. Employer	$ 17,871	$ 17,489
c. Other sources	$ -	$ -
d. Total contributions	$ 29,827	$ 29,155
5. Investment income		
a. Investment income/(loss)	$ 63,662	$ 78,973
b. Investment expenses	$ (700)	$ (610)
c. Net subtotal	$ 62,962	$ 78,363
6. Other	$ 1	$ -
7. Total income: *(4.d.) + (5.c.) + (6.)*	**$ 92,790**	**$ 107,518**
8. Benefits Paid		
a. Annuity benefits	$ (13,183)	$ (11,033)
b. Refunds	$ (1,364)	$ (1,478)
c. Total benefits paid	$ (14,547)	$ (12,511)
9. Expenses		
a. Other	$ -	$ -
b. Administrative	$ (308)	$ (330)
c. Total expenses	$ (308)	$ (330)
10. Total disbursements: *(8.c.) + (9.c.)*	**$ (14,855)**	**$ (12,841)**
11. Fund balance at market value at end of year	**$ 680,395**	**$ 602,460**
12. Approximate return on market value of assets	10.3%	15.1%

Plan Assets

Actuarial Asset Value *(Dollars in Thousands)*

		June 30, 2018	June 30, 2017
1. Market value of assets available for benefits		$ 680,395	$ 602,460
2. Determination of average balance			
a. Total assets available at beginning of year		$ 602,460	$ 507,783
b. Total assets available at end of year		$ 680,395	$ 602,460
c. Net investment income for fiscal year		$ 62,962	$ 78,363
d. Average balance *[a. + b. - c.] / 2*		$ 609,946	$ 515,940
3. Expected return *[8.0% * 2.d.]*		$ 48,796	$ 41,275
4. Actual return		$ 62,962	$ 78,363
5. Current year asset gain/(loss) *[4. - 3.]*		$ 14,166	$ 37,088
6. Unrecognized asset returns			
	Original Amount	**Unrecognized Amount**	
a. Year ended June 30, 2018	$ 14,166	$ 11,333	N/A
b. Year ended June 30, 2017	$ 37,088	$ 22,253	$ 29,670
c. Year ended June 30, 2016	$ (39,723)	$ (15,889)	$ (23,834)
d. Year ended June 30, 2015	$ (16,571)	$ (3,314)	$ (6,628)
e. Year ended June 30, 2014	$ 39,430	N/A	$ 7,886
f. Unrecognized return adjustment		$ 14,383	$ 7,094
7. **Actuarial value at end of year** *(1. - 6.f.)*		**$ 666,012**	**$ 595,366**
8. Approximate return on actuarial value of assets during fiscal year		9.2%	9.1%
9. Ratio of actuarial value of assets to market value of assets		0.98	0.99

Membership Data

Distribution of Active Members

Age	Years of Service as of June 30, 2018 <3*	3 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35+	Total
< 25	346	13								**359**
Avg. Earnings	$ 29,424	$ 49,624								**$ 30,156**
25 - 29	561	145	36							**742**
Avg. Earnings	$ 36,937	$ 47,963	$ 52,914							**$ 39,866**
30 - 34	259	132	144	52	1					**588**
Avg. Earnings	$ 37,858	$ 53,629	$ 56,478	$ 65,193	$ 55,328					**$ 48,406**
35 - 39	148	81	101	170	26					**526**
Avg. Earnings	$ 36,143	$ 50,084	$ 54,933	$ 65,689	$ 67,416					**$ 52,993**
40 - 44	115	47	71	100	123					**456**
Avg. Earnings	$ 37,126	$ 55,251	$ 57,962	$ 69,304	$ 68,755					**$ 57,826**
45 - 49	72	28	54	100	212					**466**
Avg. Earnings	$ 39,888	$ 48,476	$ 57,630	$ 69,095	$ 73,068					**$ 63,822**
50 - 54	62	24	37	72	197					**392**
Avg. Earnings	$ 33,401	$ 46,891	$ 62,615	$ 68,075	$ 76,389					**$ 64,957**
55 - 59	34	7	28	47	157					**273**
Avg. Earnings	$ 35,914	$ 34,664	$ 50,989	$ 64,848	$ 73,747					**$ 64,167**
60 - 64	14	4	9	30	91					**148**
Avg. Earnings	$ 26,949	$ 42,424	$ 49,019	$ 64,560	$ 71,377					**$ 63,650**
65 - 69	2		1	8	11					**22**
Avg. Earnings	$ 14,043		$ 60,727	$ 50,473	$ 66,576					**$ 55,679**
70+	2	1	1	3	2					**9**
Avg. Earnings	$ 3,534	$ 23,850	$ 4,003	$ 47,077	$ 80,029					**$ 37,356**
Total	**1,615**	**482**	**482**	**582**	**820**					**3,981**
Avg. Earnings	**$ 35,234**	**$ 50,314**	**$ 56,149**	**$ 66,715**	**$ 72,890**					**$ 51,951**

* *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

Age	Years Retired as of June 30, 2018							
	<1	1 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25+	Total
<50								
Avg. Benefit								
50 - 54	6	25						**31**
Avg. Benefit	$ 12,274	$ 11,494						**$ 11,645**
55 - 59	40	89	13					**142**
Avg. Benefit	$ 17,248	$ 11,899	$ 8,986					**$ 13,139**
60 - 64	40	112	80	8				**240**
Avg. Benefit	$ 16,399	$ 13,810	$ 10,533	$ 6,161				**$ 12,894**
65 - 69	19	110	117	32				**278**
Avg. Benefit	$ 16,094	$ 13,677	$ 10,451	$ 5,896				**$ 11,588**
70 - 74	3	20	73	53	14			**163**
Avg. Benefit	$ 6,904	$ 12,208	$ 9,372	$ 5,873	$ 2,789			**$ 7,972**
75 - 79		1	14	31	20			**66**
Avg. Benefit		$ 5,622	$ 6,651	$ 5,144	$ 1,909			**$ 4,491**
80 - 84			2	6	11			**19**
Avg. Benefit			$ 3,207	$ 3,478	$ 1,061			**$ 2,050**
85 - 89					3			**3**
Avg. Benefit					$ 1,360			**$ 1,360**
90+								
Avg. Benefit								
Total	**108**	**357**	**299**	**130**	**48**			**942**
Avg. Benefit	**$ 16,167**	**$ 13,017**	**$ 9,919**	**$ 5,612**	**$ 1,937**			**$ 10,809**

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, 2018							
	<1	1 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25+	Total
<45	1	5	1	2				**9**
Avg. Benefit	$ 10,037	$ 9,640	$ 4,771	$ 5,172				**$ 8,150**
45 - 49		1	2					**3**
Avg. Benefit		$ 6,531	$ 9,957					**$ 8,815**
50 - 54	1	2	3					**6**
Avg. Benefit	$ 12,415	$ 6,326	$ 15,658					**$ 12,007**
55 - 59		6	2	1				**9**
Avg. Benefit		$ 14,993	$ 16,370	$ 2,524				**$ 13,914**
60 - 64	2	5	3		2			**12**
Avg. Benefit	$ 12,056	$ 8,828	$ 6,676		$ 1,231			**$ 7,562**
65 - 69	1	4	2	3				**10**
Avg. Benefit	$ 19,352	$ 9,532	$ 8,164	$ 7,331				**$ 9,580**
70 - 74		3	2	1	2			**8**
Avg. Benefit		$ 1,712	$ 8,105	$ 7,833	$ 16,151			**$ 7,685**
75 - 79		1	1	1				**3**
Avg. Benefit		$ 1,256	$ 2,366	$ 560				**$ 1,394**
80 - 84		1						**1**
Avg. Benefit		$ 1,078						**$ 1,078**
85 - 89								
Avg. Benefit								
90+								
Avg. Benefit								
Total	**5**	**28**	**16**	**8**	**4**			**61**
Avg. Benefit	**$ 13,183**	**$ 8,824**	**$ 9,958**	**$ 5,407**	**$ 8,691**			**$ 9,022**

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

Age	Years Disabled as of June 30, 2018 *							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
< 45	2	4	10	2				**18**
Avg. Benefit	$ 29,783	$ 16,547	$ 13,420	$ 10,678				**$ 15,628**
45 - 49		6	3	2				**11**
Avg. Benefit		$ 21,504	$ 16,468	$ 18,122				**$ 19,516**
50 - 54	3	9	10	5	1			**28**
Avg. Benefit	$ 25,793	$ 18,975	$ 18,352	$ 23,791	$ 27,744			**$ 20,656**
55 - 59	3	8	11	9	4			**35**
Avg. Benefit	$ 19,259	$ 21,183	$ 12,918	$ 17,653	$ 30,097			**$ 18,532**
60 - 64		7	12	10	7			**36**
Avg. Benefit		$ 13,961	$ 18,227	$ 17,347	$ 19,366			**$ 17,375**
65 - 69	7	25	1	1	1			**35**
Avg. Benefit	$ 13,997	$ 17,963	$ 2,748	$ 24,071	$ 7,717			**$ 16,617**
70 - 74		7	13					**20**
Avg. Benefit		$ 24,348	$ 19,101					**$ 20,938**
75+			1	6				**7**
Avg. Benefit			$ 8,572	$ 16,361				**$ 15,248**
Total	**15**	**66**	**61**	**35**	**13**			**190**
Avg. Benefit	**$ 19,514**	**$ 18,980**	**$ 16,190**	**$ 18,033**	**$ 22,416**			**$ 18,187**

