GRS

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January 31, 2017

CONFIDENTIAL

Mr. Doug Anderson
Executive Director
Public Employees Ret. Assoc. of MN
60 Empire Drive, Suite 200
St. Paul, MN 55103

Re: Projection of Contributions and Funding Status – Police & Fire Plan

Dear Doug:

Attached are 30-year projections of estimated funded status, required contributions, and statutory contributions under three asset return scenarios for the Public Employees Police & Fire Plan. Unless noted otherwise, the estimates are based on participant data, assets, and plan provisions as outlined in the Public Employees Police & Fire Retirement Plan actuarial funding valuation as of July 1, 2016.

An experience study was completed in 2016. In the report, GRS recommended many changes to the valuation assumptions. Since the release of this report, the Society of Actuaries (SOA) published an updated mortality improvement scale, called MP-2016. PERA has expressed intent to adopt this mortality projection scale in lieu of the MP-2015 projection scale that was recommended in the experience study report. The recommended assumptions, including the MP-2016 projection scale, were used to determine the enclosed results. The recommended demographic assumptions are summarized in the *Public Employees Police & Fire Plan, 4-Year Experience Study*, dated August 30, 2016.

Additionally, the proposed Allowance for Combined Service Annuity assumption change is reflected in this report. The liabilities for former vested members are increased by 33% and liabilities for former non-vested members are increased by 2% to account for the effect of some participants having eligibility for a Combined Service Annuity.

As required by the Minnesota Standards for Actuarial Work, the projections reflect three asset return scenarios. The statutory investment return assumption is 8.0%. The scenarios assume future investment returns of 1.5% more than the assumed rate, the assumed rate, and 1.5% less than the assumed rate. Note that we believe the 9.5% rate of return assumption is outside of the range of reasonable expected returns for this plan. In fact, according to the *General Employees Retirement Fund 6-Year Experience Study*, dated June 30, 2015, the probability of achieving the 8.0% assumption is only 37%. The study further indicates that in order to have a 50% chance of achieving the assumed earnings rate, the rate would have to be lowered to 7.0%. Please see the aforementioned experience study report for additional information.

Note that as funding ratios decline, as they are expected to in one of the investment return scenarios shown in this letter, it will be increasingly difficult for the plan to attain the assumed investment return. Each year, a larger proportion of assets is paid out in benefits, and less capital is available to invest.

The estimates are based on the market value of assets with no smoothing of investment gains or losses. In all scenarios, the valuation interest rate used to discount liabilities was 8.0%. Payroll is assumed to increase approximately 3.50% per year over the long-term, consistent with the valuation assumption for total payroll growth.

The projection is an open group projection; meaning, active members projected to retire or otherwise terminate in the future are replaced with new active members so that the total active membership of the fund remains at 11,398 members. The profile of these new members is the same as new members of each fund hired between July 1, 2010 and July 1, 2015:

- Average age at hire is 29.9
- Average salary at hire is $55,164
- Approximately 11% female, 89% male

If actuarial accrued liability exceeds assets, the unfunded actuarial accrued liability is amortized through June 30, 2041 per Minnesota Statute 356.215, Subdivision 11. As directed by PERA, the statutory amortization date is assumed to be changed to June 30, 2071 once the current period expires in 2041. Per Minnesota Statute 356.215, Subdivision 11 (l), a negative unfunded actuarial accrued liability (i.e., when assets exceed liability) is amortized over a rolling 30-year period.

The State of Minnesota provides a $9,000,000 contribution to the fund each October 1 until both the State Patrol Fund and the PERA Police and Fire Plan become 90% funded (on a Market Value basis). For purposes of this projection, the $9,000,000 contribution is assumed to continue until the Police and Fire Plan reaches the threshold required to pay a 2.5% benefit increase.

Post-Retirement Benefit Increases

A very significant assumption affecting the projected estimates is the expectation of annual increases in the benefits being paid to retirees and beneficiaries. If the plan reaches a funding ratio of 90% (based on a 2.5% post-retirement benefit increase assumption) on a market value of assets basis for two consecutive years in the future, post-retirement increases will increase from 2.0% to 2.5%.

For the 8.0% scenario, an actuarial projection was performed to estimate when this plan is expected to attain the threshold required to pay a 2.5% post-retirement benefit increase. The projection indicated that if all assumptions were met, the threshold is expected to be attained in the year 2048, and that the plan would begin paying 2.5% benefit increases on January 1, 2049. This assumption is reflected in the 8.0% rate of return projection scenario.

