PUBLIC EMPLOYEES
RETIREMENT ASSOCIATION

Date: February 13, 2025
To: PERA Board of Trustees
From: Doug Anderson, ASA, MAAA, Executive Director
Subject: Actuarial Updates (30-year projections and postretirement cost studies)

PERA's retained actuary, GRS Consulting, has provided 30-year projections for the General Employees, Police & Fire, and Local Government Correctional Service plans. They have also provided updated postretirement increase cost studies for the General Employees and Police & Fire plans in response to both PERA and stakeholder legislative initiatives.

The 30-year projections include projections of estimated funded status, required contributions, and statutory contributions under three asset return scenarios as required by the Minnesota Standards for Actuarial Work. The estimates are based on participant data, assets, and plan provisions as outlined in each plan's 2024 actuarial valuation. The assumptions for the General Employees Plan are those used in the actuarial funding valuation as of July 1, 2024. The assumptions for the Police & Fire Plan and Local Government Correctional Service Plan are those recommended by GRS and accepted by the Board. A request for approval of those assumptions by the LCPR is expected this session.

GRS has also provided a cost analysis for various increases in the postretirement increase formula for the General Plan and the Police & Fire Plan. These increases are based on the same assumptions as noted above. A cost estimate for the removal of the two-year postretirement increase delay in the Police & Fire Plan is also included.

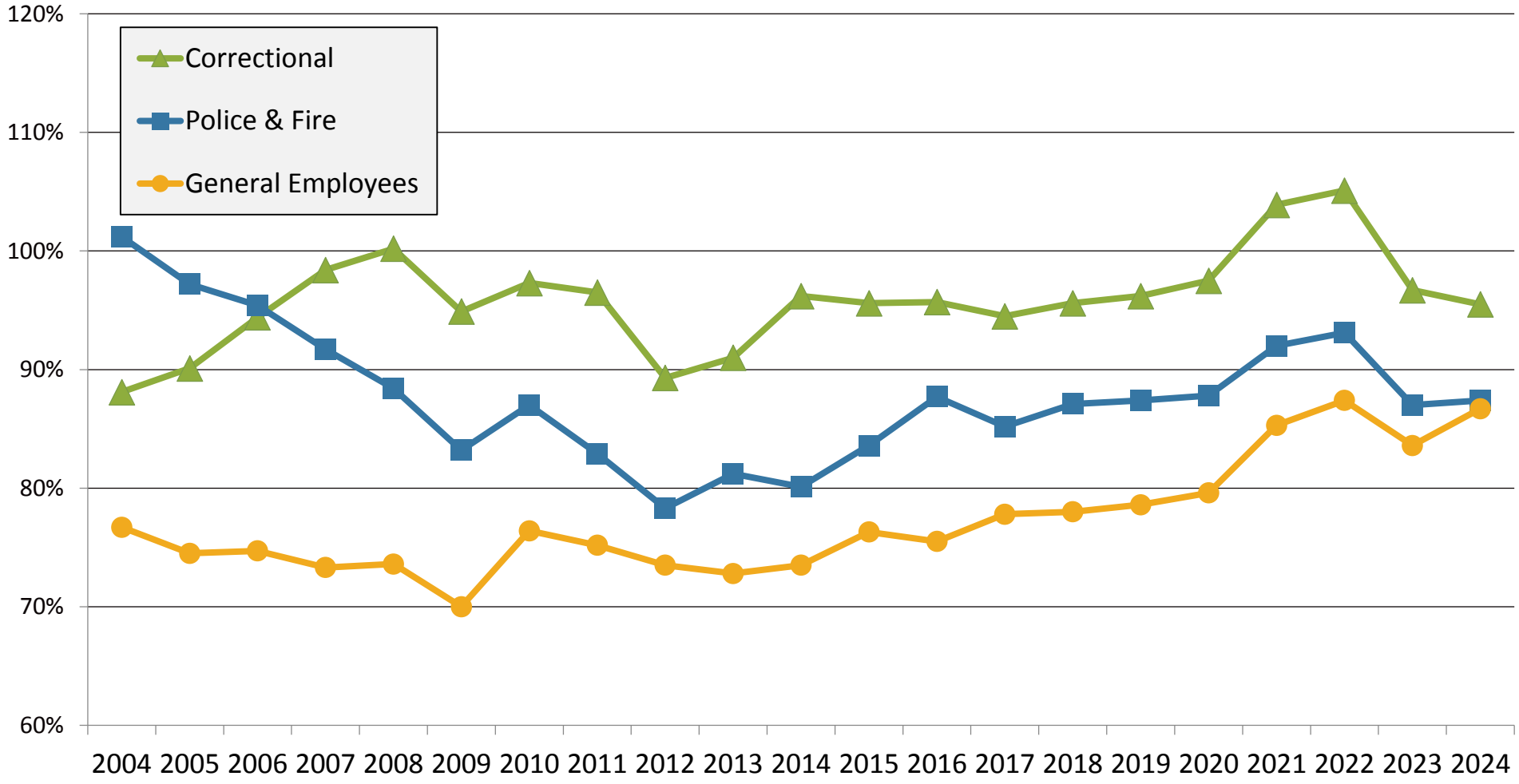
PERA staff has summarized the projection results (assuming only the 7.0% investment return assumption is met) and the cost study results in separate exhibits.

Also included is the August 2024 Survey of Capital Market Assumptions prepared by Horizon Actuarial. The report provides information helpful in assessing the investment return assumption. In particular, staff notes the information on page 10 as useful. Specifically, the report states "Based on the average assumptions from the 2024 survey, the probability of this hypothetical plan meeting or exceeding an annualized return of 7.00% over the next 20 years is 50.2%." This percentage is only slightly lower than the previous year result of 52.8%.

While this is the result for a hypothetical portfolio, it should provide the Board with support that the legislatively determined investment return assumption of 7.0% does not need to change at this time.

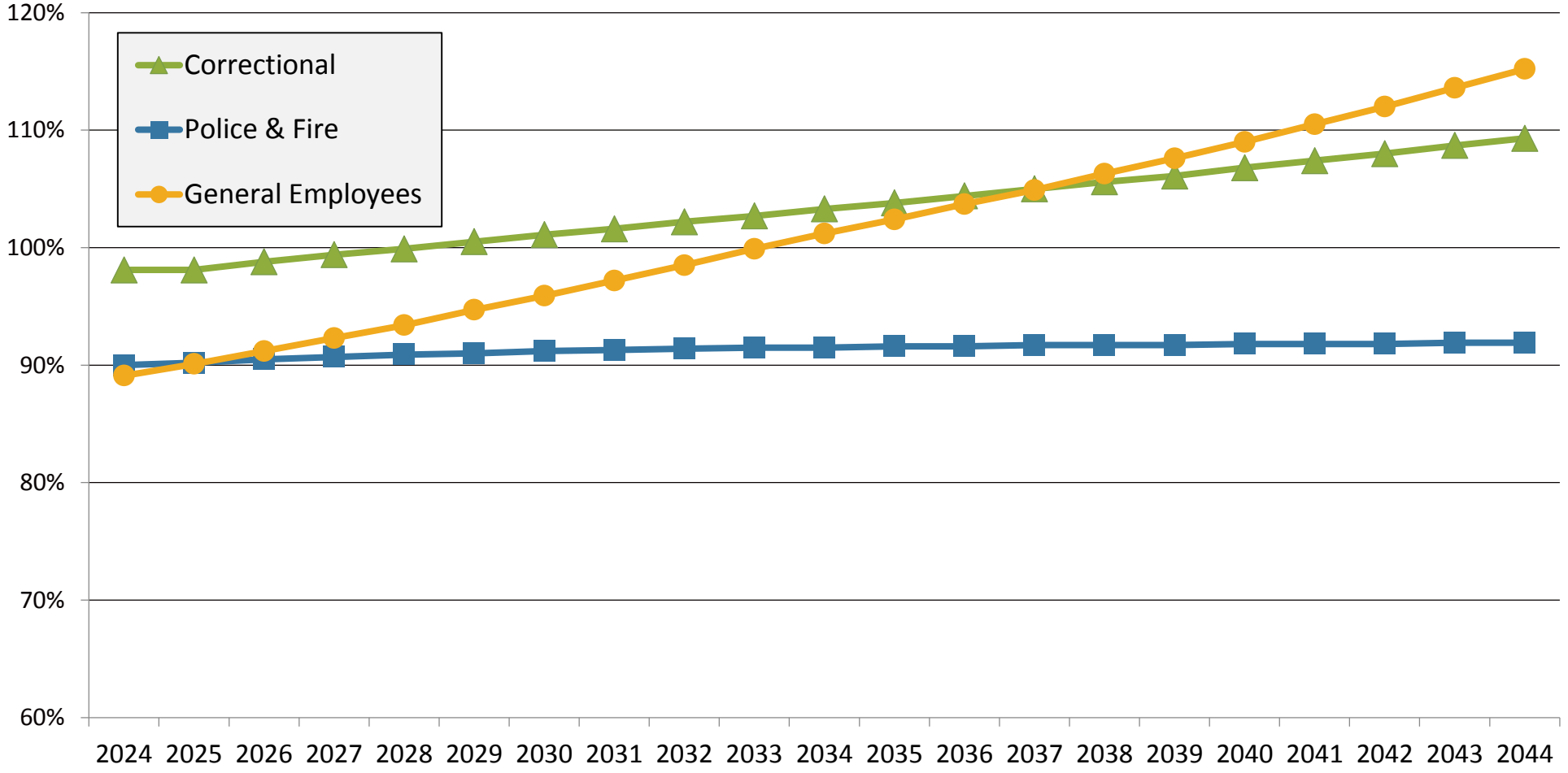
20-year Funding Ratio History

PERA plans have not been able to meet the objective of achieving and maintaining fully funding status over the past 20 years. Shown below is the ratio of Actuarial Value of Assets (AVA) to the Actuarial Accrued Liability (AAL).



20-year Funding Ratio Forecast

The funding ratios shown below assume all plan assumptions are met, including the 7.0% investment return. Results are based on the ratio of the Market Value of Assets (MVA) to the Actuarial Accrued Liability (AAL) and reflect GRS recommended assumptions for the Police & Fire and Correctional Plans.



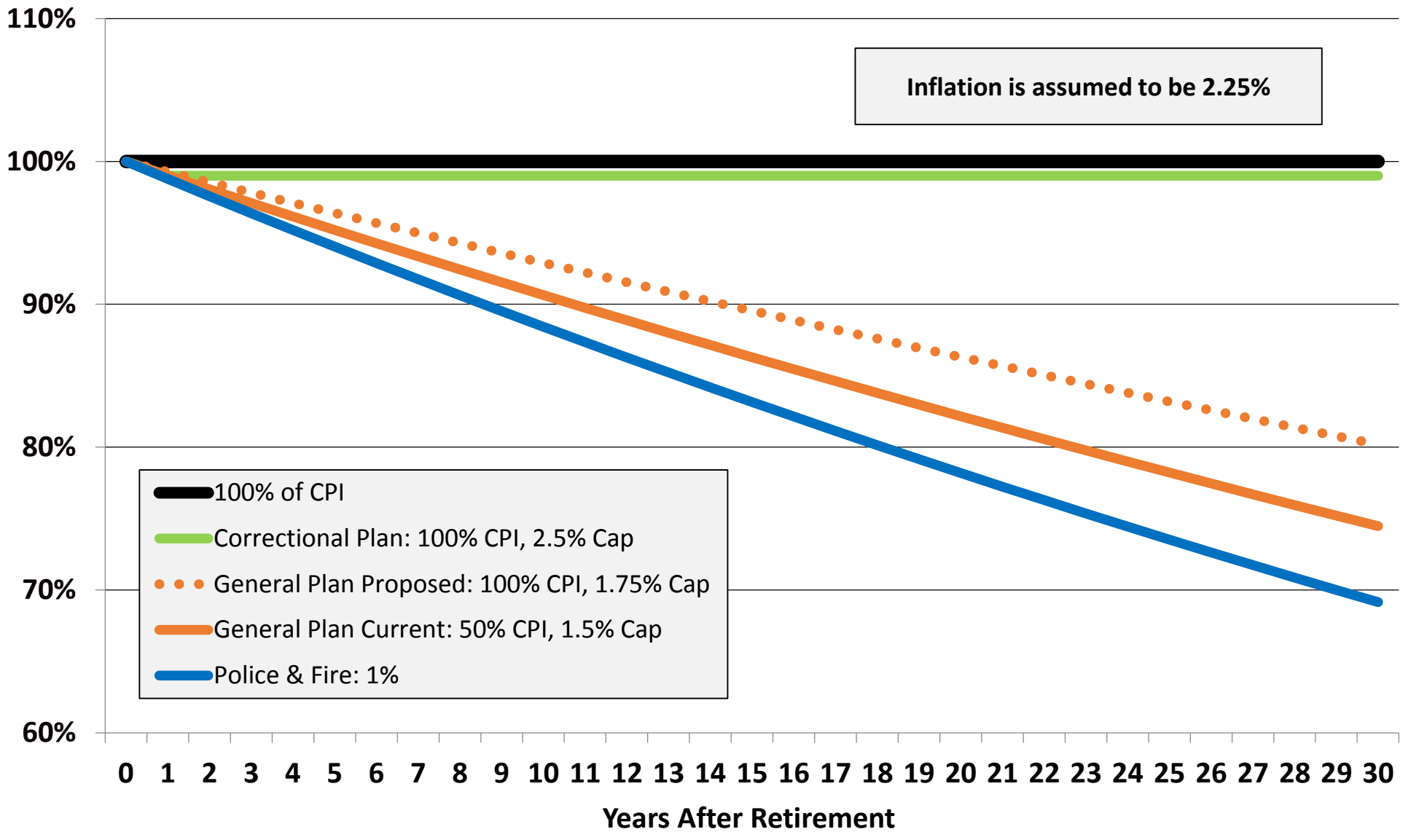
Costs to Increase Postretirement Increases

Cost to Improve the Postretirement Annual Increase Formula
(% of payroll / Annual $ Amount / Change in Present Value of Benefits (PVB))

Plan	Current Annual Increase	Formula: 50% CPI 1% Min 1.25% Max	*(General)* 50% CPI 1% Min 1.5% Max	50% CPI 1% Min 2.0% Max	100% CPI 1% Min 2.0% Max	100% CPI 1% Min 2.0% Max	*(Correctional)* 100% CPI 1% Min 2.5% Max
		Assumed Increase:					
		1.125%	1.25%	1.35%	1.5%	1.70%	2.0%
Police & Fire	**1%**	**1.2% $15M/Year $200M PVB**	**2.3% $30M/Year $403M PVB**	**3.3% $43M/Year $569M PVB**	**4.7% $62M/Year $824M PVB**	**6.7% $88M/Year $1.2B PVB**	**9.8% $130M/Year $1.7B PVB**
General Employees	**50% CPI 1% Min 1.5% Max**			**0.3% $25M/Year $349M PVB**	**0.8% $64M/Year $878M PVB**	**1.4% $117M/Year $1.6B PVB**	**2.4% $200M/Year $2.7B PVB**
Correctional Officers	**100% CPI 1% Min 2.5% Max**						

Annual amounts are first year amounts based on expected FY25 payroll and would increase annually at the rate of total payroll growth (assumed 3%/year) until 2048 (the Plan's amortization period). Police & Fire costs do not include the cost to remove the 2-year delay in postretirement increases (which costs 1.0% of payroll, $14M/Year, $166M PVB). The PVB is the full one-time cost.

Purchasing Power Protection



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January 31, 2025

CONFIDENTIAL

Mr. Doug Anderson
Executive Director
Public Employees Retirement Association of Minnesota
60 Empire Drive, Suite 200
St. Paul, MN 55103

Re: Projection of Contributions and Funding Status – General Employees Plan

Dear Mr. Anderson:

Attached are 30-year projections of estimated funded status, required contributions, and statutory contributions under three asset return scenarios for the General Employees Retirement Plan. These projections, including the underlying investment return assumptions, are required by the Minnesota Standards for Actuarial Work. Unless noted otherwise, the estimates are based on participant data, assets, and plan provisions as outlined in the General Employees Retirement Plan actuarial funding valuation as of July 1, 2024.

Basis for Projections

For all enclosed projections, liabilities are determined using the statutory investment return assumption of 7.0%. As required by the Minnesota Standards for Actuarial Work, the projections reflect three asset return scenarios (7.0%, 5.5% and 8.5%). Note that we believe the 8.5% rate of return assumption is outside of the range of reasonable expected returns for this plan.

The estimates are based on the market value of assets with no smoothing of investment gains or losses. Consequently, the required contributions for the fiscal year will not match the figures based on the actuarial value of assets shown in our valuation report. Payroll is assumed to increase approximately 3.0% 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 164,224 members. The profile of these new members is the same as new members hired between July 1, 2018 and June 30, 2023. Average salary at hire increases at the assumed payroll growth rate.

- Average age at hire is 37.6
- Average salary at hire is $39,500
- Approximately 69% female, 31% male

If actuarial accrued liability exceeds assets, the unfunded actuarial accrued liability is amortized through June 30, 2048 per Minnesota Statute 356.215, Subdivision 11. 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.

Additional employer contributions of 1.0% of payroll expire when the plan reaches 100% funding (on an Actuarial Value basis). The additional employer contributions are projected to be eliminated in fiscal years ending 2031 and 2035 in the 8.5% and 7.0% investment return scenarios, respectively.

Actual benefit increases will equal one-half the Social Security Cost-of-Living Adjustment, not less than 1.00% and not more than 1.50%. The projections assume a constant post-retirement benefit increase of 1.25%. If actual benefit increases are greater than assumed, liabilities and required contributions will be greater than the amounts shown in the enclosed projections. More information about this assumption can be found in the valuation report as of July 1, 2024.

Comments

The reader should keep the following in mind when reviewing these results:

- The enclosed projections are based on assumptions as outlined in the General Employees Retirement Plan actuarial funding valuation as of July 1, 2024.
- Statutory contributions are defined in statutes as a fixed percentage of payroll plus any statutory supplemental contributions and represent the amount that is actually contributed to the plan. Required contributions are defined in statutes and the LCPR Standards for Actuarial Work and represent the amount needed to fully fund the plan by June 30, 2048 (normal cost, expenses and a payment to amortize the unfunded liability).
- Investment experience that has occurred since the measurement date is not reflected in this report.
- In the 7.0% and 8.5% investment return scenarios, surplus assets reduce the projected required contributions to amounts less than normal cost. We typically recommend the contribution be at least equal to the normal cost of the plan and suggest that plans with considerable surplus assets investigate the pros and cons of reducing the risk of the plan's investment allocation to preserve surplus assets.
- 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 scenario investment return. Each year, a larger proportion of assets is paid out in benefits, and less capital is available to invest.

Disclosures

The purpose of this report is to estimate the Fund's funding progress and required contribution rates over a 30-year period according to prescribed assumptions and the Minnesota Standards for Actuarial Work. 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.