** 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 7/1/2017	**3,842**	**2,933**	**2,624**	**853**	**178**	**54**	**10,484**
New members	724	-	-	-	-	-	**724**
Return to active	49	(16)	(33)	-	-	-	**-**
Terminated non-vested	(317)	-	317	-	-	-	**-**
Service retirements	(69)	(35)	-	104	-	-	**-**
Terminated deferred	(171)	171	-	-	-	-	**-**
Terminated refund/transfer	(61)	(34)	(49)	-	-	-	**(144)**
Deaths	(7)	(2)	(3)	(15)	(4)	-	**(31)**
New beneficiary	-	-	-	-	-	8	**8**
Disabled	(9)	-	-	-	9	-	**-**
Data correction	-	148	(45)	-	7	(1)	**109**
Net change	139	232	187	89	12	7	**666**
Members on 6/30/2018	**3,981**	**3,165**	**2,811**	**942**	**190**	**61**	**11,150**

Terminated Member Statistics	**Deferred Retirement**	**Other Non-Vested**	**Total**
Number	3,165	2,811	5,976
Average age	42.5	37.8	40.3
Average service	3.7	1.0	2.4
Average annual benefit, with augmentation to December 31, 2018 and 35% Combined Service Annuity (CSA) load	$ 5,866	N/A	$ 5,866
Average refund value, with 35% CSA load (1% CSA load for Non-Vested)	$ 11,662	$ 1,440	$ 6,854

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, 2018
A. Actuarial Value of Assets			$ 666,012
B. Expected Future Assets			
1. Present value of expected future statutory supplemental contributions*			$ 18,226
2. Present value of future normal cost contributions			$ 234,563
3. Total expected future assets: *(1.) + (2.)*			$ 252,789
C. Total Current and Expected Future Assets: *(A.+ B.3)*			$ 918,801
D. Current Benefit Obligations**			
1. Benefit recipients	**Non-Vested**	**Vested**	**Total**
a. Service retirements	$ -	$ 134,553	$ 134,553
b. Disability retirements	$ -	$ 48,887	$ 48,887
c. Survivors	$ -	$ 6,298	$ 6,298
2. Deferred retirements with augmentation	$ -	$ 134,822	$ 134,822
3. Former members without vested rights	$ 1,779	$ -	$ 1,779
4. Active members	$ 23,691	$ 295,663	$ 319,354
5. Total Current Benefit Obligations	$ 25,470	$ 620,223	$ 645,693
E. Expected Future Benefit Obligations			$ 285,712
F. Total Current and Expected Future Benefit Obligations***			$ 931,405
G. Unfunded Current Benefit Obligations: *(D.5.) - (A.)*			$ (20,319)
H. Unfunded Current and Future Benefit Obligations: *(F.) - (C.)*			$ 12,604
I. Accrued Benefit Funding Ratio: *(A.)/(D.)*			103.15%
J. Projected Benefit Funding Ratio: *(C.)/(F.)*			98.65%

* *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	$ 462,337	$ 140,611	$ 321,726
b. Disability benefits	$ 76,620	$ 42,006	$ 34,614
c. Survivor's benefits	$ 10,184	$ 3,536	$ 6,648
d. Deferred retirements	$ 52,732	$ 39,623	$ 13,109
e. Refunds*	$ 3,193	$ 8,787	$ (5,594)
f. Total	$ 605,066	$ 234,563	$ 370,503
2. Deferred retirements with future augmentation	$ 134,822	$ -	$ 134,822
3. Former members without vested rights	$ 1,779	$ -	$ 1,779
4. Annuitants	$ 189,738	$ -	$ 189,738
5. Total	$ 931,405	$ 234,563	$ 696,842
B. Determination of Unfunded Actuarial Accrued Liability (UAAL)			
1. Actuarial accrued liability			$ 696,842
2. Current assets (AVA)			$ 666,012
3. Unfunded actuarial accrued liability			$ 30,830
C. Determination of Supplemental Contribution Rate**			
1. Present value of future payrolls through the amortization date of June 30, 2048			$ 3,719,643
2. Supplemental contribution rate: *(B.3.) / (C.1.)*			0.83% ***

* *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, 2018 17.07786.*

Development of Costs

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

	Year Ending June 30, 2018		
	Actuarial Accrued Liability	Current Assets	Unfunded Actuarial Accrued Liability
A. At beginning of year	$ 629,870	$ 595,366	$ 34,504
B. Changes due to interest requirements and current rate of funding			
1. Normal cost, including expenses	$ 28,939	$ -	$ 28,939
2. Benefit payments	$ (14,547)	$ (14,547)	$ -
3. Contributions	$ -	$ 29,827	$ (29,827)
4. Interest on A., B.1., B.2. and B.3.	$ 50,965	$ 48,240	$ 2,725
5. Total *(B.1. + B.2. + B.3. + B.4.)*	$ 65,357	$ 63,520	$ 1,837
C. Expected unfunded actuarial accrued liability at end of year *(A. + B.5.)*			$ 36,341
D. Increase (decrease) due to actuarial losses (gains) because of experience deviations from expected			
1. Age and Service Retirements			$ (73)
2. Disability Retirements			$ (1,272)
3. Death-in-Service Benefits			$ (367)
4. Withdrawals			$ (1,791)
5. Salary increases			$ (1,094)
6. Investment income			$ (7,126)
7. Mortality of annuitants			$ (810)
8. Other items			$ 3,496
9. Total			$ (9,037)
E. Unfunded actuarial accrued liability at end of year before Plan amendments and changes in actuarial assumptions *(C. + D.9.)*			$ 27,304
F. Change in unfunded actuarial accrued liability due to changes in Plan provisions			$ (41,459)
G. Change in unfunded actuarial accrued liability due to changes in actuarial assumptions			$ 44,985
H. Change in unfunded actuarial accrued liability due to changes in methodology			$ -
I. Unfunded actuarial accrued liability at end of year *(E. + F. + G. + H.)**			$ 30,830

** The unfunded actuarial accrued liability on a market value of assets basis is $16,447.*

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%	$ 12,698
2. Employer contributions	8.75%	$ 19,058
3. Total	14.58%	$ 31,756
B. Required contributions - Chapter 356		
1. Normal cost		
a. Retirement benefits	8.50%	$ 18,514
b. Disability benefits	2.67%	$ 5,815
c. Survivors	0.21%	$ 457
d. Deferred retirement benefits	2.07%	$ 4,509
e. Refunds*	0.49%	$ 1,067
f. Total	13.94%	$ 30,362
Unfunded Actuarial Accrued Liability by June 30, 2048	0.83%	$ 1,808
3. Allowance for expenses	0.15%	$ 327
4. Total	14.92% **	$ 32,497
C. Contribution Sufficiency/(Deficiency) *(A.3. - B.4.)*	(0.34%)	$ (741)

Note: Projected annual payroll for fiscal year beginning on the valuation date: $217,805 (determined according to requirements of the LCPR Standards for Actuarial Work).

** Includes non-vested refunds and non-married survivor benefits only.*
*** The required contribution on a market value of assets basis is 14.53% 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

Benefit increases after retirement will equal 100% of the Social Security Cost of Living Adjustment, not less than 1.0% and not more than 2.5%, beginning January 1, 2019; if the funding status declines to 85% for two consecutive years or 80% for one year, the maximum increase will be lowered to 1.5%. Stochastic modeling was used to determine the assumption that benefit increases will equal 2.00% per year. This is only an assumption; actual increases will depend on actual experience.

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, 2048 assuming payroll increases of 3.25% 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 may be extended.

As required by the Standards for Actuarial Work, projected payroll is 1) determined by increasing reported payroll for each member by one full year's assumed pay increase according to the actuarial salary scale and 2) multiplied by 0.962 in the determination of the present value of future payroll to account for timing differences.

Changes in Methods since Prior Valuation
The amortization period was reset to 30 years, ending in 2048.

Stochastic modeling was used to determine the assumption that benefit increases will equal 2.00% per year, beginning January 1, 2019.