Under the 9.5% rate of return scenario, the funded status of the plan is expected to improve. Based on present expectations, the 9.5% rate of return scenario is a very low probability outcome. As the plan experiences greater than expected investment return each year, the assumed 2.5% benefit increase date of January 1, 2049 is accelerated. We performed a projection to estimate when the plan is expected to attain the threshold required to pay a 2.5% post-retirement benefit increase if future investment returns are 9.5%. This projection indicated the plan would begin paying a 2.5% benefit increase on January 1, 2028. To approximate the acceleration of the assumed 2.5% benefit increase date from 2049 to 2028, we assumed the accrued liability and normal cost would increase by a proportionate amount between 2016 and 2028.

Under the 6.5% ultimate rate of return scenario, the funded status of the plan is expected to deteriorate. Based on present expectations, this is the only scenario that has a better than 50% chance of being achieved. As the plan experiences lower than expected investment returns each year, the assumed 2.5% benefit increase date becomes later each year until it is no longer projected to be attained. We assumed for purposes of this projection that this transition from the current assumption (that the benefit increase will change from 1.0% to 2.5% on January 1, 2051) to an assumption that the benefit increase will remain at 1.0% for all years would occur by July 1, 2022.

Comments

To the best of our knowledge and belief, the calculations were completed in accordance with the requirements of Minnesota Statutes, Section 356.215, and the requirements of the Standards for Actuarial Work established by the Legislative Commission on Pensions and Retirement.

This report should not be relied upon 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. GRS is not responsible for the consequences of any unauthorized use.

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.

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 the valuation report, except as noted. PERA is solely responsible for communicating to GRS any changes required thereto.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law.

Professional Qualifications

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

Bonita J. Wurst and Brian B. Murphy are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. In addition, Mr. Murphy meets the requirements of "approved actuary" under Minnesota Statutes Section 356.215, Subdivision 1, Paragraph (c).

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

Sincerely,

Bonita J. Wurst

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

Brian B Murphy

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

BJW/BBM:bd
Enclosures

Other Observations

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

Given the plan's contribution allocation procedure, if there are no changes in benefits or contributions and all actuarial assumptions are met (including the assumption of the plan earning 8.0% on the market value of assets), it is expected that:

(1) The unfunded actuarial accrued liabilities will not be fully amortized within the next 50 years, and
(2) The funded status of the plan will increase gradually.