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

The combined effect of the assumptions is expected to have no significant bias (i.e., not significantly optimistic or pessimistic). All actuarial assumptions and methods used in this report follow the guidance in the applicable Actuarial Standards of Practice. Additional information about the actuarial assumptions can be found in the Actuarial Basis section of the July 1, 2024 valuation report.

The contribution rates shown in this report have been determined using the actuarial assumptions and methods disclosed in the Actuarial Basis section of the July 1, 2024 valuation report. This valuation report includes risk metrics on pages 7 through 10, but does not include a robust assessment of the risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment.

We have assessed that the contribution rate calculated under the 7.0% investment return scenario is a reasonable Actuarially Determined Employer Contribution (ADEC) and it is consistent with the plan accumulating adequate assets to make benefit payments when due.

The projections assume 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 valuation was based upon information furnished by the Public Employees Retirement Association (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.

This report was prepared using our proprietary valuation model and related software which, in our professional judgement, has the capability to provide results that are consistent with the purposes of the valuation and has no material limitations or known weaknesses. We performed tests to ensure that the model reasonably represents that which is intended to be modeled.

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

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, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board and with applicable statutes.

Bonita J. Wurst and Sheryl L. Christensen 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. The signing actuaries are independent of the plan sponsor. We are not aware of any relationship that would impair the objectivity of our work.

Respectfully submitted,
Gabriel, Roeder, Smith & Company

Bonita J. Wurst

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

Sheryl Christensen

Sheryl L. Christensen, FSA, EA, FCA, MAAA

BJW/SLC:dj

Other Observations

General Implications of the 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, Chapter 356 required contributions are made, and all actuarial assumptions are met (including the assumption of the plan earning 7.00% on the actuarial value of assets, as prescribed by statutes), 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 24 years; and
(3) The unfunded liability will grow initially as a dollar amount for 2 years (based on the current 24-year amortization period and if contributions are equal to the required contribution 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 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.

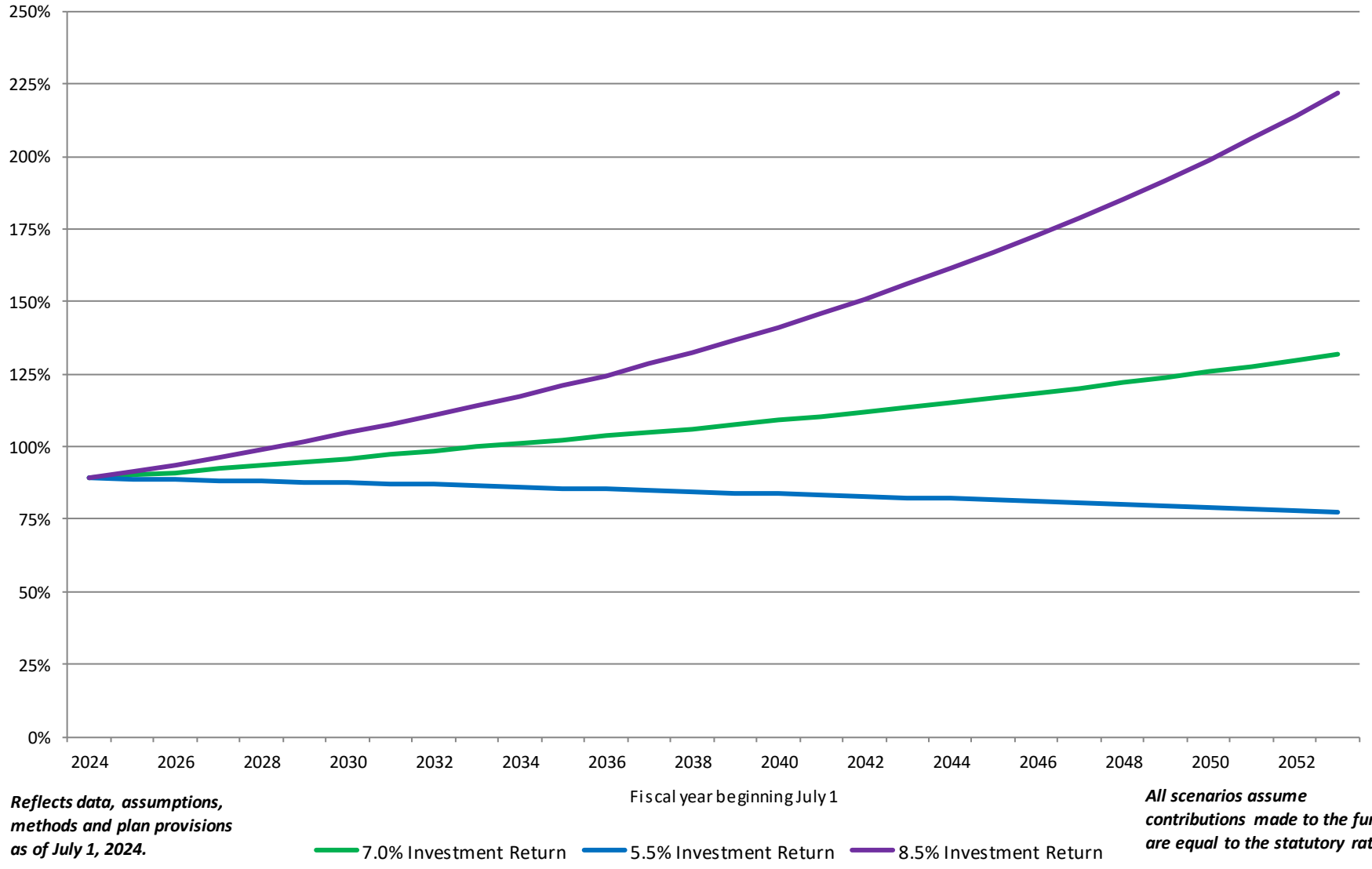
Limitations of Project Scope

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.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

PERA General Employees Retirement Plan
Estimated Accrued Liability Funded Ratio
(Market Value of Assets Basis)

In all scenarios, the interest rate used to discount liabilities was 7.00%.



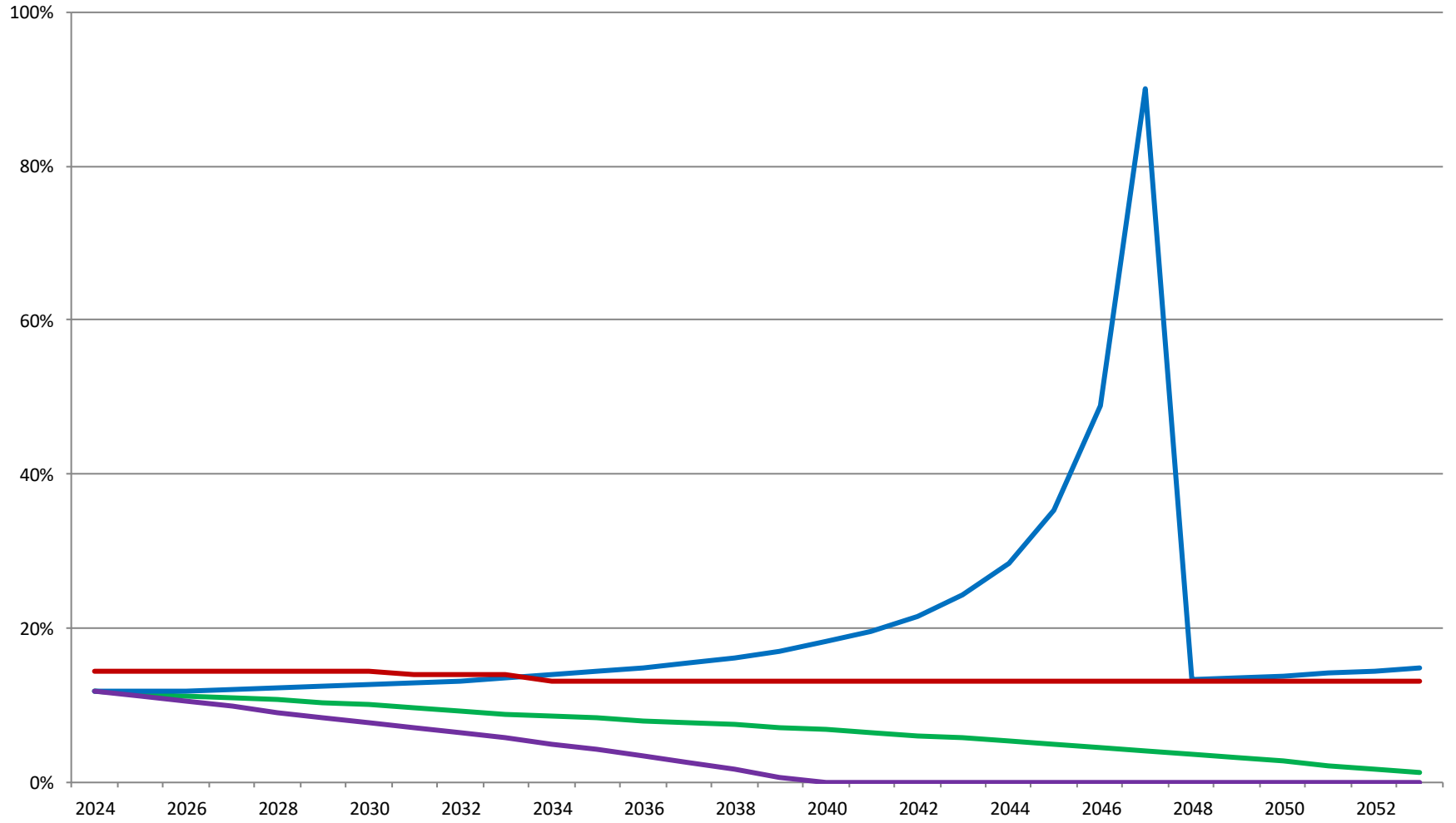
Reflects data, assumptions, methods and plan provisions as of July 1, 2024.

All scenarios assume contributions made to the fund are equal to the statutory rate.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

PERA General Employees Retirement Plan
Estimated Required Contribution Rates
(% of Pay, Market Value of Assets Basis)

In all scenarios, the interest rate used to discount liabilities was 7.00%.



Reflects data, assumptions, methods and plan provisions as of July 1, 2024.

All scenarios assume contributions made to the fund are equal to the statutory rate.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

General Employees Retirement Plan
Scenario: 7.0% Investment Return for All Years
Fiscal Year Beginning July 1

$ in Thousands	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Contributions (% of Payroll)										
Statutory - Chapter 353	14.44%	14.42%	14.40%	14.39%	14.38%	14.37%	14.36%	14.00%	14.00%	14.00%
Required - Chapter 356 (MVA)	11.67%	11.44%	11.18%	10.93%	10.66%	10.36%	10.03%	9.66%	9.28%	8.84%
Sufficiency / (Deficiency)	2.77%	2.98%	3.22%	3.46%	3.72%	4.01%	4.33%	4.34%	4.72%	5.16%
Contributions										
Statutory - Chapter 353	$ 1,219,810	$ 1,262,499	$ 1,316,323	$ 1,363,785	$ 1,407,786	$ 1,451,585	$ 1,495,447	$ 1,502,790	$ 1,547,847	$ 1,593,795
Required - Chapter 356 (MVA)	986,100	1,001,364	1,021,694	1,035,573	1,043,413	1,046,773	1,044,974	1,037,243	1,025,696	1,006,108
Sufficiency / (Deficiency)	233,710	261,136	294,629	328,212	364,374	404,812	450,472	465,548	522,151	587,686
Funding Ratios										
Current Assets (MVA)	$30,162,004	$31,456,279	$32,799,708	$34,200,492	$35,664,763	$37,196,695	$38,802,514	$40,489,571	$42,227,171	$44,058,307
Actuarial Accrued Liability (AAL)	33,858,933	34,912,782	35,983,476	37,066,424	38,169,925	39,297,432	40,452,396	41,639,090	42,861,506	44,123,021
Unfunded AAL	3,696,929	3,456,503	3,183,768	2,865,932	2,505,161	2,100,736	1,649,882	1,149,519	634,335	64,714
Funding Ratio	89.1%	90.1%	91.2%	92.3%	93.4%	94.7%	95.9%	97.2%	98.5%	99.9%
Benefit Payments	$ 1,986,430	$ 2,068,344	$ 2,156,574	$ 2,236,519	$ 2,313,332	$ 2,388,507	$ 2,461,638	$ 2,533,393	$ 2,604,726	$ 2,675,241
Ratio of Assets to Benefit Payments	15.18	15.21	15.21	15.29	15.42	15.57	15.76	15.98	16.21	16.47

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

General Employees Retirement Plan
Scenario: 7.0% Investment Return for All Years
Fiscal Year Beginning July 1

$ in Thousands	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Contributions (% of Payroll)										
Statutory - Chapter 353	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%
Required - Chapter 356 (MVA)	8.51%	8.24%	7.97%	7.68%	7.38%	7.07%	6.74%	6.40%	6.05%	5.68%
Sufficiency / (Deficiency)	4.49%	4.76%	5.03%	5.32%	5.62%	5.93%	6.26%	6.60%	6.95%	7.32%
Contributions										
Statutory - Chapter 353	$ 1,523,558	$ 1,567,974	$ 1,613,309	$ 1,659,831	$ 1,707,489	$ 1,756,182	$ 1,805,963	$ 1,856,857	$ 1,908,951	$ 1,962,345
Required - Chapter 356 (MVA)	997,343	994,407	988,820	980,545	969,284	954,695	936,528	914,503	888,356	857,790
Sufficiency / (Deficiency)	526,215	573,567	624,488	679,286	738,205	801,487	869,435	942,354	1,020,595	1,104,554
Funding Ratios										
Current Assets (MVA)	$45,991,278	$47,913,726	$49,942,344	$52,085,070	$54,352,398	$56,756,246	$59,306,500	$62,013,482	$64,886,662	$67,936,656
Actuarial Accrued Liability (AAL)	45,427,709	46,779,898	48,182,182	49,638,178	51,153,653	52,735,601	54,388,675	56,117,544	57,925,640	59,817,119
Unfunded AAL	(563,569)	(1,133,828)	(1,760,162)	(2,446,892)	(3,198,745)	(4,020,645)	(4,917,825)	(5,895,938)	(6,961,021)	(8,119,537)
Funding Ratio	101.2%	102.4%	103.7%	104.9%	106.3%	107.6%	109.0%	110.5%	112.0%	113.6%
Benefit Payments	$ 2,744,998	$ 2,815,933	$ 2,887,278	$ 2,957,365	$ 3,025,474	$ 3,094,281	$ 3,164,080	$ 3,236,421	$ 3,310,919	$ 3,388,541
Ratio of Assets to Benefit Payments	16.75	17.02	17.30	17.61	17.96	18.34	18.74	19.16	19.60	20.05

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

General Employees Retirement Plan
Scenario: 7.0% Investment Return for All Years
Fiscal Year Beginning July 1

$ in Thousands	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Contributions (% of Payroll)										
Statutory - Chapter 353	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%
Required - Chapter 356 (MVA)	5.30%	4.90%	4.49%	4.06%	3.61%	3.15%	2.67%	2.17%	1.65%	1.11%
Sufficiency / (Deficiency)	7.70%	8.10%	8.51%	8.94%	9.39%	9.85%	10.33%	10.83%	11.35%	11.89%
Contributions										
Statutory - Chapter 353	$ 2,017,097	$ 2,073,281	$ 2,131,024	$ 2,190,539	$ 2,251,910	$ 2,315,222	$ 2,380,528	$ 2,448,008	$ 2,517,761	$ 2,589,891
Required - Chapter 356 (MVA)	822,448	781,963	735,987	684,160	626,000	560,996	488,584	408,241	319,317	221,130
Sufficiency / (Deficiency)	1,194,649	1,291,317	1,395,037	1,506,379	1,625,910	1,754,226	1,891,943	2,039,767	2,198,445	2,368,761
Funding Ratios										
Current Assets (MVA)	$71,173,926	$74,609,024	$ 78,252,409	$ 82,115,200	$ 86,208,874	$ 90,547,034	$ 95,143,553	$ 100,012,120	$ 105,166,852	$ 110,623,170
Actuarial Accrued Liability (AAL)	61,795,496	63,863,898	66,024,794	68,280,710	70,633,813	73,087,730	75,645,647	78,309,806	81,081,983	83,964,376
Unfunded AAL	(9,378,430)	(10,745,126)	(12,227,614)	(13,834,489)	(15,575,062)	(17,459,304)	(19,497,907)	(21,702,314)	(24,084,868)	(26,658,794)
Funding Ratio	115.2%	116.8%	118.5%	120.3%	122.1%	123.9%	125.8%	127.7%	129.7%	131.8%
Benefit Payments	$ 3,469,964	$ 3,556,063	$ 3,647,033	$ 3,743,487	$ 3,844,234	$ 3,950,009	$ 4,061,987	$ 4,180,852	$ 4,306,398	$ 4,438,809
Ratio of Assets to Benefit Payments	20.51	20.98	21.46	21.94	22.43	22.92	23.42	23.92	24.42	24.92

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

General Employees Retirement Plan
Scenario: 5.5% Investment Return for All Years
Fiscal Year Beginning July 1

$ in Thousands	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Contributions (% of Payroll)										
Statutory - Chapter 353	14.44%	14.42%	14.40%	14.39%	14.38%	14.37%	14.36%	14.00%	14.00%	14.00%
Required - Chapter 356 (MVA)	11.67%	11.78%	11.88%	12.02%	12.19%	12.37%	12.58%	12.82%	13.11%	13.45%
Sufficiency / (Deficiency)	2.77%	2.64%	2.52%	2.37%	2.19%	2.00%	1.78%	1.18%	0.89%	0.55%
Contributions										
Statutory - Chapter 353	$ 1,219,810	$ 1,262,499	$ 1,316,323	$ 1,363,785	$ 1,407,786	$ 1,451,585	$ 1,495,447	$ 1,502,790	$ 1,547,847	$ 1,593,795
Required - Chapter 356 (MVA)	986,100	1,031,030	1,085,700	1,139,347	1,193,292	1,250,205	1,310,768	1,375,897	1,449,808	1,530,943
Sufficiency / (Deficiency)	233,710	231,470	230,623	224,438	214,494	201,380	184,679	126,893	98,039	62,852
Funding Ratios										
Current Assets (MVA)	$30,162,004	$31,009,770	$31,863,017	$32,726,775	$33,603,722	$34,494,315	$35,400,784	$36,326,165	$37,235,381	$38,166,712
Actuarial Accrued Liability (AAL)	33,858,933	34,912,782	35,983,476	37,066,424	38,169,925	39,297,432	40,452,396	41,639,090	42,861,506	44,123,021
Unfunded AAL	3,696,929	3,903,012	4,120,459	4,339,649	4,566,203	4,803,117	5,051,612	5,312,925	5,626,125	5,956,310
Funding Ratio	89.1%	88.8%	88.6%	88.3%	88.0%	87.8%	87.5%	87.2%	86.9%	86.5%
Benefit Payments	$ 1,986,430	$ 2,068,344	$ 2,156,574	$ 2,236,519	$ 2,313,332	$ 2,388,507	$ 2,461,638	$ 2,533,393	$ 2,604,726	$ 2,675,241
Ratio of Assets to Benefit Payments	15.18	14.99	14.77	14.63	14.53	14.44	14.38	14.34	14.30	14.27