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	7.50% per annum.
Benefit increases after retirement	2.00% 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	2.50% per year.
Payroll growth	3.25% per year.
Mortality rates	
Healthy pre-retirement	RP-2014 employee generational mortality table projected with mortality improvement scale MP-2017, from a base year of 2006.
Healthy post-retirement	RP-2014 annuitant generational mortality table projected with mortality improvement scale MP-2017 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-2017 from a base year of 2006. Male rates are adjusted by a factor of 0.96.
Notes	The RP-2014 employee mortality table as published by the Society of Actuaries (SOA) contains mortality rates for ages 18 to 80 and the annuitant mortality table contains mortality rates for ages 50 to 120. We have extended the annuitant mortality table as needed for members younger than age 50 who are receiving a benefit by deriving rates based on the employee table and the juvenile table. Similarly, we have extended the employee table as needed for members older than age 80 by deriving rates based on the annuitant table.
Retirement	Members retiring from active status are assumed to retire according to the age related rates shown in the rate table. Members who have attained the highest assumed retirement age are assumed to retire in one year. Note that plan changes reflected in this report may ultimately result in behavior changes that are not anticipated in the current retirement rates.
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 are assumed to take the larger of contributions accumulated with interest or the value of the 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, based on average results for applicable members, were applied: <u>Data for active members:</u> There were 111 members reported with a salary less than $100. We used prior year salary (80 members), if available; otherwise high five salary with a 10% load to account for salary increases (31 members). If neither prior year salary or high five salary was available, we assumed a value of $35,000. There were also 33 members reported without a gender and no members 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 (28 members), we used elapsed time from hire date to termination date (17 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 5 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 3 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 2018 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 61 retirees as disabled retirees in this valuation.

Actuarial Basis

Summary of Actuarial Assumptions (Continued)

Changes in actuarial assumptions	The assumed investment return was lowered from 8.0% to 7.5%. The assumed rate of inflation decreased from 2.75% to 2.50%. The assumed payroll growth rate decreased from 3.50% to 3.25%. Salary increase rates were reduced by 0.25% at each year of service. The mortality projection scale was changed from MP-2016 to MP-2017. The assumed post-retirement benefit increase was changed from 2.50% per year to 2.00% per year.

Actuarial Basis

Summary of Actuarial Assumptions (Continued)

	Percentage of Members Dying Each Year*					
	Healthy Post-Retirement Mortality		Healthy Pre-Retirement Mortality		Disability Mortality	
Age in 2018	Male	Female	Male	Female	Male	Female
20	0.04%	0.02%	0.04%	0.02%	0.04%	0.02%
25	0.06	0.03	0.05	0.02	0.06	0.03
30	0.09	0.07	0.05	0.02	0.09	0.07
35	0.13	0.12	0.06	0.03	0.13	0.12
40	0.19	0.17	0.07	0.05	0.19	0.17
45	0.27	0.22	0.10	0.07	0.27	0.22
50	0.39	0.27	0.17	0.11	0.39	0.27
55	0.56	0.38	0.28	0.18	0.56	0.38
60	0.78	0.58	0.49	0.27	0.78	0.58
65	1.12	0.85	0.88	0.39	1.12	0.85
70	1.67	1.31	1.43	0.64	1.67	1.31
75	2.66	2.16	2.39	1.11	2.66	2.16
80	4.49	3.69	4.06	1.95	4.49	3.69
85	7.87	6.60	7.99	5.15	7.87	6.60
90	13.83	11.75	14.57	11.33	13.83	11.75

* *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		Rates of 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	8.50%
25	7.25
30	6.25
35	5.75
40	5.25
45	4.50
50	4.50
55	4.25
60	3.75
65	3.50
70+	3.50

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: <u>Member</u> 5.83% <u>Employer</u> 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 <u>Normal retirement benefit</u>	
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, adjusted for partial vesting if applicable.

Summary of Plan Provisions (Continued)

Retirement (Concluded)	
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). Augmentation adjustment is phased out over a five-year period starting July 1, 2019, resulting in no augmentation adjustment after June 30, 2024.
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 increases after retirement will equal 100% of the Social Security Cost of Living Adjustment, not less than 1.0% and not more than 2.5%, beginning January 1, 2019. If the funding status declines to 85% for two consecutive years or 80% for one year, the maximum increase will be lowered to 1.5%. 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.

Summary of Plan Provisions (Continued)

Disability (Concluded)	
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.

Summary of Plan Provisions (Continued)

Death (Concluded)	
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.
Amount	If no survivor benefits are paid, the member's contributions with 6.00% interest until June 30, 2011; 4.00% to June 30, 2018; 3.00% 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	Member's contributions with 6.00% interest through June 30, 2011, compounded daily. Beginning July 1, 2011, a member's contributions increase at 4.00% interest compounded daily. Beginning July 1, 2018, a member's contributions increase at 3.00% interest compounded daily. If a member is vested, a deferred annuity may be elected in lieu of a refund.
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, 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; (c.) 1.00% from January 1, 2012 through December 31, 2018; and (d.) 0.00% thereafter. If a member terminates employment after 2011, they are not eligible for augmentation.
Form of payment	Same as for retirement.
Actuarial equivalent factors	Effective July 1, 2019, actuarially equivalent factors based on the RP-2014 mortality table for healthy annuitants for a member turning age 55 in 2021, reflecting projected mortality improvements using Scale MP-2017, male rates multiplied by 0.96, blended 65% males, 4.88% post-retirement interest, and 7.5% pre-retirement interest. Reflecting statutory requirements, joint and survivor factors are based on an interest assumption of 6.50%.

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 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	The augmentation adjustment in early retirement factors is eliminated over a five-year period starting July 1, 2019, resulting in actuarial equivalence after June 30, 2024. Post-retirement benefit increases were changed from 2.5% per year with a provision to reduce to 1.0% if the funding status declines to a certain level, to 100% of the Social Security Cost of Living Adjustment, not less than 1.0% and not more than 2.5%, beginning January 1, 2019. If the funding status declines to 85% for two consecutive years or 80% for one year, the maximum increase will be lowered to 1.5%. Deferred augmentation was changed to 0.0%, effective January 1, 2019. Augmentation that has already accrued for deferred members will still apply. Interest credited on member contributions decreased from 4.0% to 3.0%, beginning July 1, 2018. Actuarial equivalent factors were updated to reflect revised mortality and interest assumptions.

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
7-1-2018	$ 666,012	$ 696,842	$ 30,830	95.58	$ 205,077 [2]	15.03

[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	$ 205,077 [3]	$ 11,956	$ 19,031	$ 17,871	93.90
2019	14.92					

[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, 2018

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November 28, 2018

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, 2018 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 and only with permission of the Board. 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, 2018 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.

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 a 2018 analysis of long-term rate of investment return and inflation assumptions, GRS suggested that an investment return assumption in the range of 6.64% to 7.56% would be reasonable. Please see our letter dated October 3, 2018 for additional information. The current assumed rate, which is mandated by Minnesota Statutes, is 7.50% and is at the upper end of the reasonable range. This report also concluded that the probability of exceeding the current 7.50% assumption over 20 years is only 39%. If capital market assumptions decline further from present levels, the 7.5% return assumption might not comply with actuarial standards for the July 1, 2019 valuation. For informational purposes, results based on a 6.5% assumption 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 5 – 8, 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.

The valuation assumed the continuing ability of the plan sponsor to make the contributions necessary to fund this plan. A determination regarding whether or not the plan sponsor is actually able to do so is outside our scope of expertise and was not performed.

The findings in this report are based on data and other information through June 30, 2018. 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, 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 7.50%), it is expected that:

(1) The normal cost of the plan is expected to remain approximately level as a percent of pay,
(2) The funded status of the plan is expected to gradually improve and is expected to be 100% funded within the next 30 years, and
(3) The unfunded liability will grow initially as a dollar amount before beginning to decline.

Limitations of Funded Status Measurements

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

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

Limitations of Project Scope

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

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, 2018	Actuarial Valuation as of July 1, 2017
Statutory Contributions - Chapter 353 (% of Payroll)	30.51%	29.36%
Required Contributions - Chapter 356 (% of Payroll)	28.20%	30.58%
Sufficiency / (Deficiency)	2.31%	(1.22)%

The statutory contribution sufficiency/(deficiency) improved from a deficiency of (1.22)% of payroll to a sufficiency of 2.31% of payroll. The improvement is primarily due to the changes in plan provisions, assumptions, and contributions described on page three.

The contribution sufficiency referenced above is based on current snapshot of statutory contributions for the fiscal year ending June 30, 2019. Additional member and employer contribution increases will be phased in over the next two years, and state contributions will increase from $4.5 million to $9.0 million beginning July 1, 2020. Ultimately, the statutory contribution rate (and the contribution sufficiency) is projected to increase by an additional 2.30% of payroll.

Based on the actuarial value of assets, scheduled contribution rates, and actuarial assumptions described in this report, statutory contributions are expected to bring the plan to full funding within the 30-year amortization period.