Limitations of Funded Status Measurements

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

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

Limitations of Project Scope

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

Other Observations

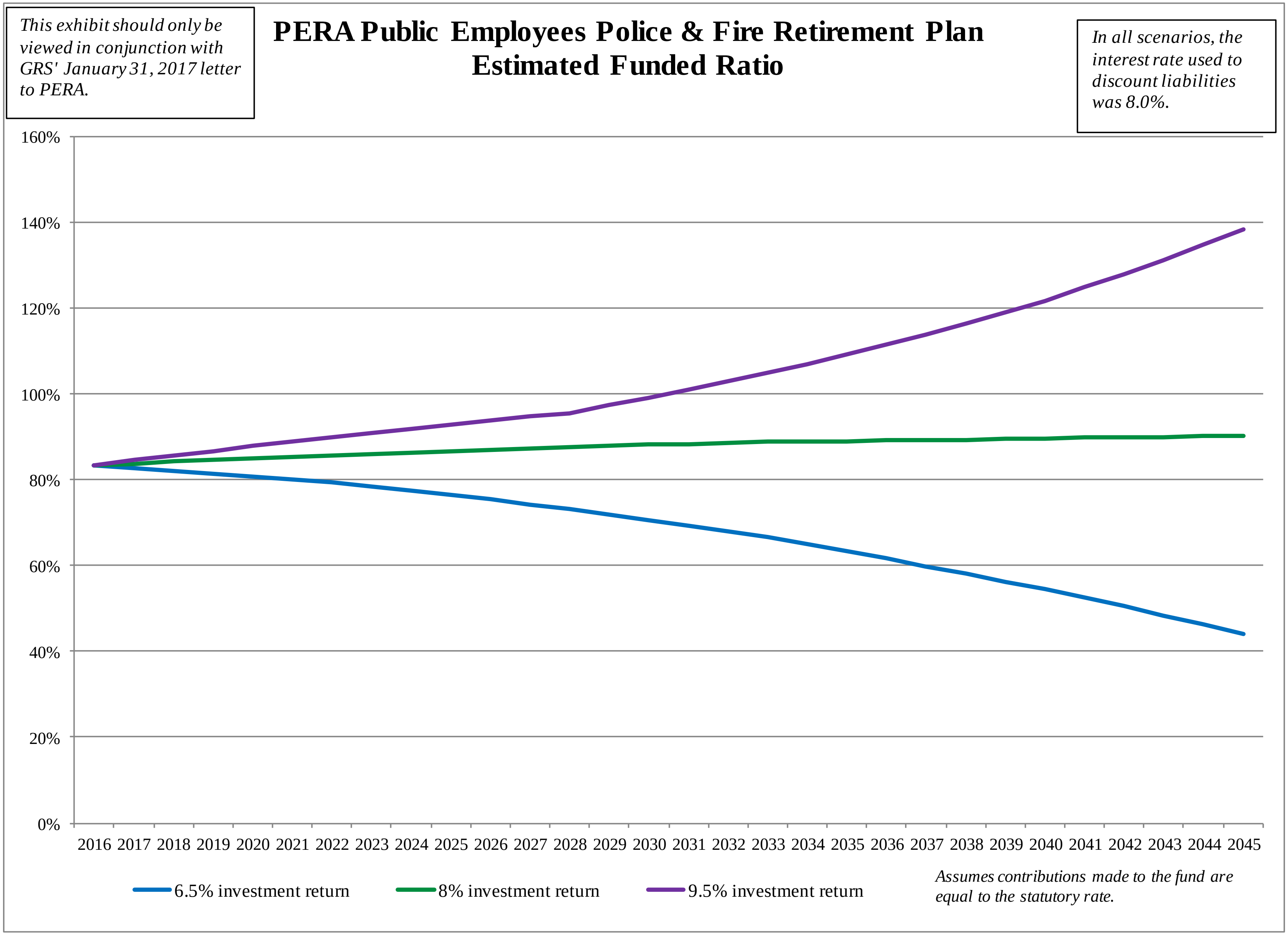
Discount Rate Assumption

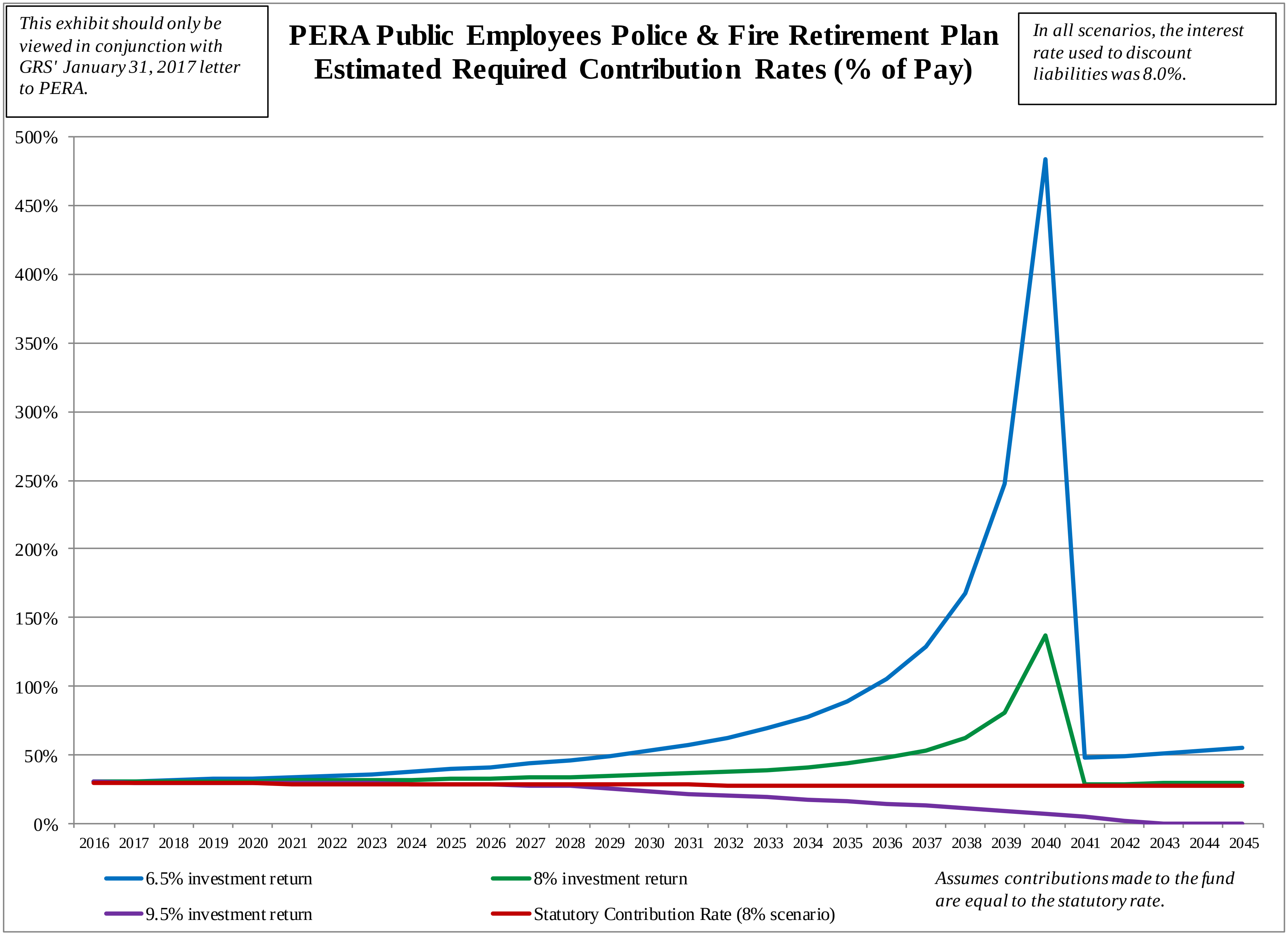
In a 2015 analysis of long-term rate of investment return and inflation assumptions, GRS suggested that an investment return assumption in the range of 7.00% to 8.00% would be reasonable. The current assumed rate, which is mandated by Minnesota Statutes, is 8.00% and is at the upper end of the reasonable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