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

General Employees Retirement Plan
Scenario: 5.5% Investment Return for All Years
Fiscal Year Beginning July 1

$ in Thousands	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Contributions (% of Payroll)										
Statutory - Chapter 353	14.00%	14.00%	14.00%	14.00%	14.00%	14.00%	14.00%	14.00%	14.00%	14.00%
Required - Chapter 356 (MVA)	13.83%	14.27%	14.79%	15.40%	16.13%	17.03%	18.16%	19.61%	21.56%	24.29%
Sufficiency / (Deficiency)	0.17%	(0.27)%	(0.79)%	(1.40)%	(2.13)%	(3.03)%	(4.16)%	(5.61)%	(7.56)%	(10.29)%
Contributions										
Statutory - Chapter 353	$ 1,640,755	$ 1,688,588	$ 1,737,409	$ 1,787,510	$ 1,838,834	$ 1,891,273	$ 1,944,883	$ 1,999,692	$ 2,055,793	$ 2,113,294
Required - Chapter 356 (MVA)	1,620,847	1,721,359	1,835,174	1,966,041	2,118,882	2,300,820	2,522,692	2,801,499	3,165,602	3,665,980
Sufficiency / (Deficiency)	19,908	(32,771)	(97,764)	(178,530)	(280,048)	(409,547)	(577,809)	(801,807)	(1,109,809)	(1,552,685)
Funding Ratios										
Current Assets (MVA)	$39,123,112	$40,107,759	$41,121,878	$42,167,663	$43,249,437	$44,372,445	$45,539,361	$46,752,761	$48,013,798	$49,324,177
Actuarial Accrued Liability (AAL)	45,427,709	46,779,898	48,182,182	49,638,178	51,153,653	52,735,601	54,388,675	56,117,544	57,925,640	59,817,119
Unfunded AAL	6,304,597	6,672,138	7,060,305	7,470,515	7,904,215	8,363,156	8,849,314	9,364,783	9,911,843	10,492,942
Funding Ratio	86.1%	85.7%	85.4%	85.0%	84.6%	84.1%	83.7%	83.3%	82.9%	82.5%
Benefit Payments	$ 2,744,998	$ 2,815,933	$ 2,887,278	$ 2,957,365	$ 3,025,474	$ 3,094,281	$ 3,164,080	$ 3,236,421	$ 3,310,919	$ 3,388,541
Ratio of Assets to Benefit Payments	14.25	14.24	14.24	14.26	14.30	14.34	14.39	14.45	14.50	14.56

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

General Employees Retirement Plan
Scenario: 5.5% Investment Return for All Years
Fiscal Year Beginning July 1

$ in Thousands	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Contributions (% of Payroll)										
Statutory - Chapter 353	14.00%	14.00%	14.00%	14.00%	14.00%	14.00%	14.00%	14.00%	14.00%	14.00%
Required - Chapter 356 (MVA)	28.39%	35.23%	48.94%	90.07%	13.34%	13.57%	13.82%	14.09%	14.38%	14.70%
Sufficiency / (Deficiency)	(14.39)%	(21.23)%	(34.94)%	(76.07)%	0.66%	0.43%	0.18%	(0.09)%	(0.38)%	(0.70)%
Contributions										
Statutory - Chapter 353	$ 2,172,258	$ 2,232,764	$ 2,294,949	$ 2,359,042	$ 2,425,134	$ 2,493,316	$ 2,563,645	$ 2,636,316	$ 2,711,435	$ 2,789,113
Required - Chapter 356 (MVA)	4,404,493	5,618,802	8,021,811	15,177,617	2,310,141	2,416,210	2,530,029	2,652,524	2,784,665	2,927,587
Sufficiency / (Deficiency)	(2,232,235)	(3,386,038)	(5,726,861)	(12,818,575)	114,994	77,106	33,616	(16,207)	(73,229)	(138,473)
Funding Ratios										
Current Assets (MVA)	$50,684,814	$52,096,041	$53,557,389	$55,068,302	$56,627,795	$58,236,143	$59,892,971	$61,596,737	$63,345,305	$65,136,743
Actuarial Accrued Liability (AAL)	61,795,496	63,863,898	66,024,794	68,280,710	70,633,813	73,087,730	75,645,647	78,309,806	81,081,983	83,964,376
Unfunded AAL	11,110,682	11,767,857	12,467,406	13,212,408	14,006,018	14,851,588	15,752,676	16,713,069	17,736,678	18,827,633
Funding Ratio	82.0%	81.6%	81.1%	80.7%	80.2%	79.7%	79.2%	78.7%	78.1%	77.6%
Benefit Payments	$ 3,469,964	$ 3,556,063	$ 3,647,033	$ 3,743,487	$ 3,844,234	$ 3,950,009	$ 4,061,987	$ 4,180,852	$ 4,306,398	$ 4,438,809
Ratio of Assets to Benefit Payments	14.61	14.65	14.69	14.71	14.73	14.74	14.74	14.73	14.71	14.67

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

General Employees Retirement Plan
Scenario: 8.5% Investment Return for All Years
Fiscal Year Beginning July 1

$ in Thousands	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Contributions (% of Payroll)										
Statutory - Chapter 353	14.44%	14.42%	14.40%	14.39%	14.38%	14.37%	13.36%	13.00%	13.00%	13.00%
Required - Chapter 356 (MVA)	11.67%	11.10%	10.47%	9.80%	9.06%	8.23%	7.70%	7.05%	6.39%	5.69%
Sufficiency / (Deficiency)	2.77%	3.32%	3.93%	4.59%	5.32%	6.14%	5.66%	5.95%	6.61%	7.31%
Contributions										
Statutory - Chapter 353	$ 1,219,810	$ 1,262,499	$ 1,316,323	$ 1,363,785	$ 1,407,786	$ 1,451,585	$ 1,391,272	$ 1,395,448	$ 1,437,287	$ 1,479,952
Required - Chapter 356 (MVA)	986,100	971,698	956,772	928,797	886,954	831,297	801,824	756,792	706,315	647,755
Sufficiency / (Deficiency)	233,710	290,801	359,551	434,987	520,832	620,288	589,448	638,656	730,972	832,198
Funding Ratios										
Current Assets (MVA)	$30,162,004	$31,902,788	$33,749,794	$35,716,843	$37,816,275	$40,059,067	$42,458,906	$44,922,734	$47,524,645	$50,316,065
Actuarial Accrued Liability (AAL)	33,858,933	34,912,782	35,983,476	37,066,424	38,169,925	39,297,432	40,452,396	41,639,090	42,861,506	44,123,021
Unfunded AAL	3,696,929	3,009,993	2,233,683	1,349,580	353,650	(761,635)	(2,006,510)	(3,283,644)	(4,663,140)	(6,193,044)
Funding Ratio	89.1%	91.4%	93.8%	96.4%	99.1%	101.9%	105.0%	107.9%	110.9%	114.0%
Benefit Payments	$ 1,986,430	$ 2,068,344	$ 2,156,574	$ 2,236,519	$ 2,313,332	$ 2,388,507	$ 2,461,638	$ 2,533,393	$ 2,604,726	$ 2,675,241
Ratio of Assets to Benefit Payments	15.18	15.42	15.65	15.97	16.35	16.77	17.25	17.73	18.25	18.81

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

General Employees Retirement Plan
Scenario: 8.5% Investment Return for All Years
Fiscal Year Beginning July 1

$ in Thousands	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Contributions (% of Payroll)										
Statutory - Chapter 353	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%
Required - Chapter 356 (MVA)	4.95%	4.17%	3.35%	2.48%	1.56%	0.59%	0.00%	0.00%	0.00%	0.00%
Sufficiency / (Deficiency)	8.05%	8.83%	9.65%	10.52%	11.44%	12.41%	13.00%	13.00%	13.00%	13.00%
Contributions										
Statutory - Chapter 353	$ 1,523,558	$ 1,567,974	$ 1,613,309	$ 1,659,831	$ 1,707,489	$ 1,756,182	$ 1,805,963	$ 1,856,857	$ 1,908,951	$ 1,962,345
Required - Chapter 356 (MVA)	580,393	503,275	415,571	316,477	204,858	79,454	-	-	-	-
Sufficiency / (Deficiency)	943,165	1,064,700	1,197,738	1,343,354	1,502,631	1,676,728	1,805,963	1,856,857	1,908,951	1,962,345
Funding Ratios										
Current Assets (MVA)	$53,314,797	$56,540,216	$60,011,188	$ 63,749,095	$ 67,779,150	$ 72,129,408	$ 76,827,415	$ 81,902,805	$ 87,386,143	$ 93,311,081
Actuarial Accrued Liability (AAL)	45,427,709	46,779,898	48,182,182	49,638,178	51,153,653	52,735,601	54,388,675	56,117,544	57,925,640	59,817,119
Unfunded AAL	(7,887,088)	(9,760,318)	(11,829,005)	(14,110,917)	(16,625,498)	(19,393,807)	(22,438,740)	(25,785,261)	(29,460,503)	(33,493,962)
Funding Ratio	117.4%	120.9%	124.6%	128.4%	132.5%	136.8%	141.3%	146.0%	150.9%	156.0%
Benefit Payments	$ 2,744,998	$ 2,815,933	$ 2,887,278	$ 2,957,365	$ 3,025,474	$ 3,094,281	$ 3,164,080	$ 3,236,421	$ 3,310,919	$ 3,388,541
Ratio of Assets to Benefit Payments	19.42	20.08	20.78	21.56	22.40	23.31	24.28	25.31	26.39	27.54

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

General Employees Retirement Plan
Scenario: 8.5% Investment Return for All Years
Fiscal Year Beginning July 1

$ in Thousands	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Contributions (% of Payroll)										
Statutory - Chapter 353	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%
Required - Chapter 356 (MVA)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Sufficiency / (Deficiency)	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%
Contributions										
Statutory - Chapter 353	$ 2,017,097	$ 2,073,281	$ 2,131,024	$ 2,190,539	$ 2,251,910	$ 2,315,222	$ 2,380,528	$ 2,448,008	$ 2,517,761	$ 2,589,891
Required - Chapter 356 (MVA)	-	-	-	-	-	-	-	-	-	-
Sufficiency / (Deficiency)	2,017,097	2,073,281	2,131,024	2,190,539	2,251,910	2,315,222	2,380,528	2,448,008	2,517,761	2,589,891
Funding Ratios										
Current Assets (MVA)	$ 99,713,225	$ 106,630,562	$ 114,103,469	$122,175,684	$130,894,239	$140,311,495	$150,483,578	$161,470,217	$173,335,692	$186,150,058
Actuarial Accrued Liability (AAL)	61,795,496	63,863,898	66,024,794	68,280,710	70,633,813	73,087,730	75,645,647	78,309,806	81,081,983	83,964,376
Unfunded AAL	(37,917,729)	(42,766,664)	(48,078,674)	(53,894,973)	(60,260,427)	(67,223,765)	(74,837,931)	(83,160,412)	(92,253,708)	(102,185,682)
Funding Ratio	161.4%	167.0%	172.8%	178.9%	185.3%	192.0%	198.9%	206.2%	213.8%	221.7%
Benefit Payments	$ 3,469,964	$ 3,556,063	$ 3,647,033	$ 3,743,487	$ 3,844,234	$ 3,950,009	$ 4,061,987	$ 4,180,852	$ 4,306,398	$ 4,438,809
Ratio of Assets to Benefit Payments	28.74	29.99	31.29	32.64	34.05	35.52	37.05	38.62	40.25	41.94

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

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January 31, 2025

CONFIDENTIAL

Mr. Doug Anderson
Executive Director
Public Employees Retirement Association of Minnesota
60 Empire Drive, Suite 200
St. Paul, MN 55103

Re: Projection of Contributions and Funding Status – Local Correctional Plan

Dear Mr. Anderson:

Attached are 30-year projections of estimated funded status, required contributions, and statutory contributions under three asset return scenarios for the Local Government Correctional Service Retirement Plan. These projections, including the underlying investment return assumptions, are required by the Minnesota Standards for Actuarial Work. Unless noted otherwise, the estimates are based on participant data, assets, and plan provisions as outlined in the Local Government Correctional Service Retirement Plan actuarial funding valuation as of July 1, 2024.

Basis for Projections

For all enclosed projections, liabilities are determined using the statutory investment return assumption of 7.0%. As required by the Minnesota Standards for Actuarial Work, the projections reflect three asset return scenarios (7.0%, 5.5% and 8.5%). Note that we believe the 8.5% rate of return assumption is outside of the range of reasonable expected returns for this plan.

The estimates are based on the market value of assets with no smoothing of investment gains or losses. Payroll is assumed to increase approximately 3.00% 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 3,914 members. The profile of these new members is the same as new members hired between July 1, 2018 and June 30, 2023. Average salary at hire increases at the assumed payroll growth rate.

- Average age at hire is 31.3
- Average salary at hire is $62,900
- Approximately 36% female, 64% male

If actuarial accrued liability exceeds assets, the unfunded actuarial accrued liability is amortized through June 30, 2048 per Minnesota Statute 356.215, Subdivision 11. 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.

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. Actual benefit increases equal the Social Security Cost-of-Living Adjustment, not less than 1.00% and not more than 2.50%. If the funded status declines to 85% for two consecutive years or to 80% for one year (on a market value of assets basis), the maximum is lowered to 1.50%. For the 7.0% and 8.5% investment return scenarios, the projections assume a constant post-retirement benefit increase of 2.00%. More information about this assumption can be found in the valuation report as of July 1, 2024.

For the 5.5% investment return scenario, if all assumptions are met, the funding status of the plan deteriorates to the point that the 1.5% maximum post-retirement benefit increase is estimated to be applied beginning January 1, 2042. In this projection, the accrued liability and normal cost are based on a 2.0% post-retirement benefit increase assumption through December 31, 2041 and a 1.5% post-retirement benefit increase assumption beginning January 1, 2042 and later.

If actual benefit increases are greater than assumed, liabilities and required contributions will be greater than the amounts shown in the enclosed projections.

Comments

The reader should keep the following in mind when reviewing these results:

- The enclosed projections are based on recommended assumption changes as outlined in the Local Government Correctional Service Retirement Plan Four-Year Experience Study for the period July 1, 2019 through June 30, 2023.
- Statutory contributions are defined in statutes as a fixed percentage of payroll plus any statutory supplemental contributions and represent the amount that is actually contributed to the plan. Required contributions are defined in statutes and the LCPR Standards for Actuarial Work and represent the amount needed to fully fund the plan by June 30, 2048 (normal cost, expenses and a payment to amortize the unfunded liability).
- Investment experience that has occurred since the measurement date is not reflected in this report.
- In the 7.0% and 8.5% investment return scenarios, surplus assets reduce the projected required contributions to amounts less than normal cost. We typically recommend the contribution be at least equal to the normal cost of the plan and suggest that plans with considerable surplus assets investigate the pros and cons of reducing the risk of the plan's investment allocation to preserve surplus assets.

- 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 scenario investment return. Each year, a larger proportion of assets is paid out in benefits, and less capital is available to invest.

Disclosures

The purpose of this report is to estimate the fund's funding progress and required contribution rates over a 30-year period according to prescribed assumptions and the Minnesota Standards for Actuarial Work. 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.

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

The combined effect of the assumptions is expected to have no significant bias (i.e., not significantly optimistic or pessimistic). All actuarial assumptions and methods used in this report follow the guidance in the applicable Actuarial Standards of Practice. Additional information about the actuarial assumptions can be found in the Local Government Correctional Service Retirement Plan Four-Year Experience Study for the period July 1, 2019 through June 30, 2023.

The contribution rates shown in this report have been determined using the actuarial methods disclosed in the Actuarial Basis section of the July 1, 2024 valuation report and the recommended assumption changes as outlined in the Public Employees Police and Fire Plan Four-Year Experience Study for the period July 1, 2019 through June 30, 2023. This valuation report includes risk metrics on pages 6-9, but does not include a robust assessment of the risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment.

We have assessed that the contribution rate calculated under the 7.0% investment return scenario is a reasonable Actuarially Determined Employer Contribution (ADEC) and it is consistent with the plan accumulating adequate assets to make benefit payments when due.

The projections assume 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 valuation was based upon information furnished by the Public Employees Retirement Association (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.

This report was prepared using our proprietary valuation model and related software which, in our professional judgement, has the capability to provide results that are consistent with the purposes of the valuation and has no material limitations or known weaknesses. We performed tests to ensure that the model reasonably represents that which is intended to be modeled.

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

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, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board and with applicable statutes.

Bonita J. Wurst and Sheryl L. Christensen 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. The signing actuaries are independent of the plan sponsor. We are not aware of any relationship that would impair the objectivity of our work.

Respectfully submitted,

Gabriel, Roeder, Smith & Company

Bonita J. Wurst

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

Sheryl Christensen

Sheryl L. Christensen, FSA, EA, FCA, MAAA

BJW/SLC:dj
Enclosures

Other Observations

General Implications of the 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, Chapter 356 required contributions are made, and all actuarial assumptions are met (including the assumption of the plan earning 7.00% on the actuarial value of assets, as prescribed by statutes), 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 24 years; and
(3) The unfunded liability will grow initially as a dollar amount for 2 years (based on the current 24-year amortization period and if contributions are equal to the required contribution 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 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.