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 10.4% for the plan year ending June 30, 2018. The AVA earned approximately 9.4% for the plan year ending June 30, 2018 as compared to the assumed rate of 8.00%. The assumed rate is mandated by Minnesota Statutes, and was recently lowered to 7.50%.

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, 2018	**July 1, 2017**
Contributions (*% of Payroll*)		
Statutory - Chapter 353	30.51%	29.36%
Required - Chapter 356	28.20%	30.58%
Sufficiency / (Deficiency)	2.31%	(1.22)%
Funding Ratios (*dollars in thousands*)		
Assets		
- Current assets (AVA)	$ 8,320,094	$ 7,840,549
- Current assets (MVA)	$ 8,486,907	$ 7,918,879
Accrued Benefit Funding Ratio		
- Current benefit obligations	$ 9,264,585	$ 8,869,242
- Funding ratio (AVA)	89.81%	88.40%
- Funding ratio (MVA)	91.61%	89.28%
Accrued Liability Funding Ratio		
- Actuarial accrued liability	$ 9,552,804	$ 9,199,208
- Funding ratio (AVA)	87.10%	85.23%
- Funding ratio (MVA)	88.84%	86.08%
Projected Benefit Funding Ratio		
- Current and expected future assets	$ 11,843,018	$ 10,871,452
- Current and expected future benefit obligations	$ 11,449,145	$ 11,051,212
- Projected benefit funding ratio (AVA)	103.44%	98.37%
Participant Data		
Active members		
- Number	11,673	11,522
- Annual valuation earnings *(000s)* *	$ 953,124	$ 912,722
- Projected annual earnings *(000s)* *	$ 1,000,474	$ 960,210
- Average projected annual earnings *	$ 85,738	$ 83,373
- Average age	40.5	40.4
- Average service	12.5	12.4
Service retirements	7,534	7,408
Survivors	1,875	1,861
Disability retirements	1,347	1,310
Deferred retirements	1,580	1,506
Terminated other non-vested	1,188	1,134
Total	**25,197**	**24,741**

** These values exclude 4 members (5 in 2017) 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, 2018 :

- Post-retirement benefit increases were changed to 1.0% for all years, with no trigger.
- An end date of July 1, 2018 was added to the existing $9.0 million state contribution.
- New annual state aid will equal $4.5 million in fiscal years 2019 and 2020, and $9.0 million thereafter until the plan reaches 100% funding, or July 1, 2048, if earlier.
- Member and employer contributions were increased.
- Interest credited on member contributions was changed from 4.0% to 3.0%, beginning July 1, 2018.
- Deferred augmentation was changed to 0.0% effective January 1, 2019.
- Actuarial equivalent factors were updated to reflect revised mortality and interest assumptions
- The assumed investment return was lowered from 8.0% to 7.5%.
- The assumed rate of inflation was decreased from 2.75% to 2.50%.
- The assumed payroll growth rate was decreased from 3.50% to 3.25%.
- Salary increase rates were reduced by 0.25% at each year of service.
- The mortality projection scale was updated.
- The amortization date was changed from June 30, 2043 to June 30, 2048.

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 decrease the accrued liability by $58 million and decrease the required contribution by 1.7% of pay, as follows:

	Before Changes	Reflecting Plan Provision Changes	Reflecting Plan Provision and Assumption Changes	Reflecting Plan Provision, Assumption, and Amortization Changes
Normal Cost Rate, % of Pay	21.3%	19.2%	20.9%	20.9%
Amortization of Unfunded Accrued Liability, % of pay	8.5%	5.1%	8.0%	7.2%
Expenses (% of Pay)	0.1%	0.1%	0.1%	0.1%
Total Required Contribution, % of Pay	29.9%	24.4%	29.0%	28.2%
Accrued Liability Funding Ratio	86.6%	91.5%	87.1%	87.1%
Projected Benefit Funding Ratio	100.7%	108.6%	102.1%	103.4%
Unfunded Accrued Liability (in billions)	$1.3	$0.8	$1.2	$1.2

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 valuations. Per the LCPR's requirement, we have calculated the liabilities associated with the following scenarios:

1) 6.5% interest rate assumption
2) 8.5% interest rate assumption

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 8.5% interest rate assumption would not comply with Actuarial Standards of Practice.

$ in billions	**Final Valuation Assumptions**	**Final Valuation Assumptions with 6.5% Interest**	**Final Valuation Assumptions with 8.5% Interest**
Normal Cost Rate, % of Pay	20.9%	26.4%	16.6%
Amortization of Unfunded Accrued Liability, % of Pay	7.2%	12.8%	1.5%
Expenses (% of Pay)	0.1%	0.1%	0.1%
Total Required Contribution, % of Pay	28.2%	39.3%	18.2%
Contribution Sufficiency/(Deficiency), % of Pay	2.3 %	(8.8)%	12.3 %
Accrued Liability Funding Ratio	87.1%	77.2%	97.4%
Present Value of Projected Benefits	$11.4	$13.4	$10.0
Present Value of Future Normal Costs	$1.8	$2.6	$1.5
Actuarial Accrued Liability	$9.6	$10.8	$8.5
Unfunded Accrued Liability	$1.2	$2.5	$0.2

Summary of Valuation Results

Risks Associated with the Measuring the Accrued Liability and Actuarially Determined Contribution

The determination of the accrued liability and the actuarially determined contribution requires the use of assumptions regarding future economic and demographic experience. Risk measures, as illustrated in this report, are intended to aid in the understanding of the effects of future experience differing from the assumptions used in the course of the actuarial valuation. Risk measures may also help with illustrating the potential volatility in the accrued liability and the actuarially determined contribution that result from the differences between actual experience and the actuarial assumptions.

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 due to changing conditions; 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. The scope of an actuarial valuation does not include an analysis of the potential range of such future measurements.

Examples of risk that may reasonably be anticipated to significantly affect the plan's future financial condition include:

1. Investment risk – actual investment returns may differ from the expected returns;
2. Asset/Liability mismatch – changes in asset values may not match changes in liabilities, thereby altering the gap between the accrued liability and assets and consequently altering the funded status and contribution requirements;
3. Contribution risk – actual contributions may differ from expected future contributions. For example, actual contributions may not be made in accordance with the plan's funding policy or material changes may occur in the anticipated number of covered employees, covered payroll, or other relevant contribution base;
4. Salary and Payroll risk – actual salaries and total payroll may differ from expected, resulting in actual future accrued liability and contributions differing from expected;
5. Longevity risk – members may live longer or shorter than expected and receive pensions for a period of time other than assumed;
6. Other demographic risks – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future accrued liability and contributions differing from expected.

The effects of certain trends in experience can generally be anticipated. For example if the investment return since the most recent actuarial valuation is less (or more) than the assumed rate, the cost of the plan can be expected to increase (or decrease). Likewise if longevity is improving (or worsening), increases (or decreases) in cost can be anticipated.

Summary of Valuation Results

The Required Contribution rate shown on page 1 may be considered as a minimum contribution rate that complies with Minnesota Statutes and the requirements of the Standards for Actuarial Work published by the LCPR. The timely receipt of the actuarially determined contributions is critical to support the financial health of the plan. Users of this report should be aware that contributions made at the actuarially determined rate do not necessarily guarantee benefit security.

PLAN MATURITY MEASURES

Risks facing a pension plan evolve over time. A young plan with virtually no investments and paying few benefits may experience little investment risk. An older plan with a large number of members in pay status and a significant trust may be much more exposed to investment risk. Generally accepted plan maturity measures include the following. Additional maturity measures are shown on the following page.

	2018	2017
Ratio of market value of assets to total payroll	8.69	8.39
Ratio of actuarial accrued liability to total payroll	9.78	9.74
Ratio of actives to retirees and beneficiaries	1.09	1.09
Ratio of net cash flow to market value of assets	-2.9%	-3.0%
Approximate modified duration* of:		
▪ Total projected benefits:	14.96	15.52
▪ Actuarial accrued liability:	11.66	12.10

* *Approximate modified duration of total projected benefits based on 7.5% interest for 2018 and 8.0% interest for 2017*

RATIO OF MARKET VALUE OF ASSETS TO PAYROLL

The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. For example, if the market value of assets is 5.0 times the payroll, a return on assets 5% different than assumed would equal 25% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in plan sponsor contributions as a percentage of payroll.

RATIO OF ACTUARIAL ACCRUED LIABILITY TO PAYROLL

The relationship between actuarial accrued liability and payroll is a useful indicator of the potential volatility of contributions for a fully funded plan. A funding policy that targets a funded ratio of 100% is expected to result in the ratio of assets to payroll and the ratio of liability to payroll converging over time.

The ratio of liability to payroll may also be used as a measure of sensitivity of contribution rates to liability gains and losses. For example, if the actuarial accrued liability is 5.0 times the payroll, a change in liability 2% other than assumed would equal 10% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in liability (and also plan sponsor contributions) as a percentage of payroll.