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

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

If a discount rate of 7.50% were used in the July 1, 2016 valuation instead of 8.00%, we estimate that the unfunded liability would be approximately $400 million higher than estimated in the 2016 valuation. This estimate incorporates lower salary scale rates due to lower inflation expectations, as well as a delay in the assumed payment of 2.50% post-retirement benefit increases.


This exhibit should only be viewed in conjunction with GRS' January 31, 2017 letter to PERA.
PERA Public Employees Police & Fire Retirement Plan
Estimated Funded Ratio
In all scenarios, the interest rate used to discount liabilities was 8.0%.
160%
140%
120%
100%
80%
60%
40%
20%
0%
2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045
6.5% investment return
8% investment return
9.5% investment return
Assumes contributions made to the fund are equal to the statutory rate.


This exhibit should only be viewed in conjunction with GRS' January 31, 2017 letter to PERA.
PERA Public Employees Police & Fire Retirement Plan
Estimated Required Contribution Rates (% of Pay)
In all scenarios, the interest rate used to discount liabilities was 8.0%.
500%
450%
400%
350%
300%
250%
200%
150%
100%
50%
0%
2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045
6.5% investment return
8% investment return
9.5% investment return
Statutory Contribution Rate (8% scenario)
Assumes contributions made to the fund are equal to the statutory rate.

This exhibit should only be viewed in conjunction with GRS' January 31, 2017 letter to PERA.