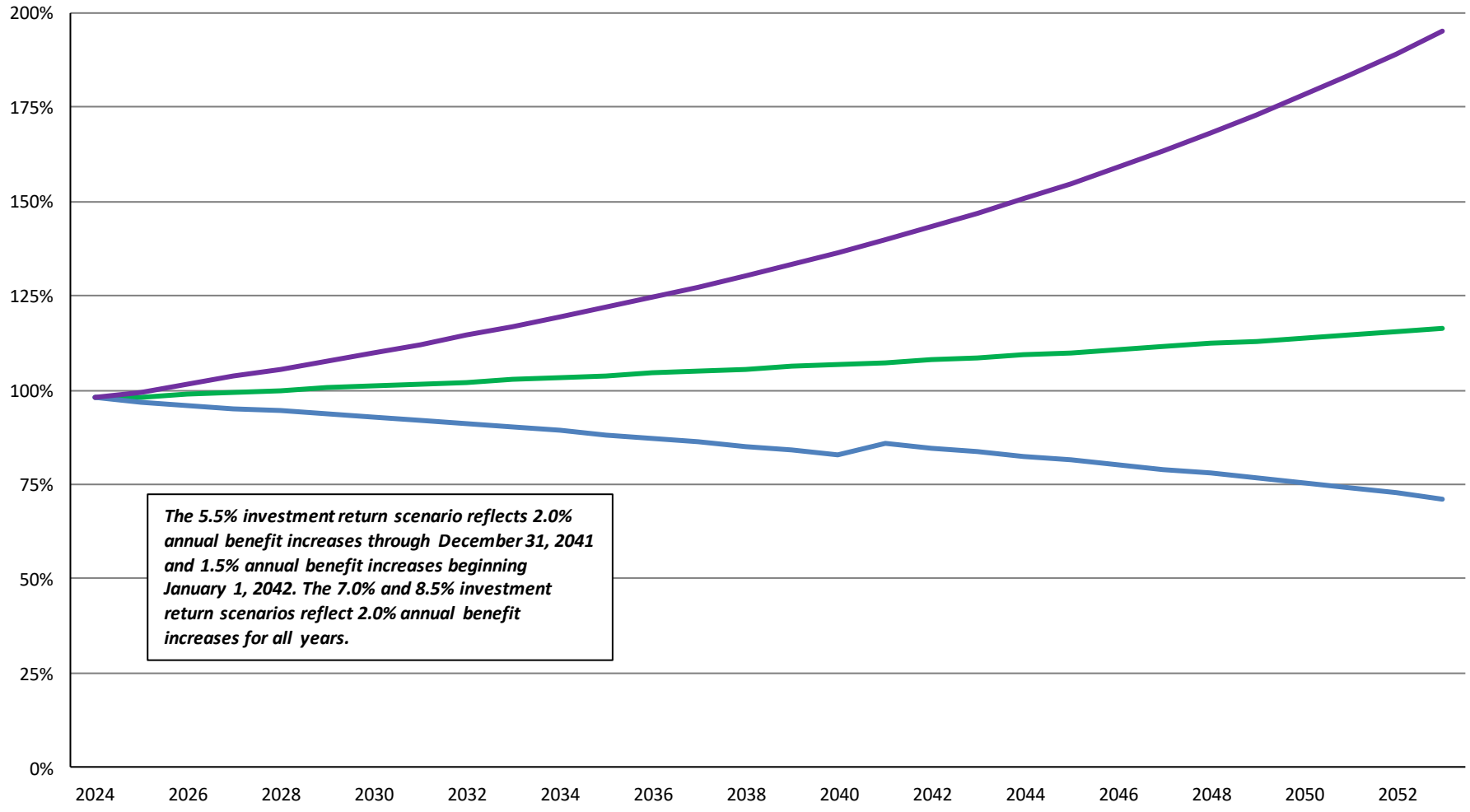
Limitations of Project Scope

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.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

PERA Local Goverment Correctional Service Retirement Plan
Estimated Funded Ratio (MVA Basis)

In all scenarios, the interest rate used to discount liabilities was 7.00%.



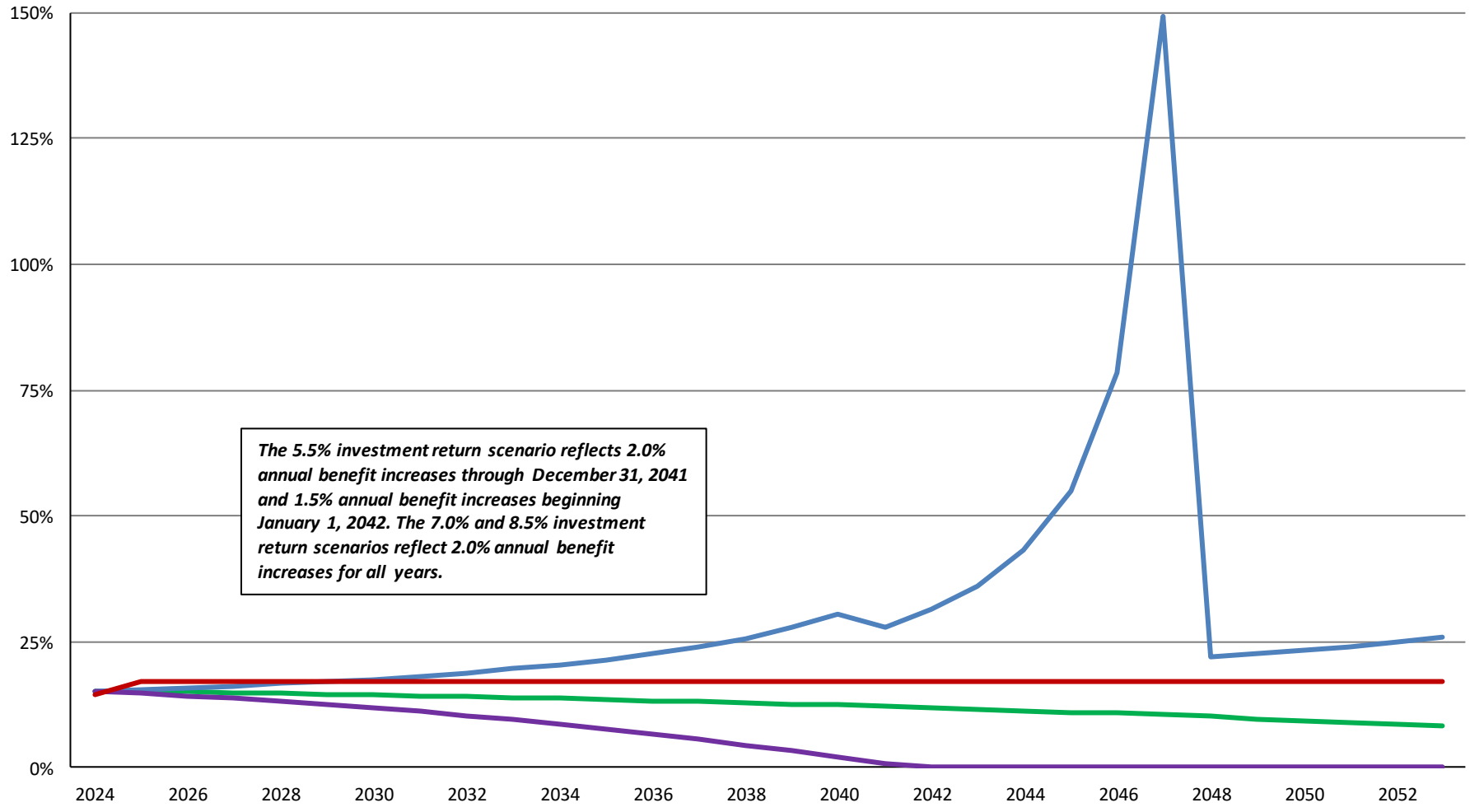
Reflects data, methods and plan provisions as of July 1, 2024 and recommended assumptions from the 2019-2023 experience study.

All scenarios assume contributions made to the fund are equal to the statutory rate.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

PERA Local Goverment Correctional Service Retirement Plan
Estimated Required Contribution Rate (MVA Basis)

In all scenarios, the interest rate used to discount liabilities was 7.00%.



Reflects data, methods and plan provisions as of July 1, 2024 and recommended assumptions from the 2019-2023 experience study.

All scenarios assume contributions made to the fund are equal to the statutory rate.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

Local Government Service Correctional Retirement Plan
Scenario: 7.0% investment return for all years
Fiscal year beginning July 1

$ in Thousands	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Contributions (% of Payroll)										
Statutory - Chapter 353	14.58%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%
Required - Chapter 356 (MVA)	15.12%	15.15%	15.01%	14.84%	14.66%	14.51%	14.36%	14.20%	14.03%	13.86%
Sufficiency / (Deficiency)	(0.54)%	1.93%	2.07%	2.24%	2.42%	2.57%	2.72%	2.88%	3.05%	3.22%
Contributions										
Statutory - Chapter 353	$ 41,075	$ 50,287	$ 52,229	$ 54,047	$ 55,848	$ 57,667	$ 59,487	$ 61,349	$ 63,264	$ 65,210
Required - Chapter 356 (MVA)	42,589	44,606	45,884	46,964	47,941	48,990	50,005	50,997	51,973	52,904
Sufficiency / (Deficiency)	(1,514)	5,681	6,345	7,083	7,906	8,677	9,482	10,351	11,291	12,306
Funding Ratios										
Current Assets (MVA)	$1,208,413	$1,292,919	$1,387,553	$1,485,589	$1,587,348	$1,692,344	$1,800,871	$1,912,976	$2,028,857	$2,148,157
Actuarial Accrued Liability (AAL)	1,232,246	1,317,422	1,405,099	1,495,334	1,588,423	1,683,839	1,781,824	1,882,379	1,985,614	2,091,084
Unfunded AAL	23,833	24,503	17,546	9,746	1,075	(8,505)	(19,046)	(30,597)	(43,243)	(57,074)
Funding Ratio	98.1%	98.1%	98.8%	99.4%	99.9%	100.5%	101.1%	101.6%	102.2%	102.7%
Benefit Payments	$ 40,450	$ 45,561	$ 50,589	$ 55,412	$ 60,942	$ 66,424	$ 72,100	$ 77,869	$ 84,289	$ 90,846
Ratio of Assets to Benefit Payments	29.87	28.38	27.43	26.81	26.05	25.48	24.98	24.57	24.07	23.65

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

Local Government Service Correctional Retirement Plan
Scenario: 7.0% investment return for all years
Fiscal year beginning July 1

$ in Thousands	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Contributions (% of Payroll)										
Statutory - Chapter 353	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%
Required - Chapter 356 (MVA)	13.67%	13.48%	13.28%	13.08%	12.86%	12.63%	12.39%	12.14%	11.88%	11.61%
Sufficiency / (Deficiency)	3.41%	3.60%	3.80%	4.00%	4.22%	4.45%	4.69%	4.94%	5.20%	5.47%
Contributions										
Statutory - Chapter 353	$ 67,211	$ 69,263	$ 71,365	$ 73,532	$ 75,766	$ 78,069	$ 80,435	$ 82,864	$ 85,374	$ 87,941
Required - Chapter 356 (MVA)	53,809	54,678	55,507	56,298	57,042	57,733	58,358	58,906	59,385	59,766
Sufficiency / (Deficiency)	13,401	14,584	15,858	17,235	18,724	20,336	22,078	23,958	25,989	28,175
Funding Ratios										
Current Assets (MVA)	$2,271,007	$2,397,708	$2,528,254	$2,662,682	$2,801,295	$2,944,266	$3,091,825	$3,244,320	$3,402,181	$3,566,082
Actuarial Accrued Liability (AAL)	2,198,836	2,309,071	2,421,674	2,536,575	2,653,950	2,773,833	2,896,306	3,021,559	3,149,857	3,281,684
Unfunded AAL	(72,171)	(88,637)	(106,580)	(126,106)	(147,345)	(170,433)	(195,519)	(222,761)	(252,324)	(284,398)
Funding Ratio	103.3%	103.8%	104.4%	105.0%	105.6%	106.1%	106.8%	107.4%	108.0%	108.7%
Benefit Payments	$ 97,405	$ 104,281	$ 111,432	$ 118,615	$ 125,981	$ 133,487	$ 141,029	$ 148,551	$ 155,866	$ 163,502
Ratio of Assets to Benefit Payments	23.32	22.99	22.69	22.45	22.24	22.06	21.92	21.84	21.83	21.81

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

Local Government Service Correctional Retirement Plan
Scenario: 7.0% investment return for all years
Fiscal year beginning July 1

$ in Thousands	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Contributions (% of Payroll)										
Statutory - Chapter 353	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%
Required - Chapter 356 (MVA)	11.32%	11.03%	10.72%	10.40%	10.07%	9.72%	9.36%	8.99%	8.60%	8.20%
Sufficiency / (Deficiency)	5.76%	6.05%	6.36%	6.68%	7.01%	7.36%	7.72%	8.09%	8.48%	8.88%
Contributions										
Statutory - Chapter 353	$ 90,590	$ 93,316	$ 96,114	$ 99,010	$ 101,985	$ 105,053	$ 108,204	$ 111,448	$ 114,791	$ 118,217
Required - Chapter 356 (MVA)	60,061	60,252	60,326	60,292	60,117	59,799	59,315	58,659	57,816	56,756
Sufficiency / (Deficiency)	30,529	33,064	35,788	38,717	41,868	45,254	48,889	52,789	56,975	61,462
Funding Ratios										
Current Assets (MVA)	$3,736,169	$3,912,600	$4,095,765	$4,285,895	$4,483,475	$4,689,151	$4,903,329	$5,126,573	$5,359,301	$5,601,960
Actuarial Accrued Liability (AAL)	3,417,007	3,555,772	3,698,150	3,844,145	3,993,984	4,148,045	4,306,447	4,469,450	4,637,146	4,809,631
Unfunded AAL	(319,162)	(356,829)	(397,615)	(441,749)	(489,491)	(541,105)	(596,882)	(657,123)	(722,155)	(792,330)
Funding Ratio	109.3%	110.0%	110.8%	111.5%	112.3%	113.0%	113.9%	114.7%	115.6%	116.5%
Benefit Payments	$ 171,486	$ 179,600	$ 188,015	$ 196,529	$ 205,001	$ 213,720	$ 222,552	$ 231,683	$ 241,122	$ 250,877
Ratio of Assets to Benefit Payments	21.79	21.79	21.78	21.81	21.87	21.94	22.03	22.13	22.23	22.33

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

Local Government Service Correctional Retirement Plan
Scenario: 5.5% investment return for all years
Fiscal year beginning July 1

$ in Thousands	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Contributions (% of Payroll)										
Statutory - Chapter 353	14.58%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%
Required - Chapter 356 (MVA)	15.12%	15.56%	15.87%	16.21%	16.60%	17.04%	17.55%	18.12%	18.77%	19.52%
Sufficiency / (Deficiency)	(0.54)%	1.52%	1.21%	0.87%	0.48%	0.04%	(0.47)%	(1.04)%	(1.69)%	(2.44)%
Contributions										
Statutory - Chapter 353	$ 41,075	$ 50,287	$ 52,229	$ 54,047	$ 55,848	$ 57,667	$ 59,487	$ 61,349	$ 63,264	$ 65,210
Required - Chapter 356 (MVA)	42,589	45,810	48,518	51,294	54,278	57,543	61,116	65,086	69,536	74,534
Sufficiency / (Deficiency)	(1,514)	4,476	3,711	2,753	1,570	124	(1,629)	(3,737)	(6,272)	(9,324)
Funding Ratios										
Current Assets (MVA)	$1,208,413	$1,274,794	$1,349,007	$1,424,103	$1,500,213	$1,576,650	$1,653,500	$1,730,589	$1,807,874	$1,884,752
Actuarial Accrued Liability (AAL)	1,232,246	1,317,422	1,405,099	1,495,334	1,588,423	1,683,839	1,781,824	1,882,379	1,985,614	2,091,084
Unfunded AAL	23,833	42,629	56,092	71,232	88,210	107,188	128,324	151,790	177,740	206,331
Funding Ratio	98.1%	96.8%	96.0%	95.2%	94.5%	93.6%	92.8%	91.9%	91.1%	90.1%
Benefit Payments	$ 40,450	$ 45,561	$ 50,589	$ 55,412	$ 60,942	$ 66,424	$ 72,100	$ 77,869	$ 84,289	$ 90,846
Ratio of Assets to Benefit Payments	29.87	27.98	26.67	25.70	24.62	23.74	22.93	22.22	21.45	20.75

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

Local Government Service Correctional Retirement Plan
Scenario: 5.5% investment return for all years
Fiscal year beginning July 1

$ in Thousands	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Contributions (% of Payroll)										
Statutory - Chapter 353	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%
Required - Chapter 356 (MVA)	20.39%	21.39%	22.57%	23.97%	25.66%	27.72%	30.31%	28.01%	31.37%	36.09%
Sufficiency / (Deficiency)	(3.31)%	(4.31)%	(5.49)%	(6.89)%	(8.58)%	(10.64)%	(13.23)%	(10.93)%	(14.29)%	(19.01)%
Contributions										
Statutory - Chapter 353	$ 67,211	$ 69,263	$ 71,365	$ 73,532	$ 75,766	$ 78,069	$ 80,435	$ 82,864	$ 85,374	$ 87,941
Required - Chapter 356 (MVA)	80,220	86,744	94,309	103,205	113,818	126,711	142,721	135,872	156,814	185,824
Sufficiency / (Deficiency)	(13,010)	(17,481)	(22,944)	(29,673)	(38,052)	(48,642)	(62,286)	(53,008)	(71,441)	(97,884)
Funding Ratios										
Current Assets (MVA)	$1,961,092	$2,036,916	$2,111,924	$2,185,837	$2,258,630	$2,330,120	$2,400,161	$2,468,700	$2,536,166	$2,602,907
Actuarial Accrued Liability (AAL)	2,198,836	2,309,071	2,421,674	2,536,575	2,653,950	2,773,833	2,896,306	2,877,228	2,992,366	3,110,537
Unfunded AAL	237,745	272,155	309,751	350,738	395,320	443,713	496,145	408,528	456,200	507,630
Funding Ratio	89.2%	88.2%	87.2%	86.2%	85.1%	84.0%	82.9%	85.8%	84.8%	83.7%
Benefit Payments	$ 97,405	$ 104,281	$ 111,432	$ 118,615	$ 125,981	$ 133,487	$ 141,029	$ 148,551	$ 154,925	$ 161,920
Ratio of Assets to Benefit Payments	20.13	19.53	18.95	18.43	17.93	17.46	17.02	16.62	16.37	16.08

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

Local Government Service Correctional Retirement Plan
Scenario: 5.5% investment return for all years
Fiscal year beginning July 1

$ in Thousands	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Contributions (% of Payroll)										
Statutory - Chapter 353	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%
Required - Chapter 356 (MVA)	43.17%	54.96%	78.55%	149.30%	21.94%	22.59%	23.30%	24.05%	24.87%	25.75%
Sufficiency / (Deficiency)	(26.09)%	(37.88)%	(61.47)%	(132.22)%	(4.86)%	(5.51)%	(6.22)%	(6.97)%	(7.79)%	(8.67)%
Contributions										
Statutory - Chapter 353	$ 90,590	$ 93,316	$ 96,114	$ 99,010	$ 101,985	$ 105,053	$ 108,204	$ 111,448	$ 114,791	$ 118,217
Required - Chapter 356 (MVA)	228,959	300,289	442,050	865,446	130,996	138,967	147,594	156,959	167,151	178,256
Sufficiency / (Deficiency)	(138,369)	(206,973)	(345,935)	(766,436)	(29,011)	(33,914)	(39,390)	(45,511)	(52,360)	(60,038)
Funding Ratios										
Current Assets (MVA)	$2,668,730	$2,733,350	$2,796,682	$2,858,453	$2,918,613	$2,977,231	$3,034,097	$3,089,113	$3,141,991	$3,192,430
Actuarial Accrued Liability (AAL)	3,231,793	3,356,088	3,483,600	3,614,340	3,748,539	3,886,585	4,028,599	4,174,841	4,325,406	4,480,387
Unfunded AAL	563,063	622,738	686,919	755,887	829,926	909,354	994,502	1,085,728	1,183,415	1,287,957
Funding Ratio	82.6%	81.4%	80.3%	79.1%	77.9%	76.6%	75.3%	74.0%	72.6%	71.3%
Benefit Payments	$ 169,226	$ 176,624	$ 184,290	$ 192,018	$ 199,669	$ 207,536	$ 215,487	$ 223,707	$ 232,206	$ 240,994
Ratio of Assets to Benefit Payments	15.77	15.48	15.18	14.89	14.62	14.35	14.08	13.81	13.53	13.25