Summary of Valuation Results

RATIO OF ACTIVES TO RETIREES AND BENEFICIARIES

A young plan with many active members and few retirees will have a high ratio of active to retirees. A mature open plan may have close to the same number of actives to retirees resulting in a ratio near 1.0. A super-mature or closed plan may have significantly more retirees than actives resulting in a ratio below 1.0.

RATIO OF NET CASH FLOW TO MARKET VALUE OF ASSETS

A positive net cash flow means contributions exceed benefits and expenses. A negative cash flow means existing funds are being used to make payments. A certain amount of negative net cash flow is generally expected to occur when benefits are prefunded through a qualified trust. Large negative net cash flows as a percent of assets may indicate a super-mature plan or a need for additional contributions.

DURATION OF ACTUARIAL ACCRUED LIABILITY

The modified duration (as opposed to the McCaulay duration) may be used to approximate the sensitivity of the accrued liability to a small change in the assumed rate of return. For example, a modified duration of 10 indicates that the liability would change by approximately 10% if the assumed rate of return were changed by 1% (i.e. from 7.5% to 6.5%).

ADDITIONAL RISK ASSESSMENT

Additional risk assessment is outside the scope of the annual actuarial valuation. Additional assessment may include scenario tests, sensitivity tests, stochastic modeling, stress tests, and a comparison of the present value of accrued benefits at low-risk discount rates with the actuarial accrued liability.

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%
2018	$ 9,552,804	$ 8,486,907	$ 1,065,897	$ 976,657	88.8%	$ 5,780,590	60.5%	978.1%	869.0%

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	(17) 10-Year Trailing Average
2010			204.0%	$ (149,485)	-3.4%	15.7%	N/A	N/A
2011			134.9%	$ (161,687)	-3.0%	23.0%	N/A	N/A
2012			205.3%	$ (190,432)	-3.3%	2.3%	2.3%	N/A
2013			120.2%	$ (230,072)	-3.6%	14.2%	6.2%	N/A
2014			107.1%	$ (232,048)	-3.2%	18.5%	14.5%	N/A
2015	14.1%	122.6%	131.6%	$ (242,036)	-3.3%	4.4%	12.2%	N/A
2016	14.1%	113.6%	149.7%	$ (241,668)	-3.4%	-0.1%	7.6%	N/A
2017	14.1%	118.2%	135.6%	$ (238,177)	-3.0%	15.2%	10.2%	6.2%
2018	14.1%	122.5%	109.1%	$ (245,996)	-2.9%	10.4%	9.5%	7.8%

(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), (16) and (17) Investment return is probably the largest single risk that most systems face. The year by year return and the 5-year and 10-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, 2018**	**June 30, 2017**
Cash, equivalents, short term securities	$ 90,015	$ 190,809
Fixed income	$ 2,060,635	$ 1,535,288
Equity	$ 5,150,491	$ 5,141,012
SBI alternative	$ 1,172,591	$ 1,038,994
Other	$ -	$ -
Total Assets in Trust	**$ 8,473,732**	**$ 7,906,103**
Assets receivable	$ 18,731 *	$ 18,348 *
Amounts payable	$ (5,556)	$ (5,572)
Net Assets Held in Trust for Pension Benefits	**$ 8,486,907**	**$ 7,918,879**

* *Includes $13.648 million contribution receivable from Minneapolis to be paid by July 15.*

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, 2018**	**June 30, 2017**
1.	Fund balance at market value at beginning of year	**$ 7,918,879**	**$ 7,098,090**
2.	Contributions		
	a. Member	$ 105,479	$ 101,984
	b. Employer	$ 170,781 *	$ 166,329 *
	c. Other sources (State contribution)	$ 9,000	$ 9,000
	d. Total contributions	$ 285,260	$ 277,313
3.	Investment income		
	a. Investment income/(loss)	$ 822,887	$ 1,067,162
	b. Investment expenses	$ (8,921)	$ (8,220)
	c. Net subtotal	$ 813,966	$ 1,058,942
4.	Other	$ 58	$ 24
5.	**Total income:** *(2.d.) + (3.c.) + (4.)*	**$ 1,099,284**	**$ 1,336,279**
6.	Benefits Paid		
	a. Annuity benefits	$ (528,468)	$ (512,379)
	b. Refunds	$ (1,902)	$ (2,119)
	c. Total benefits paid	$ (530,370)	$ (514,498)
7.	Expenses		
	a. Other	$ -	$ -
	b. Administrative	$ (886)	$ (992)
	c. Total expenses	$ (886)	$ (992)
8.	**Total disbursements:** *(6.c.) + (7.c.)*	**$ (531,256)**	**$ (515,490)**
9.	**Fund balance at market value at end of year**	**$ 8,486,907**	**$ 7,918,879**
10.	Approximate return on market value of assets	10.4%	15.2%

* *Includes $13.648 million contribution receivable from Minneapolis to be paid by July 15.*

Plan Assets

Actuarial Asset Value *(Dollars in Thousands)*

			June 30, 2018	June 30, 2017
1. Market value of assets available for benefits			**$ 8,486,907**	**$ 7,918,879**
2. Determination of average balance				
a. Total assets available at beginning of year			$ 7,918,879	$ 7,098,090
b. Total assets available at end of year			$ 8,486,907	$ 7,918,879
c. Net investment income for fiscal year			$ 813,966	$ 1,058,942
d. Average balance *[a. + b. - c.] / 2*			$ 7,795,910	$ 6,979,014
3. Expected return *[8.0% * 2.d.]*			$ 623,673	$ 558,321
4. Actual return			$ 813,966	$ 1,058,942
5. Current year asset gain/(loss) *[4. - 3.]*			$ 190,293	$ 500,621
6. Unrecognized asset returns				
	Original Amount		**Unrecognized Amount**	
a. Year ended June 30, 2018	$ 190,293		$ 152,235	N/A
b. Year ended June 30, 2017	$ 500,621		$ 300,372	$ 400,497
c. Year ended June 30, 2016	$ (587,179)		$ (234,871)	$ (352,307)
d. Year ended June 30, 2015	$ (254,614)		$ (50,923)	$ (101,846)
e. Year ended June 30, 2014	$ 659,930		N/A	$ 131,986
f. Unrecognized return adjustment			$ 166,813	$ 78,330
7. **Actuarial value at end of year** *(1. - 6.f.)*			**$ 8,320,094**	**$ 7,840,549**
8. Approximate return on actuarial value of assets during fiscal year			9.4%	9.5%
9. Ratio of actuarial value of assets to market value of assets			0.98	0.99

Membership Data

Distribution of Active Members**

	Years of Service as of June 30, 2018									
Age	**<3***	**3 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25 - 29**	**30 - 34**	**35+**	**Total**
< 25	320	14								**334**
Avg. Earnings	$ 46,426	$ 67,210								**$ 47,297**
25 - 29	785	401	145							**1,331**
Avg. Earnings	$ 55,926	$ 71,219	$ 73,391							**$ 62,436**
30 - 34	438	361	705	281						**1,785**
Avg. Earnings	$ 54,965	$ 71,828	$ 77,866	$ 81,977						**$ 71,673**
35 - 39	227	223	449	949	190					**2,038**
Avg. Earnings	$ 54,293	$ 70,862	$ 79,502	$ 85,531	$ 87,210					**$ 79,275**
40 - 44	88	91	189	528	803	164				**1,863**
Avg. Earnings	$ 53,093	$ 71,189	$ 77,131	$ 85,102	$ 91,232	$ 94,918				**$ 85,608**
45 - 49	46	63	130	293	617	850	104			**2,103**
Avg. Earnings	$ 58,392	$ 68,307	$ 73,145	$ 84,030	$ 91,713	$ 97,497	$ 100,558			**$ 90,840**
50 - 54	26	22	47	124	286	495	448	111		**1,559**
Avg. Earnings	$ 68,269	$ 78,838	$ 80,954	$ 85,133	$ 91,812	$ 100,393	$ 103,322	$ 108,058		**$ 97,567**
55 - 59	14	10	20	44	97	143	107	74	8	**517**
Avg. Earnings	$ 38,972	$ 61,319	$ 75,650	$ 90,848	$ 90,809	$ 95,989	$ 105,583	$ 107,244	$ 104,909	**$ 95,313**
60 - 64	3	3	7	12	21	26	23	14	8	**117**
Avg. Earnings	$ 43,220	$ 65,443	$ 62,057	$ 70,067	$ 90,648	$ 91,749	$ 106,884	$ 121,052	$ 122,251	**$ 94,200**
65 - 69	1		4	2	6	2	1	2	3	**21**
Avg. Earnings	$ 17,470		$ 24,306	$ 98,181	$ 104,901	$ 94,567	$ 97,857	$ 107,932	$ 115,530	**$ 85,234**
70+	1									**1**
Avg. Earnings	$ 4,523									**$ 4,523**
Total	**1,949**	**1,188**	**1,696**	**2,233**	**2,020**	**1,680**	**683**	**201**	**19**	**11,669**
Avg. Earnings	**$ 53,868**	**$ 71,176**	**$ 77,341**	**$ 84,796**	**$ 91,097**	**$ 97,878**	**$ 103,367**	**$ 108,662**	**$ 113,888**	**$ 81,680**