Public Employees Police & Fire Retirement Plan

Scenario: 8.0% investment return for all years

Fiscal year beginning July 1

$ in Thousands	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Contributions (% of Payroll)										
Statutory - Chapter 353	29.5%	29.4%	29.3%	29.3%	29.2%	29.1%	29.1%	29.0%	28.9%	28.9%
Required - Chapter 356 (MVA)	30.3%	30.4%	30.6%	30.7%	31.0%	31.2%	31.5%	31.8%	32.2%	32.6%
Sufficiency / (Deficiency)	(0.8)%	(1.0)%	(1.2)%	(1.5)%	(1.8)%	(2.1)%	(2.5)%	(2.8)%	(3.3)%	(3.7)%
Contributions										
Statutory - Chapter 353	269,109	277,345	285,562	293,935	302,435	311,178	320,264	329,706	339,482	349,698
Required - Chapter 356 (MVA)	276,513	286,804	297,501	308,815	320,756	333,512	347,178	361,861	377,665	394,816
Sufficiency / (Deficiency)	(7,404)	(9,459)	(11,939)	(14,880)	(18,321)	(22,334)	(26,914)	(32,155)	(38,183)	(45,118)
Funding Ratios										
Current Assets (MVA)	7,098,090	7,405,529	7,728,052	8,066,101	8,419,832	8,789,191	9,173,176	9,571,890	9,985,459	10,413,859
Actuarial Accrued Liability (AAL)	8,505,963	8,832,377	9,173,842	9,531,005	9,904,162	10,293,435	10,697,972	11,117,948	11,553,578	12,004,965
Unfunded AAL	1,407,873	1,426,848	1,445,790	1,464,904	1,484,330	1,504,244	1,524,796	1,546,058	1,568,119	1,591,106
Funding Ratio	83%	84%	84%	85%	85%	85%	86%	86%	86%	87%
Benefit Payments	518,589	535,939	554,007	573,274	593,926	616,984	641,412	667,205	694,497	723,334

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 8.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2017 letter to PERA.

Public Employees Police & Fire Retirement Plan

Scenario: 8.0% investment return for all years

Fiscal year beginning July 1

$ in Thousands	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Contributions (% of Payroll)										
Statutory - Chapter 353	28.8%	28.8%	28.7%	28.6%	28.6%	28.5%	27.6%	27.6%	27.6%	27.5%
Required - Chapter 356 (MVA)	33.1%	33.6%	34.2%	34.9%	35.7%	36.6%	37.8%	39.4%	41.4%	44.0%
Sufficiency / (Deficiency)	(4.3)%	(4.8)%	(5.5)%	(6.2)%	(7.1)%	(8.1)%	(10.2)%	(11.8)%	(13.8)%	(16.5)%
Contributions										
Statutory - Chapter 353	360,375	371,542	383,332	395,513	408,223	421,447	421,514	435,809	450,604	465,995
Required - Chapter 356 (MVA)	413,478	433,890	456,437	481,307	509,174	540,742	577,065	621,989	676,557	745,470
Sufficiency / (Deficiency)	(53,103)	(62,348)	(73,105)	(85,794)	(100,951)	(119,295)	(155,551)	(186,180)	(225,953)	(279,475)
Funding Ratios										
Current Assets (MVA)	10,857,126	11,315,458	11,790,396	12,283,596	12,796,494	13,330,458	13,887,088	14,453,635	15,044,963	15,662,378
Actuarial Accrued Liability (AAL)	12,472,211	12,955,565	13,456,607	13,976,946	14,518,114	15,081,483	15,668,651	16,281,066	16,920,495	17,588,337
Unfunded AAL	1,615,085	1,640,107	1,666,211	1,693,350	1,721,620	1,751,025	1,781,563	1,827,431	1,875,532	1,925,959
Funding Ratio	87%	87%	88%	88%	88%	88%	89%	89%	89%	89%
Benefit Payments	753,584	784,000	814,719	845,853	877,714	910,169	943,467	977,462	1,012,605	1,049,213

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 8.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2017 letter to PERA.

Public Employees Police & Fire Retirement Plan

Scenario: 8.0% investment return for all years

Fiscal year beginning July 1

$ in Thousands	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
Contributions (% of Payroll)										
Statutory - Chapter 353	27.5%	27.5%	27.5%	27.5%	27.5%	27.4%	27.4%	27.4%	27.4%	27.4%
Required - Chapter 356 (MVA)	47.8%	53.4%	62.7%	81.3%	137.0%	29.0%	29.1%	29.2%	29.3%	29.4%
Sufficiency / (Deficiency)	(20.3)%	(25.9)%	(35.2)%	(53.8)%	(109.6)%	(1.6)%	(1.7)%	(1.8)%	(1.9)%	(2.1)%
Contributions										
Statutory - Chapter 353	481,978	498,605	515,925	533,905	552,634	572,101	592,375	613,385	635,098	657,576
Required - Chapter 356 (MVA)	837,025	967,858	1,176,762	1,579,999	2,759,116	605,065	628,971	653,871	679,808	706,905
Sufficiency / (Deficiency)	(355,047)	(469,253)	(660,837)	(1,046,094)	(2,206,482)	(32,964)	(36,596)	(40,486)	(44,710)	(49,329)
Funding Ratios										
Current Assets (MVA)	16,307,061	16,980,745	17,685,222	18,422,708	19,195,350	20,006,015	20,857,521	21,753,107	22,695,777	23,687,896
Actuarial Accrued Liability (AAL)	18,285,811	19,014,691	19,776,775	20,574,262	21,409,306	22,284,729	23,203,313	24,168,219	25,182,412	26,248,250
Unfunded AAL	1,978,750	2,033,946	2,091,553	2,151,554	2,213,956	2,278,714	2,345,792	2,415,112	2,486,635	2,560,354
Funding Ratio	89%	89%	89%	90%	90%	90%	90%	90%	90%	90%
Benefit Payments	1,086,842	1,125,621	1,165,328	1,206,167	1,247,700	1,290,185	1,333,499	1,378,048	1,424,648	1,473,593