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

Local Government Service Correctional Retirement Plan
Scenario: 8.5% investment return for all years
Fiscal year beginning July 1

$ in Thousands	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Contributions (% of Payroll)										
Statutory - Chapter 353	14.58%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%
Required - Chapter 356 (MVA)	15.12%	14.74%	14.21%	13.66%	13.07%	12.45%	11.77%	11.05%	10.28%	9.46%
Sufficiency / (Deficiency)	(0.54)%	2.34%	2.87%	3.42%	4.01%	4.63%	5.31%	6.03%	6.80%	7.62%
Contributions										
Statutory - Chapter 353	$ 41,075	$ 50,287	$ 52,229	$ 54,047	$ 55,848	$ 57,667	$ 59,487	$ 61,349	$ 63,264	$ 65,210
Required - Chapter 356 (MVA)	42,589	43,402	43,459	43,233	42,751	42,023	41,005	39,700	38,090	36,117
Sufficiency / (Deficiency)	(1,514)	6,885	8,770	10,814	13,097	15,644	18,482	21,648	25,175	29,093
Funding Ratios										
Current Assets (MVA)	$1,208,413	$1,311,045	$1,426,643	$1,548,821	$1,678,223	$1,814,709	$1,958,950	$2,111,405	$2,272,715	$2,443,012
Actuarial Accrued Liability (AAL)	1,232,246	1,317,422	1,405,099	1,495,334	1,588,423	1,683,839	1,781,824	1,882,379	1,985,614	2,091,084
Unfunded AAL	23,833	6,377	(21,544)	(53,487)	(89,800)	(130,871)	(177,126)	(229,025)	(287,102)	(351,928)
Funding Ratio	98.1%	99.5%	101.5%	103.6%	105.7%	107.8%	109.9%	112.2%	114.5%	116.8%
Benefit Payments	$ 40,450	$ 45,561	$ 50,589	$ 55,412	$ 60,942	$ 66,424	$ 72,100	$ 77,869	$ 84,289	$ 90,846
Ratio of Assets to Benefit Payments	29.87	28.78	28.20	27.95	27.54	27.32	27.17	27.11	26.96	26.89

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

Local Government Service Correctional Retirement Plan
Scenario: 8.5% investment return for all years
Fiscal year beginning July 1

$ in Thousands	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Contributions (% of Payroll)										
Statutory - Chapter 353	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%
Required - Chapter 356 (MVA)	8.58%	7.65%	6.65%	5.60%	4.47%	3.28%	2.02%	0.68%	0.00%	0.00%
Sufficiency / (Deficiency)	8.50%	9.43%	10.43%	11.48%	12.61%	13.80%	15.06%	16.40%	17.08%	17.08%
Contributions										
Statutory - Chapter 353	$ 67,211	$ 69,263	$ 71,365	$ 73,532	$ 75,766	$ 78,069	$ 80,435	$ 82,864	$ 85,374	$ 87,941
Required - Chapter 356 (MVA)	33,772	31,012	27,796	24,090	19,843	15,002	9,504	3,286	-	-
Sufficiency / (Deficiency)	33,438	38,251	43,569	49,442	55,923	63,067	70,931	79,578	85,374	87,941
Funding Ratios										
Current Assets (MVA)	$2,622,947	$2,813,394	$3,014,969	$3,228,383	$3,454,675	$3,694,818	$3,949,913	$4,221,260	$4,510,325	$4,818,912
Actuarial Accrued Liability (AAL)	2,198,836	2,309,071	2,421,674	2,536,575	2,653,950	2,773,833	2,896,306	3,021,559	3,149,857	3,281,684
Unfunded AAL	(424,111)	(504,324)	(593,295)	(691,808)	(800,725)	(920,984)	(1,053,608)	(1,199,701)	(1,360,467)	(1,537,228)
Funding Ratio	119.3%	121.8%	124.5%	127.3%	130.2%	133.2%	136.4%	139.7%	143.2%	146.8%
Benefit Payments	$ 97,405	$ 104,281	$ 111,432	$ 118,615	$ 125,981	$ 133,487	$ 141,029	$ 148,551	$ 155,866	$ 163,502
Ratio of Assets to Benefit Payments	26.93	26.98	27.06	27.22	27.42	27.68	28.01	28.42	28.94	29.47

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

Local Government Service Correctional Retirement Plan
Scenario: 8.5% investment return for all years
Fiscal year beginning July 1

$ in Thousands	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Contributions (% of Payroll)										
Statutory - Chapter 353	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%
Required - Chapter 356 (MVA)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Sufficiency / (Deficiency)	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%	17.08%
Contributions										
Statutory - Chapter 353	$ 90,590	$ 93,316	$ 96,114	$ 99,010	$ 101,985	$ 105,053	$ 108,204	$ 111,448	$ 114,791	$ 118,217
Required - Chapter 356 (MVA)	-	-	-	-	-	-	-	-	-	-
Sufficiency / (Deficiency)	90,590	93,316	96,114	99,010	101,985	105,053	108,204	111,448	114,791	118,217
Funding Ratios										
Current Assets (MVA)	$5,148,404	$5,500,302	$5,876,452	$6,278,677	$6,709,190	$7,170,520	$7,665,126	$8,195,802	$8,765,399	$9,377,007
Actuarial Accrued Liability (AAL)	3,417,007	3,555,772	3,698,150	3,844,145	3,993,984	4,148,045	4,306,447	4,469,450	4,637,146	4,809,631
Unfunded AAL	(1,731,397)	(1,944,530)	(2,178,302)	(2,434,532)	(2,715,206)	(3,022,475)	(3,358,678)	(3,726,353)	(4,128,253)	(4,567,376)
Funding Ratio	150.7%	154.7%	158.9%	163.3%	168.0%	172.9%	178.0%	183.4%	189.0%	195.0%
Benefit Payments	$ 171,486	$ 179,600	$ 188,015	$ 196,529	$ 205,001	$ 213,720	$ 222,552	$ 231,683	$ 241,122	$ 250,877
Ratio of Assets to Benefit Payments	30.02	30.63	31.26	31.95	32.73	33.55	34.44	35.37	36.35	37.38

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

P: 800.521.0498 | www.grsconsulting.com

January 31, 2025

CONFIDENTIAL

Mr. Doug Anderson
Executive Director
Public Employees Retirement Association of Minnesota
60 Empire Drive, Suite 200
St. Paul, MN 55103

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

Dear Mr. Anderson:

Attached are 30-year projections of estimated funded status, required contributions, and statutory contributions under three asset return scenarios for the Public Employees Police and Fire Plan. These projections, including the underlying investment return assumptions, are required by the Minnesota Standards for Actuarial Work. Unless noted otherwise, the estimates are based on participant data, assets, and plan provisions as outlined in the Public Employees Police and Fire Plan actuarial funding valuation as of July 1, 2024.

Basis for Projections

For all enclosed projections, liabilities are determined using the statutory investment return assumption of 7.0%. As required by the Minnesota Standards for Actuarial Work, the projections reflect three asset return scenarios (7.0%, 5.5% and 8.5%). Note that we believe the 8.5% rate of return assumption is outside of the range of reasonable expected returns for this plan.

The estimates are based on the market value of assets with no smoothing of investment gains or losses. Payroll is assumed to increase approximately 3.00% 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 11,994 members. The profile of these new members is the same as new members hired between July 1, 2018 and June 30, 2023. Average salary at hire increases at the assumed payroll growth rate.

- Average age at hire is 29.4
- Average salary at hire is $81,000
- Approximately 15% female, 85% male

If actuarial accrued liability exceeds assets, the unfunded actuarial accrued liability is amortized through June 30, 2048 per Minnesota Statute 356.215, Subdivision 11. 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 $9.0 million contribution to the fund each October 1 until both the MSRS State Patrol Fund and the PERA Police and Fire Plan become 90% funded (on an Actuarial Value of Assets basis) for a minimum of three consecutive years or July 1, 2048, if earlier. For purposes of the enclosed projections, this State contribution is projected to be eliminated in fiscal years ending 2030, 2031 and 2049 in the 8.5%, 7.0% and 5.5% investment return scenarios, respectively, based on the projected funded status of the PERA Police and Fire Plan. The funding status of the MSRS State Patrol Plan is not reflected for purposes of this assumption.

The State of Minnesota provides additional State contributions of $9.0 million until the plan reaches 100% funding (on an Actuarial Value of Assets basis) for a minimum of three consecutive years or July 1, 2048 if earlier. The additional State contributions are projected to be eliminated in fiscal years ending 2035, 2049 and 2049 in the 8.5%, 7.0% and 5.5% investment return scenarios, respectively.

Comments

The reader should keep the following in mind when reviewing these results:

- The enclosed projections are based on recommended assumption changes as outlined in the Public Employees Police and Fire Plan Four-Year Experience Study for the period July 1, 2019 through June 30, 2023.
- Statutory contributions are defined in statutes as a fixed percentage of payroll plus any statutory supplemental contributions and represent the amount that is actually contributed to the plan. Required contributions are defined in statutes and the LCPR Standards for Actuarial Work and represent the amount needed to fully fund the plan by June 30, 2048 (normal cost, expenses and a payment to amortize the unfunded liability).
- Investment experience that has occurred since the measurement date is not reflected in this report.
- In the 8.5% investment return scenario, surplus assets reduce the projected required contributions to amounts less than normal cost. We typically recommend the contribution be at least equal to the normal cost of the plan and suggest that plans with considerable surplus assets investigate the pros and cons of reducing the risk of the plan's investment allocation to preserve surplus assets.
- 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 scenario investment return. Each year, a larger proportion of assets is paid out in benefits, and less capital is available to invest.

Disclosures

The purpose of this report is to estimate the Fund's funding progress and required contribution rates over a 30-year period according to prescribed assumptions and the Minnesota Standards for Actuarial Work. 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.

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

The combined effect of the assumptions is expected to have no significant bias (i.e., not significantly optimistic or pessimistic). All actuarial assumptions and methods used in this report follow the guidance in the applicable Actuarial Standards of Practice. Additional information about the actuarial assumptions can be found in the Public Employees Police and Fire Plan Four-Year Experience Study Four-Year Experience Study for the period July 1, 2019 through June 30, 2023.

The contribution rates shown in this report have been determined using the actuarial methods disclosed in the Actuarial Basis section of the July 1, 2024 valuation report and the recommended assumption changes as outlined in the Public Employees Police and Fire Plan Four-Year Experience Study for the period July 1, 2019 through June 30, 2023. This valuation report includes risk metrics on pages 6-9, but does not include a robust assessment of the risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment.

We have assessed that the contribution rate calculated under the 7.0% investment return scenario is a reasonable Actuarially Determined Employer Contribution (ADEC) and it is consistent with the plan accumulating adequate assets to make benefit payments when due.

The projections assume 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 valuation was based upon information furnished by the Public Employees Retirement Association (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.

This report was prepared using our proprietary valuation model and related software which, in our professional judgement, has the capability to provide results that are consistent with the purposes of the valuation and has no material limitations or known weaknesses. We performed tests to ensure that the model reasonably represents that which is intended to be modeled.

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

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 and 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.

Bonita J. Wurst and Sheryl L. Christensen 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. The signing actuaries are independent of the plan sponsor. We are not aware of any relationship that would impair the objectivity of our work.

Respectfully submitted,

Gabriel, Roeder, Smith & Company

Bonita J. Wurst

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

Sheryl Christensen

Sheryl L. Christensen, FSA, EA, FCA, MAAA

BJW/SLC:dj

Other Observations

General Implications of the 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, Chapter 356 required contributions are made, and all actuarial assumptions are met (including the assumption of the plan earning 7.00% on the actuarial value of assets, as prescribed by statutes), 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 24 years; and
(3) The unfunded liability will grow initially as a dollar amount for 2 years (based on the current 24-year amortization period and if contributions are equal to the required contribution 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 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.

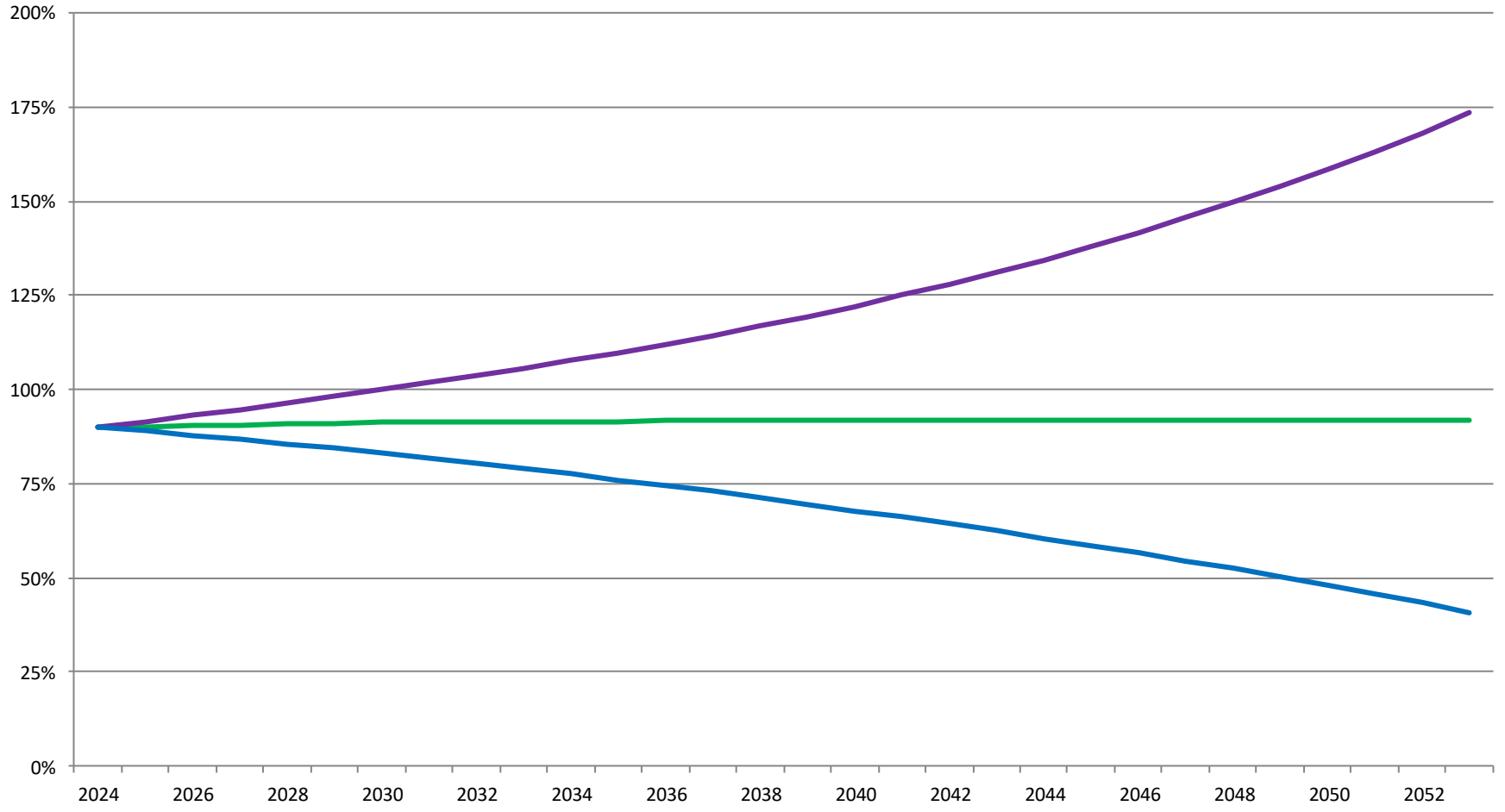
Limitations of Project Scope

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.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

PERA Public Employees Police and Fire Plan
Estimated Accrued Liability Funded Ratio
(Market Value of Assets Basis)

In all scenarios, the interest rate used to discount liabilities was 7.00%.



Reflects data, methods and plan provisions as of July 1, 2024 and the recommended assumption changes from the 2019-2023 experience study.

All scenarios assume contributions made to the fund are equal to the statutory rate.

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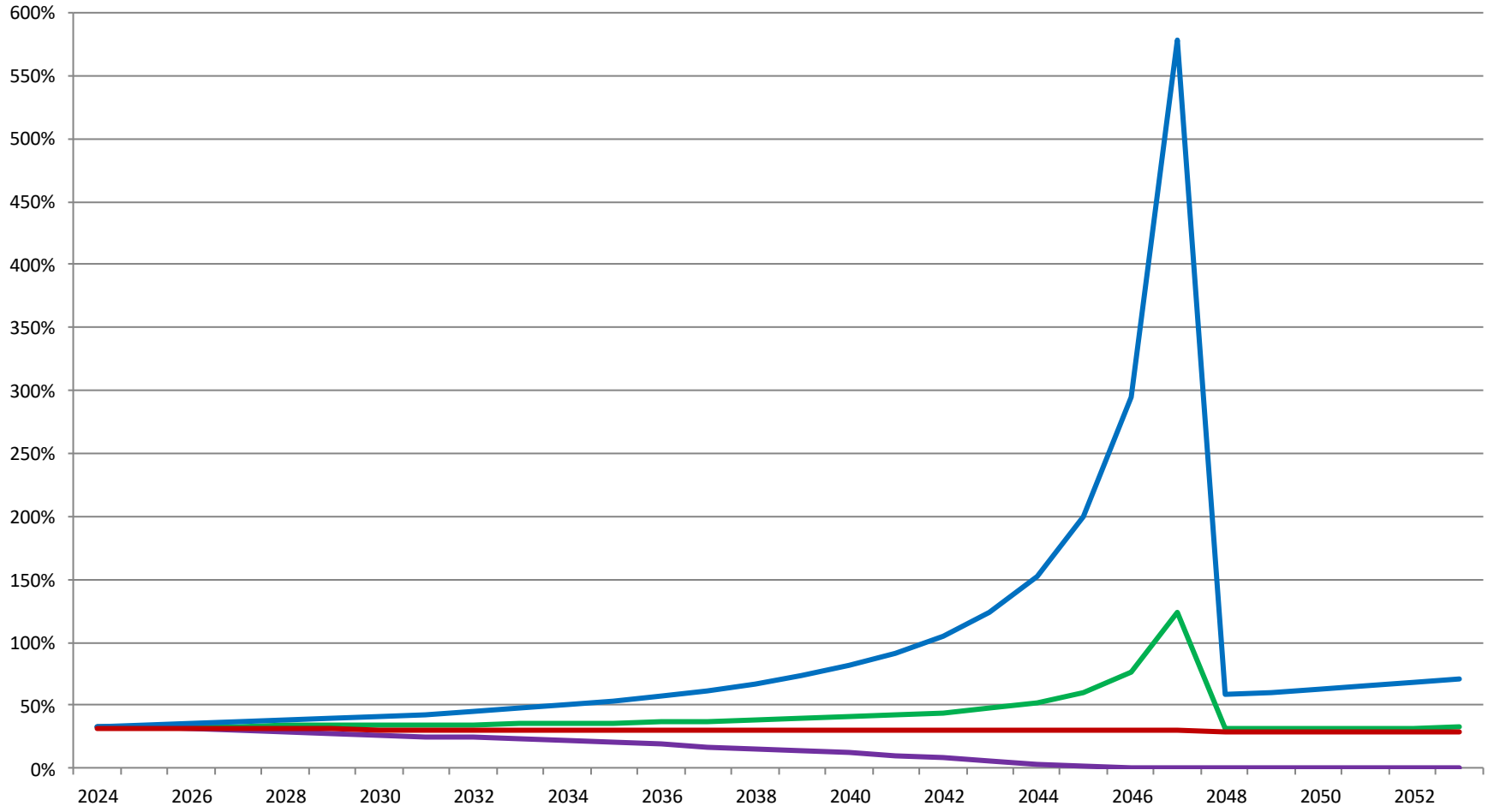
PERA Public Employees Police and Fire Plan
Estimated Required Contribution Rates
(% of Pay, Market Value of Assets Basis)

In all scenarios, the interest rate used to discount liabilities was 7.00%.