* *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 four 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, 2018							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<50								
Avg. Benefit								
50 - 54	76	263						**339**
Avg. Benefit	$ 48,155	$ 45,389						**$ 46,009**
55 - 59	166	681	389	1				**1,237**
Avg. Benefit	$ 65,522	$ 58,586	$ 50,291	$ 61,615				**$ 56,911**
60 - 64	39	340	594	392				**1,365**
Avg. Benefit	$ 56,611	$ 60,555	$ 59,730	$ 48,871				**$ 56,728**
65 - 69	15	119	277	576	453	2	2	**1,444**
Avg. Benefit	$ 42,829	$ 49,357	$ 54,506	$ 54,495	$ 50,526	$ 54,583	$ 65,939	**$ 52,724**
70 - 74		17	107	188	771	202	2	**1,287**
Avg. Benefit		$ 37,652	$ 48,395	$ 48,672	$ 55,442	$ 49,562	$ 65,939	**$ 52,725**
75 - 79		2	14	39	314	428	41	**838**
Avg. Benefit		$ 2,622	$ 26,491	$ 33,343	$ 55,294	$ 62,488	$ 48,955	**$ 57,030**
80 - 84			4	5	133	231	169	**542**
Avg. Benefit			$ 33,835	$ 54,280	$ 53,465	$ 62,203	$ 54,181	**$ 57,275**
85 - 89			3		37	98	180	**318**
Avg. Benefit			$ 31,669		$ 55,958	$ 57,916	$ 55,984	**$ 56,347**
90+			2		20	39	103	**164**
Avg. Benefit			$ 26,890		$ 63,976	$ 55,027	$ 57,182	**$ 57,129**
Total	**296**	**1,422**	**1,390**	**1,201**	**1,728**	**1,000**	**497**	**7,534**
Avg. Benefit	**$ 58,739**	**$ 55,515**	**$ 54,658**	**$ 51,066**	**$ 54,084**	**$ 59,056**	**$ 55,119**	**$ 54,890**

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, 2018 <1	1 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25+	Total
<45	8	36	59	25	3	1		**132**
Avg. Benefit	$ 15,332	$ 17,023	$ 15,651	$ 14,124	$ 25,945	$ 6,359		**$ 15,880**
45 - 49	2	5	6	8		2		**23**
Avg. Benefit	$ 38,147	$ 36,926	$ 26,162	$ 37,709		$ 31,812		**$ 34,052**
50 - 54	2	7	7	6	4	1	2	**29**
Avg. Benefit	$ 30,108	$ 44,350	$ 33,879	$ 39,313	$ 41,572	$ 48,105	$ 25,148	**$ 38,220**
55 - 59	3	12	19	14	2	4	5	**59**
Avg. Benefit	$ 38,791	$ 36,785	$ 43,421	$ 33,882	$ 20,646	$ 44,871	$ 37,704	**$ 38,414**
60 - 64	9	28	25	24	13	10	6	**115**
Avg. Benefit	$ 31,863	$ 31,758	$ 31,824	$ 32,629	$ 33,191	$ 43,892	$ 40,292	**$ 33,625**
65 - 69	17	49	39	26	20	7	22	**180**
Avg. Benefit	$ 31,709	$ 32,178	$ 35,037	$ 33,007	$ 32,815	$ 52,231	$ 36,628	**$ 34,267**
70 - 74	13	57	53	47	50	25	26	**271**
Avg. Benefit	$ 32,233	$ 32,498	$ 35,782	$ 31,075	$ 34,500	$ 39,667	$ 31,741	**$ 33,839**
75 - 79	13	63	49	32	54	24	27	**262**
Avg. Benefit	$ 30,815	$ 34,876	$ 31,225	$ 31,596	$ 36,993	$ 31,977	$ 35,745	**$ 33,851**
80 - 84	25	53	60	36	44	29	28	**275**
Avg. Benefit	$ 34,181	$ 33,430	$ 32,047	$ 34,449	$ 33,347	$ 31,500	$ 32,638	**$ 33,033**
85 - 89	13	37	49	41	62	43	33	**278**
Avg. Benefit	$ 41,535	$ 33,935	$ 30,133	$ 33,352	$ 30,518	$ 31,849	$ 29,942	**$ 31,975**
90+	7	21	32	35	55	51	50	**251**
Avg. Benefit	$ 34,864	$ 30,502	$ 33,690	$ 25,196	$ 34,410	$ 27,232	$ 27,581	**$ 29,900**
Total	**112**	**368**	**398**	**294**	**307**	**197**	**199**	**1,875**
Avg. Benefit	**$ 32,674**	**$ 31,882**	**$ 30,674**	**$ 30,501**	**$ 33,706**	**$ 33,163**	**$ 31,949**	**$ 31,897**

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

Age	<1	1 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25+	Total
	Years Disabled* as of June 30, 2018							
< 45	14	76	26	9	1			**126**
Avg. Benefit	$ 43,327	$ 39,008	$ 33,641	$ 31,573	$ 28,208			**$ 37,763**
45 - 49	16	61	21	20	3	1		**122**
Avg. Benefit	$ 42,547	$ 45,168	$ 38,687	$ 33,456	$ 22,447	$ 34,751		**$ 41,145**
50 - 54	6	58	45	30	14	7	1	**161**
Avg. Benefit	$ 54,698	$ 52,142	$ 41,424	$ 40,244	$ 35,259	$ 33,634	$ 41,690	**$ 44,687**
55 - 59	21	54	6	35	39	11	1	**167**
Avg. Benefit	$ 54,275	$ 43,997	$ 42,382	$ 41,491	$ 37,749	$ 40,507	$ 27,367	**$ 42,918**
60 - 64	6	28	16	68	58	15		**191**
Avg. Benefit	$ 46,545	$ 50,966	$ 40,432	$ 48,656	$ 41,636	$ 45,055		**$ 45,825**
65 - 69	5	10	6	79	107	29		**236**
Avg. Benefit	$ 34,831	$ 41,195	$ 42,935	$ 48,941	$ 51,363	$ 48,665		**$ 49,225**
70 - 74		6	4	21	115	59	5	**210**
Avg. Benefit		$ 57,567	$ 57,637	$ 46,930	$ 52,819	$ 56,705	$ 49,359	**$ 53,467**
75+			2	4	25	62	41	**134**
Avg. Benefit			$ 51,078	$ 63,238	$ 46,556	$ 56,228	$ 51,084	**$ 52,982**
Total	**68**	**293**	**126**	**266**	**362**	**184**	**48**	**1,347**
Avg. Benefit	**$ 47,187**	**$ 45,407**	**$ 40,021**	**$ 45,211**	**$ 47,542**	**$ 52,362**	**$ 50,214**	**$ 46,650**

** 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 7/1/2017	**11,522**	**1,506**	**1,134**	**7,408**	**1,310**	**1,861**	**24,741**
New members	641						641
Return to active	57	(22)	(35)	0	0	0	0
Terminated non-vested	(93)	0	93	0	0	0	0
Service retirements	(206)	(71)	0	277	0	0	0
Terminated deferred	(163)	163	0	0	0	0	0
Terminated refund/transfer	(31)	(19)	(27)	0	0	0	(77)
Deaths	(7)	(3)	(2)	(155)	(21)	(93)	(281)
New beneficiary	0	0	0	0	0	114	114
Disabled	(48)	0	0	0	48	0	0
Data adjustments	1	26	25	4	10	(7)	59
Net change	151	74	54	126	37	14	456
Members on 6/30/2018	**11,673**	**1,580**	**1,188**	**7,534**	**1,347**	**1,875**	**25,197**

Terminated Member Statistics	Deferred Retirement	Other Non-Vested	Total
Number	1,580	1,188	2,768
Average age	45.0	44.6	44.8
Average service	7.2	0.8	4.4
Average annual benefit, with augmentation to December 31, 2018 and 33% Combined Service Annuity (CSA) load	\$20,137	N/A	\$20,137
Average refund value, with 33% CSA load (2% CSA load for Non-Vested)	\$40,779	\$2,722	\$24,446