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 8.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2017 letter to PERA.

Public Employees Police & Fire Retirement Plan

Scenario: 6.5% investment return for all years

Fiscal year beginning July 1

$ in Thousands	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Contributions (% of Payroll)										
Statutory - Chapter 353	29.5%	29.4%	29.3%	29.3%	29.2%	29.1%	29.1%	29.0%	28.9%	28.9%
Required - Chapter 356 (MVA)	30.3%	30.9%	31.6%	32.3%	33.1%	33.9%	34.7%	36.1%	37.7%	39.4%
Sufficiency / (Deficiency)	(0.8)%	(1.5)%	(2.3)%	(3.1)%	(3.9)%	(4.8)%	(5.7)%	(7.1)%	(8.7)%	(10.6)%
Contributions										
Statutory - Chapter 353	269,109	277,345	285,562	293,935	302,435	311,178	320,264	329,706	339,482	349,698
Required - Chapter 356 (MVA)	276,513	291,718	307,706	324,710	342,773	362,111	382,872	410,694	441,992	477,470
Sufficiency / (Deficiency)	(7,404)	(14,373)	(22,144)	(30,775)	(40,338)	(50,933)	(62,608)	(80,988)	(102,510)	(127,772)
Funding Ratios										
Current Assets (MVA)	7,098,090	7,300,936	7,507,524	7,717,338	7,929,511	8,142,895	8,355,335	8,565,708	8,772,837	8,975,306
Actuarial Accrued Liability (AAL)	8,505,963	8,818,325	9,141,055	9,473,641	9,815,036	10,163,822	10,517,370	10,908,715	11,311,776	11,726,264
Unfunded AAL	1,407,873	1,517,389	1,633,531	1,756,303	1,885,525	2,020,927	2,162,035	2,343,007	2,538,939	2,750,958
Funding Ratio	83%	83%	82%	81%	81%	80%	79%	79%	78%	77%
Benefit Payments	518,589	535,939	554,007	573,274	593,926	616,984	641,412	667,205	694,497	723,334

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The interest rate used to discount liabilities was 8.0%.

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Public Employees Police & Fire Retirement Plan

Scenario: 6.5% investment return for all years

Fiscal year beginning July 1

$ in Thousands	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Contributions (% of Payroll)										
Statutory - Chapter 353	28.8%	28.8%	28.7%	28.6%	28.6%	28.5%	27.6%	27.6%	27.6%	27.5%
Required - Chapter 356 (MVA)	41.4%	43.7%	46.3%	49.3%	52.9%	57.2%	62.4%	69.1%	77.6%	89.0%
Sufficiency / (Deficiency)	(12.6)%	(14.9)%	(17.6)%	(20.7)%	(24.3)%	(28.7)%	(34.8)%	(41.5)%	(50.1)%	(61.5)%
Contributions										
Statutory - Chapter 353	360,375	371,542	383,332	395,513	408,223	421,447	421,514	435,809	450,604	465,995
Required - Chapter 356 (MVA)	517,912	564,350	618,200	681,048	755,432	844,703	953,731	1,092,061	1,269,715	1,506,356
Sufficiency / (Deficiency)	(157,537)	(192,808)	(234,868)	(285,535)	(347,209)	(423,256)	(532,217)	(656,252)	(819,111)	(1,040,361)
Funding Ratios										
Current Assets (MVA)	9,171,670	9,360,550	9,541,789	9,715,219	9,880,307	10,036,303	10,182,533	10,303,904	10,412,768	10,507,644
Actuarial Accrued Liability (AAL)	12,151,845	12,588,310	13,036,751	13,498,247	13,973,796	14,464,162	14,970,299	15,492,972	16,033,199	16,591,588
Unfunded AAL	2,980,175	3,227,760	3,494,962	3,783,028	4,093,489	4,427,859	4,787,766	5,189,068	5,620,431	6,083,944
Funding Ratio	75%	74%	73%	72%	71%	69%	68%	67%	65%	63%
Benefit Payments	753,584	784,000	814,719	845,853	877,714	910,169	943,467	977,462	1,012,605	1,049,213

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 8.0%.