Reflects data, methods and plan provisions as of July 1, 2024 and the recommended assumption changes from the 2019-2023 experience study.

All scenarios assume contributions made to the fund are equal to the statutory rate.

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Public Employees Police and Fire Plan
Scenario: 7.0% Investment Return for All Years
Fiscal Year Beginning July 1

$ in Thousands	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Contributions (% of Payroll)										
Statutory - Chapter 353	31.45%	31.41%	31.36%	31.32%	31.27%	31.23%	30.59%	30.08%	30.06%	30.05%
Required - Chapter 356 (MVA)	33.03%	33.14%	33.27%	33.42%	33.58%	33.77%	33.98%	34.26%	34.61%	35.01%
Sufficiency / (Deficiency)	(1.58)%	(1.73)%	(1.91)%	(2.10)%	(2.31)%	(2.54)%	(3.39)%	(4.18)%	(4.55)%	(4.96)%
Contributions										
Statutory - Chapter 353	$ 414,335	$ 423,249	$ 432,619	$ 442,431	$ 452,913	$ 463,848	$ 466,310	$ 470,503	$ 482,897	$ 495,745
Required - Chapter 356 (MVA)	435,369	446,691	458,954	472,114	486,353	501,564	517,887	535,941	556,011	577,648
Sufficiency / (Deficiency)	(21,034)	(23,442)	(26,335)	(29,683)	(33,441)	(37,716)	(51,577)	(65,438)	(73,114)	(81,903)
Funding Ratios										
Current Assets (MVA)	$12,065,232	$12,569,026	$13,078,961	$13,595,060	$14,118,113	$14,650,461	$15,192,398	$15,736,160	$16,283,638	$16,843,311
Actuarial Accrued Liability (AAL)	13,406,981	13,930,628	14,460,464	14,996,606	15,539,929	16,092,730	16,655,437	17,229,594	17,816,349	18,416,736
Unfunded AAL	1,341,749	1,361,602	1,381,502	1,401,547	1,421,817	1,442,270	1,463,039	1,493,434	1,532,711	1,573,426
Funding Ratio	90.0%	90.2%	90.5%	90.7%	90.9%	91.0%	91.2%	91.3%	91.4%	91.5%
Benefit Payments	$ 741,739	$ 778,750	$ 816,610	$ 854,561	$ 891,387	$ 929,010	$ 966,308	$ 1,003,630	$ 1,041,210	$ 1,079,049
Ratio of Assets to Benefit Payments	16.27	16.14	16.02	15.91	15.84	15.77	15.72	15.68	15.64	15.61

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

Public Employees Police and Fire Plan
Scenario: 7.0% Investment Return for All Years
Fiscal Year Beginning July 1

$ in Thousands	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Contributions (% of Payroll)										
Statutory - Chapter 353	30.03%	30.02%	30.00%	29.99%	29.98%	29.96%	29.95%	29.94%	29.92%	29.91%
Required - Chapter 356 (MVA)	35.46%	35.98%	36.59%	37.31%	38.17%	39.21%	40.52%	42.19%	44.43%	47.57%
Sufficiency / (Deficiency)	(5.43)%	(5.96)%	(6.59)%	(7.32)%	(8.19)%	(9.25)%	(10.57)%	(12.25)%	(14.51)%	(17.66)%
Contributions										
Statutory - Chapter 353	$ 509,010	$ 522,763	$ 536,907	$ 551,596	$ 566,923	$ 582,926	$ 599,682	$ 617,043	$ 634,983	$ 653,458
Required - Chapter 356 (MVA)	601,061	626,682	654,830	686,222	721,828	762,889	811,244	869,625	942,777	1,039,227
Sufficiency / (Deficiency)	(92,051)	(103,918)	(117,923)	(134,627)	(154,904)	(179,963)	(211,563)	(252,581)	(307,794)	(385,769)
Funding Ratios										
Current Assets (MVA)	$17,416,232	$18,002,927	$18,603,455	$19,217,927	$19,847,408	$20,492,589	$21,154,651	$21,835,471	$22,536,881	$23,260,475
Actuarial Accrued Liability (AAL)	19,031,846	19,662,230	20,307,966	20,969,196	21,646,925	22,341,831	23,055,063	23,788,373	24,543,585	25,322,287
Unfunded AAL	1,615,614	1,659,303	1,704,510	1,751,268	1,799,517	1,849,242	1,900,412	1,952,902	2,006,703	2,061,812
Funding Ratio	91.5%	91.6%	91.6%	91.7%	91.7%	91.7%	91.8%	91.8%	91.8%	91.9%
Benefit Payments	$ 1,117,691	$ 1,157,693	$ 1,198,914	$ 1,240,590	$ 1,283,249	$ 1,326,500	$ 1,369,831	$ 1,413,262	$ 1,457,121	$ 1,501,619
Ratio of Assets to Benefit Payments	15.58	15.55	15.52	15.49	15.47	15.45	15.44	15.45	15.47	15.49

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

Public Employees Police and Fire Plan
Scenario: 7.0% Investment Return for All Years
Fiscal Year Beginning July 1

$ in Thousands	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Contributions (% of Payroll)										
Statutory - Chapter 353	29.90%	29.89%	29.88%	29.87%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%
Required - Chapter 356 (MVA)	52.29%	60.19%	76.01%	123.49%	31.74%	31.84%	31.95%	32.07%	32.20%	32.34%
Sufficiency / (Deficiency)	(22.39)%	(30.30)%	(46.13)%	(93.62)%	(2.24)%	(2.34)%	(2.45)%	(2.57)%	(2.70)%	(2.84)%
Contributions										
Statutory - Chapter 353	$ 672,501	$ 692,060	$ 712,127	$ 732,942	$ 745,482	$ 767,825	$ 790,763	$ 814,424	$ 838,910	$ 864,231
Required - Chapter 356 (MVA)	1,176,191	1,393,650	1,811,630	3,030,540	802,057	828,681	856,355	885,275	915,596	947,390
Sufficiency / (Deficiency)	(503,690)	(701,590)	(1,099,503)	(2,297,598)	(56,576)	(60,855)	(65,592)	(70,851)	(76,687)	(83,159)
Funding Ratios										
Current Assets (MVA)	$24,007,696	$24,779,006	$25,574,739	$26,394,734	$27,239,167	$28,099,499	$28,985,937	$29,899,069	$30,838,954	$31,805,951
Actuarial Accrued Liability (AAL)	26,125,959	26,955,086	27,810,080	28,690,901	29,597,712	30,531,314	31,493,252	32,484,299	33,504,645	34,554,728
Unfunded AAL	2,118,263	2,176,079	2,235,341	2,296,166	2,358,544	2,431,816	2,507,315	2,585,231	2,665,690	2,748,777
Funding Ratio	91.9%	91.9%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.1%
Benefit Payments	$ 1,547,834	$ 1,595,869	$ 1,646,216	$ 1,698,780	$ 1,752,968	$ 1,808,168	$ 1,865,159	$ 1,924,616	$ 1,986,359	$ 2,049,816
Ratio of Assets to Benefit Payments	15.51	15.53	15.54	15.54	15.54	15.54	15.54	15.54	15.53	15.52

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

Public Employees Police and Fire Plan
Scenario: 5.5% Investment Return for All Years
Fiscal Year Beginning July 1

$ in Thousands	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Contributions (% of Payroll)										
Statutory - Chapter 353	31.45%	31.41%	31.36%	31.32%	31.27%	31.23%	31.18%	30.65%	30.62%	30.59%
Required - Chapter 356 (MVA)	33.03%	34.02%	35.12%	36.35%	37.71%	39.22%	40.90%	42.78%	44.94%	47.38%
Sufficiency / (Deficiency)	(1.58)%	(2.61)%	(3.76)%	(5.03)%	(6.44)%	(7.99)%	(9.72)%	(12.13)%	(14.32)%	(16.79)%
Contributions										
Statutory - Chapter 353	$ 414,335	$ 423,249	$ 432,619	$ 442,431	$ 452,913	$ 463,848	$ 475,310	$ 479,503	$ 491,897	$ 504,745
Required - Chapter 356 (MVA)	435,369	458,551	484,523	513,523	546,072	582,477	623,386	669,287	721,882	781,688
Sufficiency / (Deficiency)	(21,034)	(35,302)	(51,904)	(71,091)	(93,160)	(118,630)	(148,076)	(189,784)	(229,985)	(276,943)
Funding Ratios										
Current Assets (MVA)	$12,065,232	$12,390,517	$12,704,779	$13,007,008	$13,296,898	$13,575,611	$13,842,179	$14,096,806	$14,331,340	$14,552,833
Actuarial Accrued Liability (AAL)	13,406,981	13,930,628	14,460,464	14,996,606	15,539,929	16,092,730	16,655,437	17,229,594	17,816,349	18,416,736
Unfunded AAL	1,341,749	1,540,111	1,755,684	1,989,599	2,243,032	2,517,119	2,813,259	3,132,788	3,485,009	3,863,903
Funding Ratio	90.0%	88.9%	87.9%	86.7%	85.6%	84.4%	83.1%	81.8%	80.4%	79.0%
Benefit Payments	$ 741,739	$ 778,750	$ 816,610	$ 854,561	$ 891,387	$ 929,010	$ 966,308	$ 1,003,630	$ 1,041,210	$ 1,079,049
Ratio of Assets to Benefit Payments	16.27	15.91	15.56	15.22	14.92	14.61	14.32	14.05	13.76	13.49

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

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Public Employees Police and Fire Plan
Scenario: 5.5% Investment Return for All Years
Fiscal Year Beginning July 1

$ in Thousands	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Contributions (% of Payroll)										
Statutory - Chapter 353	30.56%	30.53%	30.51%	30.48%	30.45%	30.43%	30.40%	30.37%	30.35%	30.32%
Required - Chapter 356 (MVA)	50.16%	53.36%	57.10%	61.50%	66.76%	73.16%	81.12%	91.33%	104.91%	123.89%
Sufficiency / (Deficiency)	(19.60)%	(22.83)%	(26.59)%	(31.02)%	(36.31)%	(42.73)%	(50.72)%	(60.96)%	(74.56)%	(93.57)%
Contributions										
Statutory - Chapter 353	$ 518,010	$ 531,763	$ 545,907	$ 560,596	$ 575,923	$ 591,926	$ 608,682	$ 626,043	$ 643,983	$ 662,458
Required - Chapter 356 (MVA)	850,163	929,374	1,021,823	1,131,199	1,262,638	1,423,405	1,624,372	1,882,470	2,226,120	2,706,470
Sufficiency / (Deficiency)	(332,153)	(397,611)	(475,915)	(570,603)	(686,715)	(831,479)	(1,015,690)	(1,256,426)	(1,582,137)	(2,044,012)
Funding Ratios										
Current Assets (MVA)	$14,760,768	$14,954,000	$15,130,821	$15,289,477	$15,429,059	$15,548,159	$15,645,734	$15,721,288	$15,774,127	$15,803,152
Actuarial Accrued Liability (AAL)	19,031,846	19,662,230	20,307,966	20,969,196	21,646,925	22,341,831	23,055,063	23,788,373	24,543,585	25,322,287
Unfunded AAL	4,271,078	4,708,231	5,177,145	5,679,718	6,217,867	6,793,672	7,409,329	8,067,085	8,769,458	9,519,135
Funding Ratio	77.6%	76.1%	74.5%	72.9%	71.3%	69.6%	67.9%	66.1%	64.3%	62.4%
Benefit Payments	$ 1,117,691	$ 1,157,693	$ 1,198,914	$ 1,240,590	$ 1,283,249	$ 1,326,500	$ 1,369,831	$ 1,413,262	$ 1,457,121	$ 1,501,619
Ratio of Assets to Benefit Payments	13.21	12.92	12.62	12.32	12.02	11.72	11.42	11.12	10.83	10.52

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

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Public Employees Police and Fire Plan
Scenario: 5.5% Investment Return for All Years
Fiscal Year Beginning July 1

$ in Thousands	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Contributions (% of Payroll)										
Statutory - Chapter 353	30.30%	30.28%	30.26%	30.23%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%
Required - Chapter 356 (MVA)	152.32%	199.68%	294.36%	578.13%	58.16%	60.29%	62.58%	65.03%	67.66%	70.49%
Sufficiency / (Deficiency)	(122.02)%	(169.40)%	(264.10)%	(547.90)%	(28.66)%	(30.79)%	(33.08)%	(35.53)%	(38.16)%	(40.99)%
Contributions										
Statutory - Chapter 353	$ 681,501	$ 701,060	$ 721,127	$ 741,942	$ 745,482	$ 767,825	$ 790,763	$ 814,424	$ 838,910	$ 864,231
Required - Chapter 356 (MVA)	3,425,984	4,623,565	7,016,009	14,187,584	1,469,674	1,569,311	1,677,502	1,795,356	1,924,086	2,064,987
Sufficiency / (Deficiency)	(2,744,483)	(3,922,505)	(6,294,882)	(13,445,642)	(724,192)	(801,486)	(886,739)	(980,932)	(1,085,176)	(1,200,756)
Funding Ratios										
Current Assets (MVA)	$15,806,945	$15,782,934	$15,728,248	$15,639,344	$15,512,826	$15,327,204	$15,097,504	$14,820,068	$14,490,478	$14,104,360
Actuarial Accrued Liability (AAL)	26,125,959	26,955,086	27,810,080	28,690,901	29,597,712	30,531,314	31,493,252	32,484,299	33,504,645	34,554,728
Unfunded AAL	10,319,014	11,172,152	12,081,832	13,051,557	14,084,885	15,204,111	16,395,749	17,664,231	19,014,167	20,450,368
Funding Ratio	60.5%	58.6%	56.6%	54.5%	52.4%	50.2%	47.9%	45.6%	43.3%	40.8%
Benefit Payments	$ 1,547,834	$ 1,595,869	$ 1,646,216	$ 1,698,780	$ 1,752,968	$ 1,808,168	$ 1,865,159	$ 1,924,616	$ 1,986,359	$ 2,049,816
Ratio of Assets to Benefit Payments	10.21	9.89	9.55	9.21	8.85	8.48	8.09	7.70	7.29	6.88

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

Public Employees Police and Fire Plan
Scenario: 8.5% Investment Return for All Years
Fiscal Year Beginning July 1

$ in Thousands	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Contributions (% of Payroll)										
Statutory - Chapter 353	31.45%	31.41%	31.36%	31.32%	31.27%	30.62%	30.59%	30.08%	30.06%	30.05%
Required - Chapter 356 (MVA)	33.03%	32.26%	31.39%	30.40%	29.28%	28.00%	26.58%	24.96%	24.24%	22.98%
Sufficiency / (Deficiency)	(1.58)%	(0.85)%	(0.03)%	0.92%	1.99%	2.62%	4.01%	5.12%	5.82%	7.07%
Contributions										
Statutory - Chapter 353	$ 414,335	$ 423,249	$ 432,619	$ 442,431	$ 452,913	$ 454,848	$ 466,310	$ 470,503	$ 482,897	$ 495,745
Required - Chapter 356 (MVA)	435,369	434,831	433,020	429,506	424,008	415,845	405,190	390,418	389,326	379,156
Sufficiency / (Deficiency)	(21,034)	(11,582)	(401)	12,925	28,905	39,002	61,120	80,086	93,571	116,588
Funding Ratios										
Current Assets (MVA)	$12,065,232	$12,747,535	$13,458,499	$14,200,148	$14,975,453	$15,789,143	$16,634,738	$17,525,219	$18,456,795	$19,441,236
Actuarial Accrued Liability (AAL)	13,406,981	13,930,628	14,460,464	14,996,606	15,539,929	16,092,730	16,655,437	17,229,594	17,816,349	18,416,736
Unfunded AAL	1,341,749	1,183,093	1,001,965	796,459	564,476	303,587	20,699	(295,625)	(640,446)	(1,024,500)
Funding Ratio	90.0%	91.5%	93.1%	94.7%	96.4%	98.1%	99.9%	101.7%	103.6%	105.6%
Benefit Payments	$ 741,739	$ 778,750	$ 816,610	$ 854,561	$ 891,387	$ 929,010	$ 966,308	$ 1,003,630	$ 1,041,210	$ 1,079,049
Ratio of Assets to Benefit Payments	16.27	16.37	16.48	16.62	16.80	17.00	17.21	17.46	17.73	18.02

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

Public Employees Police and Fire Plan
Scenario: 8.5% Investment Return for All Years
Fiscal Year Beginning July 1

$ in Thousands	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Contributions (% of Payroll)										
Statutory - Chapter 353	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%
Required - Chapter 356 (MVA)	21.65%	20.26%	18.79%	17.24%	15.60%	13.86%	12.04%	10.11%	8.07%	5.93%
Sufficiency / (Deficiency)	7.85%	9.24%	10.71%	12.26%	13.90%	15.64%	17.46%	19.39%	21.43%	23.57%
Contributions										
Statutory - Chapter 353	$ 500,010	$ 513,763	$ 527,907	$ 542,596	$ 557,923	$ 573,926	$ 590,682	$ 608,043	$ 625,983	$ 644,458
Required - Chapter 356 (MVA)	366,872	352,883	336,335	317,079	294,962	269,702	240,983	208,321	171,304	129,457
Sufficiency / (Deficiency)	133,138	160,880	191,572	225,516	262,962	304,224	349,699	399,722	454,679	515,001
Funding Ratios										
Current Assets (MVA)	$20,483,239	$21,577,908	$22,738,191	$23,968,800	$25,275,805	$26,665,336	$28,144,491	$29,721,587	$31,405,474	$33,205,381
Actuarial Accrued Liability (AAL)	19,031,846	19,662,230	20,307,966	20,969,196	21,646,925	22,341,831	23,055,063	23,788,373	24,543,585	25,322,287
Unfunded AAL	(1,451,393)	(1,915,678)	(2,430,225)	(2,999,605)	(3,628,880)	(4,323,505)	(5,089,428)	(5,933,214)	(6,861,889)	(7,883,093)
Funding Ratio	107.6%	109.7%	112.0%	114.3%	116.8%	119.4%	122.1%	124.9%	128.0%	131.1%
Benefit Payments	$ 1,117,691	$ 1,157,693	$ 1,198,914	$ 1,240,590	$ 1,283,249	$ 1,326,500	$ 1,369,831	$ 1,413,262	$ 1,457,121	$ 1,501,619
Ratio of Assets to Benefit Payments	18.33	18.64	18.97	19.32	19.70	20.10	20.55	21.03	21.55	22.11

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2025 letter to PERA.