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 30.51% 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, 2018
A. Actuarial Value of Assets			$ 8,320,094
B. Expected Future Assets			
1. Present value of expected future statutory supplemental contributions*			$ 1,626,583
2. Present value of future normal cost contributions			$ 1,896,341
3. Total expected future assets: *(1.) + (2.)*			$ 3,522,924
C. Total Current and Expected Future Assets *(A.+ B.3)*			$ 11,843,018
D. Current Benefit Obligations**			
1. Benefit recipients	**Non-Vested**	**Vested**	**Total**
a. Service retirements	$ -	$ 4,533,465	$ 4,533,465
b. Disability retirements	$ -	$ 765,374	$ 765,374
c. Survivors	$ -	$ 481,751	$ 481,751
2. Deferred retirements with augmentation	$ -	$ 239,465	$ 239,465
3. Former members without vested rights	$ 1,622	$ -	$ 1,622
4. Active members	$ 139,358	$ 3,103,550	$ 3,242,908
5. Total current benefit obligations	$ 140,980	$ 9,123,605	$ 9,264,585
E. Expected Future Benefit Obligations			$ 2,184,560
F. Total Current and Expected Future Benefit Obligations***			$ 11,449,145
G. Unfunded Current Benefit Obligations: *(D.5.) - (A.)*			$ 944,491
H. Unfunded Current and Future Benefit Obligations: *(F.) - (C.)*			$ (393,873)
I. Accrued Benefit Funding Ratio: *(A.)/(D.5.)*			89.81%
J. Projected Benefit Funding Ratio: *(C.)/(F.)*			103.44%

* *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	$ 4,623,218	$ 1,372,609	$ 3,250,609
b. Disability benefits	$ 516,924	$ 310,798	$ 206,126
c. Survivor's benefits	$ 100,051	$ 58,608	$ 41,443
d. Deferred retirements	$ 180,744	$ 143,265	$ 37,479
e. Refunds*	$ 6,531	$ 11,061	$ (4,530)
f. Total	$ 5,427,468	$ 1,896,341	$ 3,531,127
2. Deferred retirements with future augmentation	$ 239,465	$ -	$ 239,465
3. Former members without vested rights	$ 1,622	$ -	$ 1,622
4. Annuitants	$ 5,780,590	$ -	$ 5,780,590
5. Total	$ 11,449,145	$ 1,896,341	$ 9,552,804

B. Determination of Unfunded Actuarial Accrued Liability (UAAL)	
1. Actuarial accrued liability	$ 9,552,804
2. Current assets (AVA)	$ 8,320,094
3. Unfunded actuarial accrued liability	$ 1,232,710
C. Determination of Supplemental Contribution Rate**	
1. Present value of future payrolls through the amortization date of June 30, 2048	$ 17,085,951
2. Supplemental contribution rate: *(B.3.) / (C.1.)*	7.21% ***

* *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, 2018 is 17.077856.*

Development of Costs

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

	Year Ending June 30, 2018		
	Actuarial Accrued Liability	Current Assets	Unfunded Actuarial Accrued Liability
A. Unfunded actuarial accrued liability at beginning of year	$ 9,199,208	$ 7,840,549	$ 1,358,659
B. Changes due to interest requirements and current rate of funding			
1. Normal cost, including expenses	$ 205,218	$ -	$ 205,218
2. Benefit payments	$ (530,370)	$ (530,370)	$ -
3. Contributions	$ -	$ 285,260	$ (285,260)
4. Interest on A., B.1., B.2. and B.3.	$ 722,931	$ 617,440	$ 105,491
5. Total *(B.1. + B.2. + B.3. + B.4.)*	$ 397,779	$ 372,330	$ 25,449
C. Expected unfunded actuarial accrued liability at end of year *(A. + B.5.)*			$ 1,384,108
D. Increase (decrease) due to actuarial losses (gains) because of experience deviations from expected			
1. Age and service retirements			$ (1,089)
2. Disability retirements			$ (1,253)
3. Death-in-service benefits			$ (978)
4. Withdrawals			$ (317)
5. Salary increases			$ (3,344)
6. Investment income			$ (107,215)
7. Mortality of annuitants			$ 9,281
8. Other items			$ 11,092
9. Total			$ (93,823)
E. Unfunded actuarial accrued liability at end of year before plan amendments and changes in actuarial assumptions *(C. + D.9.)*			$ 1,290,285
F. Change in unfunded actuarial accrued liability due to changes in plan provisions			$ (514,295)
G. Change in unfunded actuarial accrued liability due to changes in actuarial assumptions			$ 456,720
H. Change in unfunded actuarial accrued liability due to changes in methodology			$ -
I. Unfunded actuarial accrued liability at end of year *(E. + F. + G. + H.)**			$ 1,232,710

* *The unfunded actuarial accrued liability on a market value of assets basis is $1,065,897.*

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	11.05%	$ 110,552
2. Employer contributions	16.58%	$ 165,829
3. Minneapolis Police contributions***	0.99%	$ 9,892
4. Minneapolis Fire contributions***	0.54%	$ 5,416
5. Virginia Fire contributions	0.00%	$ 30
6. State contributions****	1.35%	$ 13,500
7. Total	30.51%	$ 305,219
B. Required contributions - Chapter 356		
1. Normal cost		
a. Retirement benefits	15.17%	$ 151,771
b. Disability benefits	3.45%	$ 34,516
c. Survivors	0.67%	$ 6,703
d. Deferred retirement benefits	1.50%	$ 15,007
e. Refunds*	0.11%	$ 1,101
f. Total	20.90%	$ 209,098
2. Supplemental contribution amortization of Unfunded Actuarial Accrued Liability by June 30, 2048	7.21%	$ 72,134
3. Allowance for expenses	0.09%	$ 900
4. Total	28.20% **	$ 282,132
C. Contribution Sufficiency/(Deficiency) *(A.7. - B.4.)*	2.31%	$ 23,087

Note: Projected annual payroll for fiscal year beginning on the valuation date: $1,000,474 (determined according to requirements of the LCPR Standards for Actuarial Work).

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

** *The required contribution on a market value of assets basis is 27.23% of payroll.*

*** *Contributions (estimated, assumes recalculation) due July 15, 2019; 2018 contributions are included in assets as receivable contributions.*

**** *$9.0 million contributions paid until both PERA P&F and MSRS State Patrol reach 90% funding (on a Market Value of Assets basis), or July 1, 2048, if earlier. In addition, $4.5 million in fiscal years 2019 and 2020, and $9.0 million thereafter, paid until the plan reaches 100% funding, or July 1, 2048, if earlier.*

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 made annually on July 15th beginning in 2013 and ending in 2015 was $7,612,423 (previously calculated). Due to the change in P&F's statutory discount rate from 8.5% to 8.0%, 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). This contribution may be recalculated to reflect the change in discount rate from 8.0% to 7.5%. An estimated amount is shown on page 21.

Year Ending June 30, 2018

Group	Number	Annual Benefits	Average Age	Present Value of Projected Benefits
Active Members	0	N/A	N/A	$ -
Service Retirements	410	$ 26,014	76.2	$ 243,568
Disability Retirements	16	$ 911	73.6	$ 9,299
Survivors	203	$ 7,196	80.4	$ 51,337
Total	**629**	**$ 34,121**	**77.5**	**$ 304,204**

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 made annually on July 15th beginning in 2013 and ending in 2015 was $3,921,787 (previously calculated). Due to the change in P&F's statutory discount rate from 8.5% to 8.0%, 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). This contribution may be recalculated to reflect the change in discount rate from 8.0% to 7.5%. An estimated amount is shown on page 21.

Year Ending June 30, 2018

Group	Number		Annual Benefits	Average Age		Present Value of Projected Benefits
Active Members	4		N/A	62.0	$	2,659
Service Retirements	246	$	16,008	76.4	$	144,752
Disability Retirements	36	$	2,263	75.1	$	21,571
Survivors	161	$	5,785	80.9	$	39,895
Total	**447**	**$**	**24,056**	**77.8**	**$**	**208,877**

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 was $25,431 (previously calculated). Due to the change in P&F's statutory discount rate from 8.5% to 8.0%, the contribution amount was recalculated. The employer contribution to be made annually beginning in 2015 and ending in 2020 is $29,611 (previously calculated). This contribution may be recalculated to reflect the change in discount rate from 8.0% to 7.5%.

Year Ending June 30, 2018

Group	Number	Annual Benefits*	Average Age	Present Value of Projected Benefits
Service Retirements	5	$ 141	84.7	$ 882
Survivors	3	$ 46	89.2	$ 209
Total	**8**	**$ 187**	**86.4**	**$ 1,091**

* *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, 2018

Group	Number	Annual Benefits*	Average Age	Present Value of Projected Benefits
Service Retirements	7	$ 460	73.9	$ 4,502
Survivors	3	$ 119	80.1	$ 855
Total	**10**	**$ 579**	**75.8**	**$ 5,357**

* *Benefit amounts were provided by PERA for all members. Surviving spouses will receive an annual benefit equal to 35 times the unit value. See Summary of Plan Provisions for a description of unit values.*

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.

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, 2048 assuming payroll increases of 3.25% 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 may be extended.