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Public Employees Police & Fire Retirement Plan

Scenario: 6.5% investment return for all years

Fiscal year beginning July 1

$ in Thousands	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
Contributions (% of Payroll)										
Statutory - Chapter 353	27.5%	27.5%	27.5%	27.5%	27.5%	27.4%	27.4%	27.4%	27.4%	27.4%
Required - Chapter 356 (MVA)	104.9%	128.7%	168.2%	247.2%	484.0%	47.7%	49.4%	51.1%	53.0%	55.0%
Sufficiency / (Deficiency)	(77.4)%	(101.2)%	(140.7)%	(219.7)%	(456.5)%	(20.3)%	(22.0)%	(23.7)%	(25.6)%	(27.7)%
Contributions										
Statutory - Chapter 353	481,978	498,605	515,925	533,905	552,634	572,101	592,375	613,385	635,098	657,576
Required - Chapter 356 (MVA)	1,837,232	2,332,881	3,157,858	4,805,729	9,744,540	995,352	1,066,726	1,144,477	1,229,344	1,322,248
Sufficiency / (Deficiency)	(1,355,254)	(1,834,276)	(2,641,933)	(4,271,824)	(9,191,906)	(423,251)	(474,351)	(531,092)	(594,246)	(664,672)
Funding Ratios										
Current Assets (MVA)	10,586,720	10,648,526	10,691,414	10,713,909	10,714,195	10,690,883	10,642,216	10,566,519	10,461,516	10,323,910
Actuarial Accrued Liability (AAL)	17,168,493	17,764,761	18,381,187	19,018,887	19,678,856	20,362,658	21,071,799	21,808,144	22,573,314	23,368,246
Unfunded AAL	6,581,773	7,116,235	7,689,773	8,304,978	8,964,661	9,671,775	10,429,583	11,241,625	12,111,798	13,044,336
Funding Ratio	62%	60%	58%	56%	54%	53%	51%	48%	46%	44%
Benefit Payments	1,086,842	1,125,621	1,165,328	1,206,167	1,247,700	1,290,185	1,333,499	1,378,048	1,424,648	1,473,593

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 8.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2017 letter to PERA.

Public Employees Police & Fire Retirement Plan

Scenario: 9.5% investment return for all years

Fiscal year beginning July 1

$ in Thousands	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Contributions (% of Payroll)										
Statutory - Chapter 353	29.5%	29.4%	29.3%	29.3%	29.2%	29.1%	29.1%	29.0%	28.9%	28.9%
Required - Chapter 356 (MVA)	30.3%	30.2%	30.0%	29.9%	29.7%	29.6%	29.4%	29.2%	28.9%	28.7%
Sufficiency / (Deficiency)	(0.8)%	(0.8)%	(0.7)%	(0.6)%	(0.5)%	(0.4)%	(0.3)%	(0.2)%	(0.0)%	0.2%
Contributions										
Statutory - Chapter 353	269,109	277,345	285,562	293,935	302,435	311,178	320,264	329,706	339,482	349,698
Required - Chapter 356 (MVA)	276,513	284,338	292,133	300,022	307,912	315,870	323,853	331,796	339,599	347,235
Sufficiency / (Deficiency)	(7,404)	(6,993)	(6,571)	(6,087)	(5,477)	(4,692)	(3,589)	(2,090)	(117)	2,463
Funding Ratios										
Current Assets (MVA)	7,098,090	7,510,113	7,951,698	8,424,885	8,931,581	9,473,651	10,052,188	10,669,577	11,328,447	12,031,514
Actuarial Accrued Liability (AAL)	8,505,963	8,881,443	9,282,567	9,711,295	10,169,357	10,658,434	11,179,376	11,734,215	12,325,196	12,954,650
Unfunded AAL	1,407,873	1,371,330	1,330,869	1,286,410	1,237,776	1,184,783	1,127,188	1,064,638	996,749	923,136
Funding Ratio	83%	85%	86%	87%	88%	89%	90%	91%	92%	93%
Benefit Payments	518,589	535,939	554,007	573,274	593,926	616,984	641,412	667,205	694,497	723,334

Numbers may not add due to rounding.