Public Employees Police and Fire Plan
Scenario: 8.5% Investment Return for All Years
Fiscal Year Beginning July 1

$ in Thousands	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Contributions (% of Payroll)										
Statutory - Chapter 353	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%
Required - Chapter 356 (MVA)	3.66%	1.28%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Sufficiency / (Deficiency)	25.84%	28.22%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%
Contributions										
Statutory - Chapter 353	$ 663,501	$ 683,060	$ 703,127	$ 723,942	$ 745,482	$ 767,825	$ 790,763	$ 814,424	$ 838,910	$ 864,231
Required - Chapter 356 (MVA)	82,380	29,540	-	-	-	-	-	-	-	-
Sufficiency / (Deficiency)	581,121	653,519	703,127	723,942	745,482	767,825	790,763	814,424	838,910	864,231
Funding Ratios										
Current Assets (MVA)	$35,131,059	$37,191,999	$39,398,336	$41,760,545	$44,290,341	$47,001,027	$49,907,758	$53,025,947	$56,371,748	$59,962,980
Actuarial Accrued Liability (AAL)	26,125,959	26,955,086	27,810,080	28,690,901	29,597,712	30,531,314	31,493,252	32,484,299	33,504,645	34,554,728
Unfunded AAL	(9,005,100)	(10,236,913)	(11,588,256)	(13,069,644)	(14,692,629)	(16,469,712)	(18,414,506)	(20,541,647)	(22,867,103)	(25,408,252)
Funding Ratio	134.5%	138.0%	141.7%	145.6%	149.6%	153.9%	158.5%	163.2%	168.3%	173.5%
Benefit Payments	$ 1,547,834	$ 1,595,869	$ 1,646,216	$ 1,698,780	$ 1,752,968	$ 1,808,168	$ 1,865,159	$ 1,924,616	$ 1,986,359	$ 2,049,816
Ratio of Assets to Benefit Payments	22.70	23.31	23.93	24.58	25.27	25.99	26.76	27.55	28.38	29.25

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.0%.

PERA Public Employees Police and Fire Plan

Cost studies as of July 1, 2024

						Reflecting Amortization to June 30, 2048			Reflecting Layered Amortization^				
Scenario	Assumptions	COLA Formula	Assumed COLA	Cola Delay	Normal Cost and Expenses	Amortization of Unfunded AAL	Total Required Contribution % of Pay	Total Required Contribution* 000s	Amortization of Unfunded AAL	Total Required Contribution % of Pay	Total Required Contribution* 000s	Actuarial Accrued Liability (AAL) 000s	Present Value of Benefits 000s
1	June 30, 2024 Valuation	1% Fixed	1.000%	+2 years	23.49%	6.44%	29.93%	$ 395,589	N/A	N/A	N/A	$ 13,380,841	$ 16,303,394
2	2024 Experience Study	1% Fixed	1.000%	+2 years	26.44%	6.59%	33.03%	$ 435,163	6.60%	33.04%	$ 435,295	$ 13,406,981	$ 16,324,262
3a	2024 Experience Study	50% CPI, 1.00% Min, 1.25% Max	1.125%	+2 years	26.80%	7.38%	34.18%	$ 450,314	7.69%	34.49%	$ 454,399	$ 13,568,595	$ 16,523,899
3b	2024 Experience Study	50% CPI, 1.00% Min, 1.50% Max	1.250%	+2 years	27.14%	8.19%	35.33%	$ 465,465	8.81%	35.95%	$ 473,634	$ 13,733,382	$ 16,727,375
3c	2024 Experience Study	50% of CPI, 1.00% Min, 2.00% Max	1.350%	+2 years	27.43%	8.85%	36.28%	$ 477,981	9.72%	37.15%	$ 489,443	$ 13,867,722	$ 16,893,402
3d	2024 Experience Study	100% CPI 1.00% Min, 1.75% Max	1.500%	+2 years	27.87%	9.86%	37.73%	$ 497,085	11.11%	38.98%	$ 513,553	$ 14,073,540	$ 17,148,009
3e	2024 Experience Study	100% CPI 1.00% Min, 2.00% Max	1.700%	+2 years	28.47%	11.25%	39.72%	$ 523,303	13.02%	41.49%	$ 546,622	$ 14,356,264	$ 17,498,237
3f	2024 Experience Study	100% CPI 1.00% Min, 2.50% Max	2.000%	+2 years	29.43%	13.43%	42.86%	$ 564,671	16.01%	45.44%	$ 598,662	$ 14,799,009	$ 18,047,808
4	2024 Experience Study	1% Fixed	1.000%	Removed	26.92%	7.15%	34.07%	$ 448,865	7.37%	34.29%	$ 451,764	$ 13,521,500	$ 16,490,476

* *Based on projected payroll of $1,321,631,000 per the 2024 valuation assumptions and $1,317,479,000 per the recommended assumption changes*

^ *20-year amortization for assumption changes and 15-year amortization for benefit changes; all other unfunded liabilities are amortized to June 30, 2048*

Results are based on data, assumptions, methods, and plan provisions as of July 1, 2024 unless noted otherwise.
Determined as of July 1, 2024 based on the market value of assets and investment return rate of 7.0%.
Benefit changes are assumed to apply to all members (active, terminated and retired/survivor).

PERA General Employees Retirement Plan

Cost Studies as of July 1, 2024

Scenario	COLA Formula	Assumed COLA	Normal Cost and Expenses	Reflecting Amortization to June 30, 2048			Reflecting Layered Amortization^			Actuarial Accrued Liability (AAL) 000s	Present Value of Benefits 000s
				Amortization of Unfunded AAL	Total Required Contribution % of Pay	Total Required Contribution* 000s	Amortization of Unfunded AAL	Total Required Contribution % of Pay	Total Required Contribution* 000s		
1	50% CPI, 1.00% Min, 1.50% Max	1.250%	8.84%	2.83%	11.67%	$ 985,950	N/A	N/A	N/A	$ 33,858,933	$ 39,400,752
2a	50% of CPI, 1.00% Min, 2.00% Max	1.350%	8.90%	3.07%	11.97%	$ 1,011,296	3.15%	12.05%	$ 1,018,054	$ 34,163,778	$ 39,749,256
2b	100% CPI 1.00% Min, 1.75% Max	1.500%	9.01%	3.42%	12.43%	$ 1,050,159	3.64%	12.65%	$ 1,068,746	$ 34,626,280	$ 40,278,666
2c	100% CPI 1.00% Min, 2.00% Max	1.700%	9.15%	3.91%	13.06%	$ 1,103,385	4.31%	13.46%	$ 1,137,180	$ 35,261,139	$ 41,005,458
2d	100% CPI 1.00% Min, 2.50% Max	2.000%	9.38%	4.66%	14.04%	$ 1,186,181	5.35%	14.73%	$ 1,244,477	$ 36,246,369	$ 42,134,681

* *Based on projected payroll of $8,448,585,000*

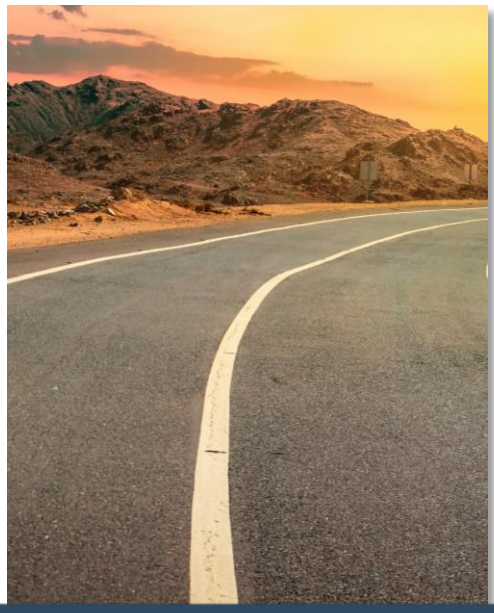
^ *15-year amortization for benefit changes; all other unfunded liabilities are amortized to June 30, 2048*

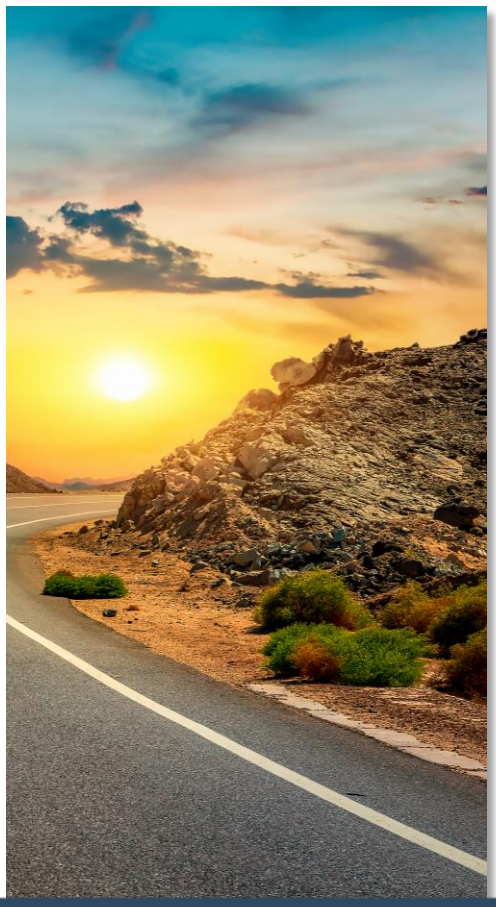
Results are based on data, assumptions, methods, and plan provisions as of July 1, 2024 unless noted otherwise.
Determined as of July 1, 2024 based on the market value of assets and investment return rate of 7.0%.
Benefit changes are assumed to apply to all members (active, terminated and retired/survivor).

August 2024

Survey of Capital Market Assumptions

2024 Edition





HORIZONactuarial®

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Horizon Actuarial Services, LLC is proud to serve as the actuary to over 100 multiemployer defined benefit pension plans across the United States and across various industries. As actuary to these plans, we must develop assumptions regarding future investment returns on plan assets. We then use those assumptions as we determine the actuarial values of the benefits promised by these plans to their participants and beneficiaries, as well as to project plan funding and solvency levels years into the future.

At Horizon Actuarial, we are retirement and healthcare actuaries, not investment professionals. Therefore, when developing assumptions as to what returns a pension plan's assets might be expected to earn in the future, we seek input from our colleagues in the investment advisory community. Each year, as part of this survey, we ask different investment firms to provide their "capital market assumptions" – their expectations for future risk and returns for different asset classes in which pension plans commonly invest. The information gathered from this survey can help answer the common question: "Are my plan's investment return assumptions reasonable?"

There are many factors to consider when evaluating a plan's investment return assumptions, such as its asset allocation, the maturity of its participant population, and the purpose of the measurement. Any of these factors can make the expected return for one plan very different from others. Therefore, this report does not opine on the reasonableness of any one plan's investment return assumptions. Nevertheless, we hope this report will be a useful resource for trustees, actuaries, and investment professionals alike.

Horizon Actuarial sincerely thanks the 41 investment advisors who participated in this survey.

Survey of Capital Market Assumptions: 2024 Edition

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Horizon Actuarial Services, LLC is an independent consulting firm specializing in providing actuarial and consulting services to multiemployer benefit plans. Horizon Actuarial does not provide investment, legal, or tax advice. Please consult with your investment advisor, legal counsel, or tax advisor for information specific to your plan's investment, legal, or tax implications.

Summary

Horizon Actuarial first conducted this survey in 2010, and it included 8 investment advisors. In 2012, we first published a report on the survey results, which included 17 advisors. The survey has expanded considerably in recent years; this 2024 edition of the survey includes assumptions from 41 different investment firms.

Readers of this survey are aware that expected returns declined significantly for all but a few asset classes from 2016 to 2022. The steepest declines were for fixed income investments such as US corporate bonds and Treasuries, whose return expectations fell more than 100 basis points from 2019 to 2021. We saw a reversal of this trend in 2023 resulting from increases in interest rates and lower equity valuations at the end of 2022. This 2024 edition of the survey brings only modest change versus 2023, with slightly higher return expectations for some asset classes and slightly lower expectations for other asset classes.

As we have seen in prior surveys, expected returns are generally lower over the short term than over the long term, though short-term expected returns are higher than long-term expected returns for selected asset classes such as US Treasuries for the second straight year. This is likely the result of an inverted yield curve at the time when many of the advisors developed their assumptions.

For less mature ongoing pension plans without solvency issues, we believe a horizon of 20 years or more is appropriate for evaluating the reasonableness of the long-term investment return assumption. A shorter horizon, such as 10 years, may be more appropriate for evaluating the return assumption for a plan whose duration of liabilities is shorter such as a plan that is more mature or has solvency issues. Even for plans with long-term investment horizons, it is important to understand the potential impact of lower expected returns over the short term. Therefore, this survey shows return expectations over horizons of both 10 years and 20 years.

For illustration, this report also constructs an asset allocation for a hypothetical multiemployer pension plan and uses the results from the survey to develop a range of reasonably expected returns for the plan. The expected returns for this 2024 edition were ***16 basis points lower over a 10-year horizon than they were last year***, and 62 basis points *higher* than they were in 2019. ***Over a 20-year horizon, expected returns are 16 basis points lower than last year***, and the exact same as they were five years ago in the 2019 edition of the survey.

If you have questions about how the results of this survey relate to your multiemployer plan, please contact your consultant at Horizon Actuarial or visit the "contact us" page on our website, www.horizonactuarial.com. For questions about the survey itself, please contact Ben Ablin at ben.ablin@horizonactuarial.com.

Survey Participants

Exhibit 1 below lists the 41 investment advisors whose capital market assumptions are included in the 2024 survey. This report does not attribute specific assumptions to individual firms, which is a precondition of the survey.

Originally, this survey was exclusive to the multiemployer plan community; it included assumptions only from investment advisors to multiemployer pension plans. The survey has expanded over the years, and it now includes assumptions from investment advisors outside of the multiemployer plan community.

A complete listing of the firms participating in the survey is provided below.

Exhibit 1

2024 Survey Participants	
AJ Gallagher	Merrill
Alan Biller	Milliman
Aon	Morgan Stanley
The Atlanta Consulting Group	NEPC
Bank of New York Mellon*	PFM Asset Management, LLC
BlackRock*	PIMCO
Callan Associates	Principal
Cambridge Associates	Research Affiliates, LLC*
CapTrust	Royal Bank of Canada
Envestnet	RVK
Goldman Sachs Asset Management	Segal Marco Advisors
Graystone Consulting	SEI
Invesco*	Sellwood Consulting
Investment Performance Services, LLC (IPS)	Sterling Capital Management, LLC
Janney Montgomery Scott, LLC	Truist Investment Advisory
J.P. Morgan Asset Management*	UBS
Mariner	The Vanguard Group*
Marquette Associates	Verus
Meketa Investment Group	Voya Investment Management*
Mercer	Willis Towers Watson
	Wilshire

**Assumptions obtained from published white paper.*

Investment Horizons

When evaluating the expected return assumption for an active, ongoing multiemployer pension plan, actuaries often consider investment returns over a long-term investment horizon of 20 years or more. A shorter time horizon, say over the next 10 years, may be more appropriate when evaluating the return assumption for a more mature plan whose liabilities have a shorter duration, a plan that has high negative cash flows, or a plan that is projected to become insolvent.

It is also important to understand the sensitivity of plan funding to changes in future investment returns. For example, the actuary for an active, ongoing pension plan will typically set the plan's investment return assumption based on expectations over a long-term horizon. However, evaluating the sensitivity of funding results to short-term investment returns that are expected to be higher or lower than the long-term assumption also plays an integral role in the decision-making process.

Advisors provided their most recent capital market assumptions: expected returns for different asset classes, standard deviations (i.e., volatilities) for those expected returns, and a correlation matrix. The advisors also indicated the investment horizon(s) to which their assumptions apply. If the advisor develops separate assumptions for different time horizons, they provided multiple sets of assumptions, one for each time horizon.

In the 2024 edition of the survey, 15 advisors provided one set of assumptions, of which all 15 specified a time horizon of 10 years. The remaining 26 advisors provided assumptions over both shorter-term (5 to 10 years) and longer-term (20 years or more) horizons. Note that two of the advisors rely on the same assumptions as other survey participants. Each assumption set was only counted once, even if it was provided by more than one advisor. Each unique assumption set was given equal weight in the survey.

Exhibit 2 below summarizes the time horizons specified by each advisor.

Exhibit 2

Investment Time Horizons	
Time Horizon	**Total**
10 Years	15
Both Short- and Long-Term	26
Total	41

Short-Term vs. Long-Term

As noted in the previous section, survey participants provided expected returns over different time horizons. Given current market conditions, many investment advisors may expect returns for certain asset classes to be different in the short term versus over the long term.

For comparability, this survey groups expected returns into two time horizons: 10 years and 20 years. As pension plan actuaries, we often refer to the 10-year expected returns as "short-term" and the 20-year expected returns as "long-term." Note, however, that many investment firms consider 10-year expectations to be "long-term."

When comparing the expected returns for the 26 advisors who provided both short-term and long-term assumptions,[1] we see some interesting differences. See Exhibit 3 below. The expected returns shown below are annualized (geometric) over the indicated time horizons.

Exhibit 3

Average Expected Returns: Short-Term vs. Long-Term
Subset of 26 Survey Respondents

Asset Class	10-Year Horizon	20-Year Horizon	Difference
US Equity - Large Cap	6.39%	6.96%	0.57%
US Equity - Small/Mid Cap	7.13%	7.50%	0.37%
Non-US Equity - Developed	7.26%	7.52%	0.26%
Non-US Equity - Emerging	7.97%	8.24%	0.27%
US Corporate Bonds - Core	4.82%	4.88%	0.06%
US Corporate Bonds - Long Dur.	4.97%	5.16%	0.18%
US Corporate Bonds - High Yield	6.22%	6.36%	0.14%
Non-US Debt - Developed	3.50%	3.71%	0.21%
Non-US Debt - Emerging	6.29%	6.28%	-0.01%
US Treasuries (Cash Equivalents)	3.66%	3.43%	-0.23%
TIPS (Inflation-Protected)	4.28%	4.27%	-0.01%
Real Estate	5.77%	6.17%	0.40%
Hedge Funds	6.07%	6.17%	0.10%
Commodities	5.27%	4.95%	-0.32%
Infrastructure	7.08%	7.36%	0.28%
Private Equity	9.26%	9.71%	0.44%
Private Debt	8.49%	8.44%	-0.06%
Inflation	2.43%	2.44%	0.01%

The 10-year and 20-year returns shown above are the averages for the 26 advisors who provided both short-term and long-term assumptions. Expected returns are annualized (geometric).