As required by the Standards for Actuarial Work, projected payroll is 1) determined by increasing reported payroll for each member by one full year's assumed pay increase according to the actuarial salary scale and 2) multiplied by 0.962 in the determination of the present value of future payroll to account for timing differences.

Changes in Methods Since Prior Valuation

The amortization period was reset to 30 years, ending in 2048.

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	7.50% per annum.
Salary increases	Reported salary at valuation date increased according to the rate table, to current fiscal year and annually for each future year. Prior fiscal year salary is annualized for members with less than one year of service earned during the year.
Inflation	2.50% per year.
Payroll growth	3.25% per year.
Mortality rates	
Healthy pre-retirement	RP-2014 employee generational mortality table projected with mortality improvement scale MP-2017 from a base year of 2006.
Healthy post-retirement	RP-2014 annuitant generational mortality table projected with mortality improvement scale MP-2017 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-2017 from a base year of 2006. Male rates are adjusted by a factor of 0.96.
Notes	The RP-2014 employee mortality table as published by the Society of Actuaries (SOA) contains mortality rates for ages 18 to 80 and the annuitant mortality table contains mortality rates for ages 50 to 120. We have extended the annuitant mortality table as needed for members younger than age 50 who are receiving a benefit by deriving rates based on the employee table and the juvenile table. Similarly, we have extended the employee table as needed for members older than age 80 by deriving rates based on the annuitant table.
Retirement	Members retiring from active status are assumed to retire according to the age related rates shown in the rate table. Members who have attained the highest assumed retirement age are assumed to retire in one year. Note that plan changes reflected in this report may ultimately result in behavior changes that are not anticipated in the current retirement rates.
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 are assumed to take the larger of contributions accumulated with interest or the value of the 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, based on average results for applicable members at the time of the last experience study, were applied: <u>Data for active members:</u> There were 41 members reported with a salary less than $100. We used prior year salary (26 members), if available; otherwise high five salary with a 10% load to account for salary increases (15 members). If neither prior year salary nor high five salary was available, we assumed a value of $35,000. Note former members of Minneapolis Fire are excluded from these salary counts as salary is not used to calculate the benefit. There were also 133 members reported without a gender. We assumed male gender. There were 9 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 (1 member), we assumed a value of $24,000. If credited service was not reported (13 members), we used elapsed time from hire date to termination date (6 members); if elapsed time was not available, we assumed nine years of service. If termination date was invalid or not reported (7 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 8 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 21 members reported without a gender. We assumed retirees are male and beneficiaries are female. There were 13 members that were active last year and retirement eligible and none on the retiree data file this year. At the direction of PERA, we included these members in the 2018 valuation as retirees with an estimated life only monthly benefit.

Actuarial Basis

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 205 retirees as disabled retirees in this valuation.
Changes in actuarial assumptions	The assumed investment return was lowered from 8.0% to 7.5%. The assumed rate of inflation decreased from 2.75% to 2.50%. The assumed payroll growth rate decreased from 3.50% to 3.25%. Salary increase rates were reduced by 0.25% at each year of service. The mortality projection scale was changed from MP-2016 to MP-2017.

Summary of Actuarial Assumptions (Continued)

Age in 2018	Percentage of Members Dying Each Year* Healthy Post-Retirement Mortality Males	Healthy Post-Retirement Mortality Females	Healthy Pre-Retirement Mortality Males	Healthy Pre-Retirement Mortality Females	Disability Mortality Males	Disability Mortality Females
20	0.04%	0.02%	0.04%	0.02%	0.04%	0.02%
25	0.06	0.03	0.05	0.02	0.06	0.03
30	0.09	0.07	0.05	0.02	0.09	0.07
35	0.13	0.12	0.06	0.03	0.13	0.12
40	0.19	0.17	0.07	0.05	0.19	0.17
45	0.27	0.22	0.10	0.07	0.27	0.22
50	0.39	0.27	0.17	0.11	0.39	0.27
55	0.56	0.38	0.28	0.18	0.56	0.38
60	0.78	0.58	0.49	0.27	0.78	0.58
65	1.12	0.85	0.88	0.39	1.12	0.85
70	1.67	1.31	1.43	0.64	1.67	1.31
75	2.66	2.16	2.39	1.11	2.66	2.16
80	4.49	3.69	4.06	1.95	4.49	3.69
85	7.87	6.60	7.99	5.15	7.87	6.60
90	13.83	11.75	14.57	11.33	13.83	11.75

* *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 Males	Withdrawal Rates After Third Year Females	Rates of Disability Retirement Males	Rates of Disability Retirement 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

Summary of Actuarial Assumptions (Concluded)

Age	Rates of Service Retirement	Salary Scale Year	Salary Scale Increase
50	10.00%	1	12.25%
51	7.00	2	10.50%
52	7.00	3	8.75%
53	10.00	4	7.75%
54	10.00	5	6.25%
55	25.00	6	5.75%
56	22.50	7	5.25%
57	22.50	8	5.00%
58	22.50	9	4.75%
59	20.00	10	4.50%
60	22.50	11	4.25%
61	25.00	12	4.15%
62	30.00	13	4.05%
63	30.00	14	3.95%
64	30.00	15	3.85%
65	50.00	16	3.75%
66	50.00	17	3.75%
67	50.00	18	3.75%
68	50.00	19	3.75%
69	50.00	20	3.75%
70+	100.00	21	3.65%
		22	3.55%
		23	3.45%
		24	3.35%
		25+	3.25%

Actuarial Basis

Summary of Plan Provisions – Police & Fire Plan

Following is a summary of the major plan provisions used in the valuation of this report. PERA is solely responsible for the validity, accuracy and comprehensiveness of this information. If any of the plan provisions shown below are not accurate and complete, the valuation results may differ significantly from those shown in this report and may require a revision of this report.

Plan year	July 1 through June 30.
Eligibility	All full-time and certain part-time police officers and fire fighters, and certain paramedics, who are not contributing to any other local retirement fund.
Contributions	**Effective as of** / **Member** / **Employer** / **Total** Prior to January 1, 2019: 10.80% / 16.20% / 27.00% January 1, 2019: 11.30% / 16.95% / 28.25% January 1, 2020 and later: 11.80% / 17.70% / 29.50% 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), or July 1, 2048, if earlier. In addition, $4.5 million in fiscal years 2019 and 2020, and $9.0 million thereafter, until the plan reaches 100% funding, or July 1, 2048, if earlier.
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.

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

Vesting

Years of Service	Vesting Percent if First Hired: Before 7/1/2010	Vesting Percent if First Hired: After 6/30/2010 & before 7/1/2014	Vesting Percent if First Hired: 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, adjusted for partial vesting if applicable. 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. 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.

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

Death (Concluded)

Duty disability surviving dependent children's benefit

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

Surviving spouse optional annuity

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

Actuarial Basis

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

Termination	
Refund of contributions	
Age/service requirement	Termination of public service.
Amount	Member's contributions with 6.00% interest through June 30, 2011, compounded daily. Beginning July 1, 2011, a member's contributions increase at 4.00% interest compounded daily. Beginning July 1, 2018, a member's contributions increase at 3.00% interest compounded daily. If a member is vested, a deferred annuity may be elected in lieu of a refund.
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; (e.) 1.00% from January 1, 2012 through December 31, 2018; and (f.) 0.00% from January 1, 2019, 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.
Actuarial equivalent factors	Effective July 1, 2019, actuarially equivalent factors based on the RP-2014 mortality table for healthy annuitants for a member turning age 55 in 2021, reflecting projected mortality improvements using Scale MP-2017, male rates multiplied by 0.96, blended 90% males, and 6.50% interest.

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 benefits 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	Post-retirement benefit increases were changed to 1.0% for all years, with no trigger. An end date of July 1, 2048 was added to the existing $9.0 million state contribution. New annual state aid will equal $4.5 million in fiscal years 2019 and 2020, and $9.0 million thereafter until the plan reaches 100% funding, or July 1, 2048, if earlier. Member contributions were changed from 10.8% to 11.3% of pay, effective January 1, 2019 and 11.8% of pay, effective January 1, 2020. Employer contributions were changed from 16.20% to 16.95% of pay, effective January 1, 2019 and 17.70% of pay, effective January 1, 2020. Interest credited on member contributions decreased from 4.0% to 3.0%, beginning July 1, 2018. Deferred augmentation was changed to 0.00%, effective January 1, 2019. Augmentation that has already accrued for deferred members will still apply. Actuarial equivalent factors were updated to reflect revised mortality and interest assumptions.

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.

Actuarial Basis

Summary of Plan Provisions – Minneapolis Firefighters' Relief Association (Concluded)

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.

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)
7-1-1996	$ 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
7-1-2018	$ 8,320,094	$ 9,552,804	$ 1,232,710	87.10	$ 976,657 [5]	126.22

[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)
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	$ 976,657 [6]	$ 105,479	$ 193,183	$ 179,781	93.06
2019	28.20					

[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.