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Public Employees Police & Fire Retirement Plan

Scenario: 9.5% investment return for all years

Fiscal year beginning July 1

$ in Thousands	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Contributions (% of Payroll)										
Statutory - Chapter 353	28.8%	28.8%	28.0%	28.0%	28.0%	27.9%	27.0%	27.0%	27.0%	27.0%
Required - Chapter 356 (MVA)	28.4%	28.0%	27.5%	25.8%	23.7%	21.9%	20.6%	19.2%	17.8%	16.2%
Sufficiency / (Deficiency)	0.5%	0.8%	0.5%	2.2%	4.2%	6.0%	6.4%	7.8%	9.3%	10.8%
Contributions										
Statutory - Chapter 353	360,375	371,542	374,332	386,513	399,223	412,447	412,514	426,809	441,604	456,995
Required - Chapter 356 (MVA)	354,552	361,391	367,622	356,432	338,871	323,614	314,342	303,644	290,377	274,320
Sufficiency / (Deficiency)	5,823	10,151	6,710	30,081	60,352	88,833	98,172	123,165	151,227	182,675
Funding Ratios										
Current Assets (MVA)	12,781,812	13,582,820	14,434,199	15,326,237	16,271,709	17,275,000	18,341,042	19,460,661	20,652,657	21,922,765
Actuarial Accrued Liability (AAL)	13,625,110	14,339,496	15,096,871	15,746,926	16,416,458	17,106,234	17,817,215	18,550,184	19,306,188	20,085,875
Unfunded AAL	843,298	756,676	662,672	420,689	144,749	(168,766)	(523,827)	(910,477)	(1,346,469)	(1,836,890)
Funding Ratio	94%	95%	96%	97%	99%	101%	103%	105%	107%	109%
Benefit Payments	753,584	784,000	830,477	872,503	915,716	959,975	1,005,525	1,052,214	1,100,488	1,150,664

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 8.0%.

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Public Employees Police & Fire Retirement Plan

Scenario: 9.5% investment return for all years

Fiscal year beginning July 1

$ in Thousands	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**	**2044**	**2045**
Contributions (% of Payroll)										
Statutory - Chapter 353	27.0%	27.0%	27.0%	27.0%	27.0%	27.0%	27.0%	27.0%	27.0%	27.0%
Required - Chapter 356 (MVA)	14.6%	12.8%	11.0%	9.0%	6.9%	4.7%	2.4%	0.0%	0.0%	0.0%
Sufficiency / (Deficiency)	12.4%	14.2%	16.0%	18.0%	20.1%	22.3%	24.6%	27.0%	27.0%	27.0%
Contributions										
Statutory - Chapter 353	472,978	489,605	506,925	524,905	543,634	563,101	583,375	604,385	626,098	648,576
Required - Chapter 356 (MVA)	255,126	232,452	205,921	175,061	139,451	98,531	51,763	-	-	-
Sufficiency / (Deficiency)	217,852	257,153	301,004	349,844	404,183	464,570	531,612	604,385	626,098	648,576
Funding Ratios										
Current Assets (MVA)	23,277,036	24,722,570	26,267,063	27,919,224	29,688,344	31,585,135	33,621,124	35,809,219	38,163,102	40,696,927
Actuarial Accrued Liability (AAL)	20,889,646	21,718,420	22,573,080	23,454,848	24,364,835	25,304,722	26,276,150	27,281,118	28,321,403	29,398,124
Unfunded AAL	(2,387,390)	(3,004,150)	(3,693,983)	(4,464,376)	(5,323,509)	(6,280,413)	(7,344,974)	(8,528,101)	(9,841,699)	(11,298,803)
Funding Ratio	111%	114%	116%	119%	122%	125%	128%	131%	135%	138%
Benefit Payments	1,202,285	1,255,478	1,310,020	1,366,118	1,423,340	1,481,873	1,541,513	1,602,616	1,665,945	1,731,728

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 8.0%.