The consensus among these 26 advisors is that returns for most asset classes are expected to be lower in the short term compared to the long term. In general, the difference between long-term and short-term returns is more pronounced for equity type investments. Short-term expected returns are higher than long-term expected returns for some fixed income investments for the second straight year, likely due to a flat or inverted yield curve.

As noted earlier, the results shown in Exhibit 3 are based on a subset of 26 advisors. If we include all 41 survey advisors, the results do not change dramatically for most asset classes. See Exhibit 4 below.

Exhibit 4

Average Expected Returns: Short-Term vs. Long-Term
All Survey Respondents

Asset Class	10-Year Horizon	20-Year Horizon	Difference
US Equity - Large Cap	6.46%	6.96%	0.49%
US Equity - Small/Mid Cap	7.07%	7.50%	0.43%
Non-US Equity - Developed	7.08%	7.52%	0.44%
Non-US Equity - Emerging	7.70%	8.24%	0.53%
US Corporate Bonds - Core	4.93%	4.88%	-0.05%
US Corporate Bonds - Long Dur.	5.05%	5.16%	0.10%
US Corporate Bonds - High Yield	6.13%	6.36%	0.23%
Non-US Debt - Developed	3.66%	3.71%	0.04%
Non-US Debt - Emerging	6.17%	6.28%	0.12%
US Treasuries (Cash Equivalents)	3.68%	3.43%	-0.25%
TIPS (Inflation-Protected)	4.38%	4.27%	-0.11%
Real Estate	6.06%	6.17%	0.11%
Hedge Funds	5.90%	6.17%	0.27%
Commodities	4.92%	4.95%	0.03%
Infrastructure	7.26%	7.36%	0.10%
Private Equity	9.09%	9.71%	0.61%
Private Debt	8.32%	8.44%	0.11%
Inflation	2.42%	2.44%	0.01%

10-year horizon results include all 41 survey respondents.
20-year horizon results include a subset of 26 survey respondents.
Expected returns are annualized (geometric).

The 10-year expected returns shown above include assumptions from all 41 advisors, while the 20-year expected returns include assumptions from only the 26 advisors who provided longer-term assumptions.

The differences between short- and long-term expectations are the smallest they have been since we first conducted this survey using two separate time horizons. Nonetheless, it remains important for actuaries to illustrate the effects of near-term underperformance on their clients' pension funds. Furthermore, it may be appropriate for actuaries to attribute more weight to nearer term expectations when setting the investment return assumption for more mature plans or plans whose liabilities have a shorter duration.

[1] In cases where an advisor indicated a time horizon shorter than 10 years, the shorter-term expected returns were combined with the longer-term expected returns to achieve a 10-year horizon. Similarly, if an advisor indicated a time horizon longer than 20 years, the longer-term expected returns were combined with the shorter-term expected returns to achieve a 20-year horizon.

Differing Opinions

Exhibit 5 below shows the distribution of expected returns and standard deviations (i.e., volatilities) for each asset class in the survey, as provided by the 41 individual advisors in the survey. The expected returns shown are geometric.

Note that the exhibit below focuses on a 10-year horizon in order to include assumptions from all 41 advisors. See Exhibits 17 and 18 in the appendix to this report for a more detailed look at the distribution of expected returns and standard deviations over both 10- and 20-year horizons. The ranges of expected returns by asset class can be found in the appendix as Exhibits 19 and 20.

A summary of the average survey assumptions can be found in the appendix to this report as Exhibit 16. This summary includes expected returns, standard deviations, and a correlation matrix.

The exhibit below shows that there are significant differences in expected returns and standard deviations among investment advisors. As the saying goes, "reasonable people may differ."

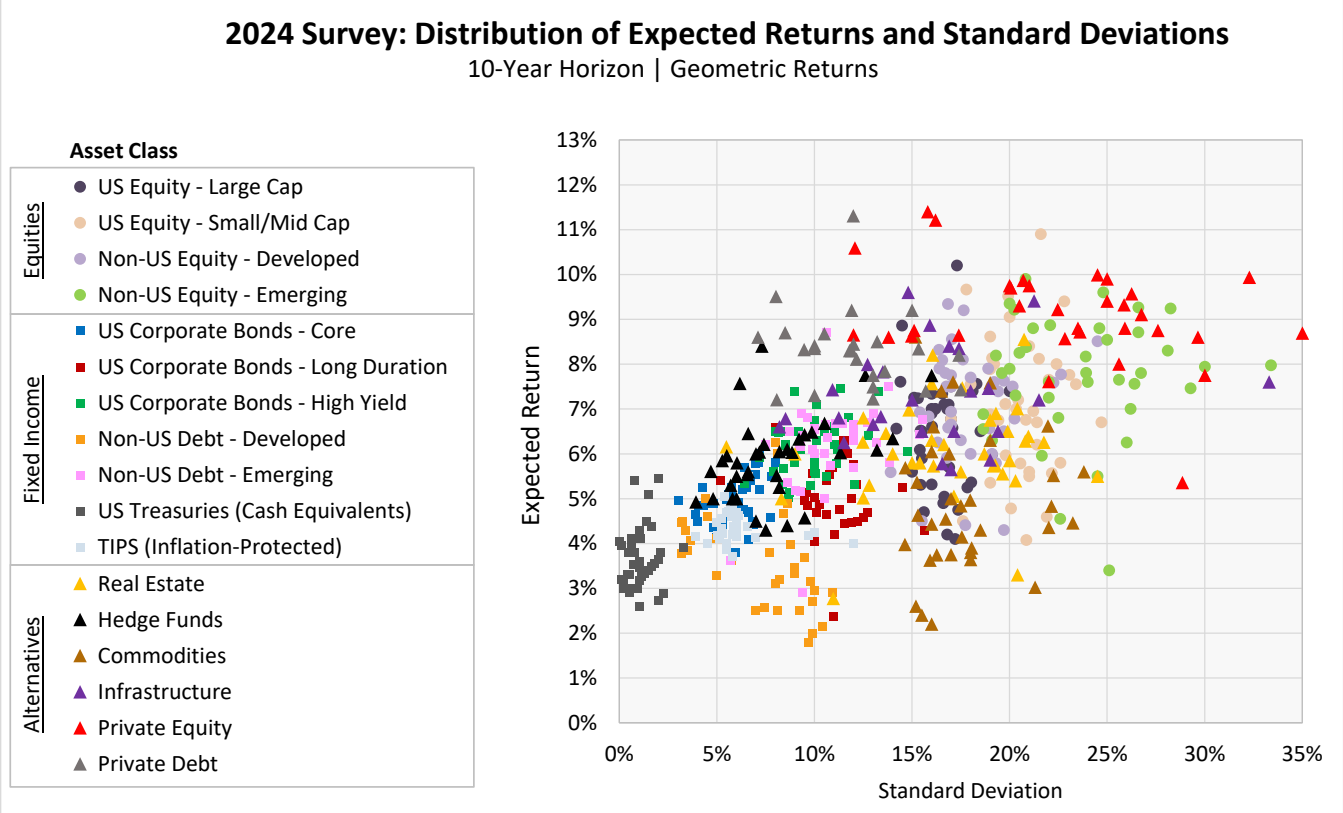
The differences in assumptions are more pronounced for alternative investments such as real estate, hedge funds, and private equity. A contributing factor may be differences in the underlying strategies different advisors apply to these alternative investments.

To contrast, the differences in expected returns and volatilities are smaller for more traditional investments, such as US equity and US fixed income.

Another reason for the significant differences among investment advisors may be the effective date of the assumptions. Ideally, this survey would compile and compare assumptions that all have the same effective date. However, this is not feasible when aggregating results from 41 advisors who update their assumptions on different schedules.

The vast majority of advisors specified effective dates on or around January 1, 2024. However, a few specified effective dates as early as October 1, 2023 and a few specified dates as late as March 31, 2024.

Exhibit 5



Changing Outlooks: 2020 to 2024

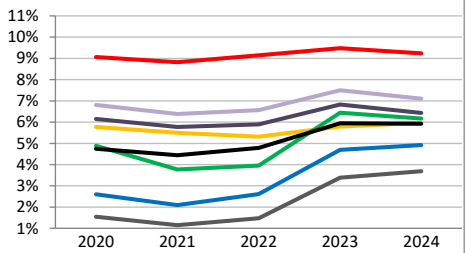
In recent years, there has been much discussion about whether it is reasonable to expect that future investment returns will be as high as they have been historically. Citing various reasons such as increased equity prices, tightening credit spreads, and the persistence of historically low interest rates, many advisors lowered their expectations gradually from year-to-year before reducing them considerably from 2019 to 2021.

With interest rates on the rise and lower equity valuations at the end of 2022, we saw a sharp reversal of this trend, with markedly higher expectations across asset classes in 2023. For 2024, we see continued increases in expectations for fixed income alongside lower expectations for equities.

Exhibit 6 below shows average expected returns over a 10-year horizon for selected asset classes each year from 2020 to 2024. For consistency, this exhibit includes only the 38 advisors who provided short-term assumptions in each of these years.

Exhibit 6

Average Expected Returns (10-Year Horizon)



	2020	2021	2022	2023	2024
Private Equity	9.1%	8.8%	9.1%	9.5%	9.2%
Non-US Eq. (Dev)	6.8%	6.4%	6.6%	7.5%	7.1%
US Eq. (Large Cap)	6.2%	5.8%	5.9%	6.8%	6.4%
Real Estate	5.8%	5.5%	5.3%	5.8%	6.0%
US Bonds (HY)	4.9%	3.8%	4.0%	6.4%	6.2%
Hedge Funds	4.7%	4.4%	4.8%	5.9%	5.9%
US Bonds (Core)	2.6%	2.1%	2.6%	4.7%	4.9%
US Treasuries	1.6%	1.2%	1.5%	3.4%	3.7%

Figures are average geometric returns for selected asset classes for the 38 advisors who provided short-term assumptions in each of the surveys from 2020 through 2024.

For this subset of advisors, average expected returns over a 10-year horizon declined for most asset classes from 2020 to 2021, then increased slightly in 2022 before increasing dramatically in 2023. The sharpest increases in 2023 were for fixed income classes, such as US Treasuries, core US bonds, and high-yield US bonds.

The increases in expectations continued from 2023 to 2024 in the fixed income space with the exception of high yield US bonds. Conversely, return expectations have declined for equity-type investments since last year.

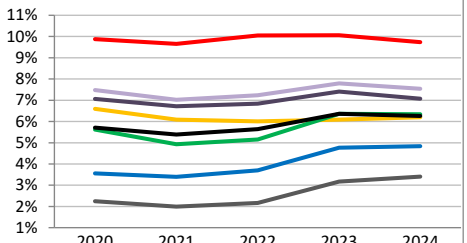
Despite their ups and downs, expectations for all of the asset classes shown increased from 2020 to 2024.

Exhibit 7 below shows how average expected returns have changed for the same asset classes for a subset of 18 advisors who provided assumptions each year from 2020 to 2024 over a 20-year horizon.

Note that the expected returns shown in Exhibits 6 and 7 are not directly comparable with those in other sections or previous surveys because we include only a subset of advisors who participated in each of the last 5 years.

Exhibit 7

Average Expected Returns (20-Year Horizon)



	2020	2021	2022	2023	2024
Private Equity	9.9%	9.7%	10.1%	10.1%	9.7%
Non-US Eq. (Dev)	7.5%	7.0%	7.2%	7.8%	7.5%
US Eq. (Large Cap)	7.1%	6.7%	6.8%	7.4%	7.1%
Real Estate	6.6%	6.1%	6.0%	6.1%	6.2%
US Bonds (HY)	5.6%	4.9%	5.2%	6.4%	6.3%
Hedge Funds	5.7%	5.4%	5.6%	6.4%	6.3%
US Bonds (Core)	3.6%	3.4%	3.7%	4.8%	4.8%
US Treasuries	2.2%	2.0%	2.2%	3.2%	3.4%

Figures are average geometric returns for selected asset classes for the 18 advisors who provided long-term assumptions in each of the surveys from 2020 through 2024.

Although the expected returns are generally higher over a 20-year horizon than a 10-year horizon, the trends over the period from 2020 to 2024 are similar. Namely, declines in return expectations for fixed income investments from 2020 to 2021, followed by a dramatic increase in 2023 and continuing increases into 2024. Overall, expectations for fixed income investments remain elevated when compared to their 2020 levels as a result of rising interest rates during the period.

On the equity side, the increases in return expectations that we saw from 2021 to 2023 were pared back modestly in 2024. While there was significant volatility in expected returns over the 5-year period, expected returns for equity-type investments in 2024 are largely the same as they were in 2020 for this subset of advisors.

Return expectations for hedge funds have increased significantly over both 10- and 20-year horizons as evidenced by the black line in the graphs above.

Evaluating the Return Assumption

Multiemployer pension plans are usually invested in a well-diversified mix of stocks, bonds, real estate, and alternative investments structured to meet the goals of the Trustees. This typically involves maximizing returns over the long term while minimizing return volatility.

The actuary of a multiemployer pension plan must consider the plan's asset allocation and, based on expectations of future returns, develop an assumption for what plan assets are projected to earn over the long term. This assumption is then used (along with others) to determine the actuarial present value of the benefits promised by the plan to its participants and beneficiaries.

The actuary will often seek input on future return expectations from the plan's investment advisor in developing the plan's investment return assumption. However, as noted earlier, different investment advisors often have widely differing opinions on what future returns will be. Therefore, it can be beneficial to keep in mind other advisors' expectations when setting the investment return assumption.

In the following exhibits, we will evaluate the investment return assumption for a hypothetical multiemployer pension plan. Exhibit 8 below shows the asset allocation for this hypothetical plan. The asset allocations are arbitrary, except for the fact that we made sure to include at least a small allocation to every asset class in the survey.

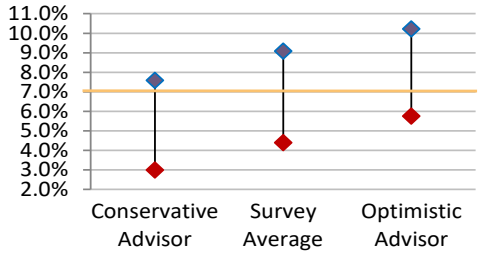
Exhibit 8

Asset Class - Hypothetical Plan	Weight
US Equity - Large Cap	20.0%
US Equity - Small/Mid Cap	10.0%
Non-US Equity - Developed	7.5%
Non-US Equity - Emerging	5.0%
US Corporate Bonds - Core	7.5%
US Corporate Bonds - Long Duration	2.5%
US Corporate Bonds - High Yield	5.0%
Non-US Debt - Developed	5.0%
Non-US Debt - Emerging	2.5%
US Treasuries (Cash Equivalents)	5.0%
TIPS (Inflation-Protected)	5.0%
Real Estate	7.5%
Hedge Funds	5.0%
Commodities	2.5%
Infrastructure	2.5%
Private Equity	5.0%
Private Debt	2.5%
TOTAL PORTFOLIO	**100.0%**

Exhibit 9 shows expected annualized (geometric) returns for the hypothetical plan over a 10-year horizon. These results may be appropriate for modeling sensitivities of future funding results to short-term investment returns, or for evaluating the return assumption for a plan with a shorter duration of liabilities or solvency issues.

Exhibit 9

Annualized Expected Returns
Hypothetical Multiemployer Pension Fund
10-Year Horizon

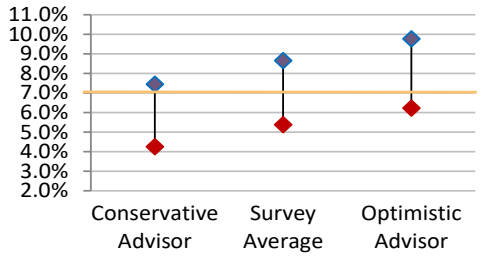


	Conservative Advisor	Survey Average	Optimistic Advisor
75th percentile	7.57%	9.07%	10.22%
25th percentile	2.98%	4.39%	5.75%
Probability of Meeting or Exceeding:			
7.50% per Year	25.7%	41.2%	55.8%
7.00% per Year	30.6%	46.9%	61.7%
6.50% per Year	36.0%	52.7%	67.3%

Exhibit 10 shows expected annualized (geometric) returns for the hypothetical plan over a 20-year horizon based on assumptions from the 26 advisors who provided longer-term assumptions. These results may be more appropriate for evaluating the return assumption for a less mature plan with no projected solvency issues.

Exhibit 10

Annualized Expected Returns
Hypothetical Multiemployer Pension Fund
20-Year Horizon



	Conservative Advisor	Survey Average	Optimistic Advisor
75th percentile	7.45%	8.65%	9.76%
25th percentile	4.25%	5.38%	6.22%
Probability of Meeting or Exceeding:			
7.50% per Year	24.3%	42.1%	57.4%
7.00% per Year	31.4%	50.2%	64.7%
6.50% per Year	39.2%	58.4%	71.5%

Evaluating the Return Assumption (cont.)

It is important to keep in mind that the expected returns shown in Exhibits 9 and 10 apply only to the hypothetical asset allocation shown in Exhibit 8. The expected returns will be different – perhaps significantly – for different asset allocations. The following are points to consider when reviewing the results in Exhibits 9 and 10:

Range of Reasonable Assumptions: When setting the investment return assumption for pension valuations, actuaries traditionally constructed a range of reasonable assumptions and then selected a best-estimate point within that range. Actuaries would often consider the reasonable range to be the middle 50 percent of possible results, bounded by the 25th and 75th percentiles.

The applicable actuarial standards of practice were updated in 2013, and the updated standards de-emphasize use of the reasonable range when setting the investment return assumption. Nevertheless, considering this range remains instructive; it may be difficult for an actuary to justify an assumption outside of this range.

Based on the average assumptions in this 2024 survey, the middle 50 percent range for this hypothetical pension plan is very wide: 5.38% to 8.65% over the next 20 years. Note that the range is even wider for a 10-year horizon: 4.39% to 9.07%. This is due to the fact that, while returns may be volatile from one year to the next, deviations will be lower when returns are annualized (in other words, smoothed out) over longer horizons.

Probability of Meeting/Exceeding the Benchmark: For example, say that the actuary for this hypothetical pension plan expects its investment returns to be 7.00% per year, represented by the gold lines in Exhibits 9 and 10. Based on the average assumptions in this 2024 survey, there is a 50.2% probability the plan will meet or beat its 7.00% benchmark on an annualized basis over a 20-year period. The probability is lower, 46.9%, that the plan will meet or beat its benchmark over the next 10 years.

Also note that over a 20-year period, the probability that the annualized investment return will exceed 7.50% (arbitrarily, 50 basis points above the benchmark return) is 42.1%. The probability that the annualized return will exceed 6.50% (50 basis points below the benchmark) is 58.4%. These probabilities are a bit lower when focusing on a 10-year horizon rather than a 20-year horizon.

Purpose of the Measurement: It is important to note that this survey focuses on the investment return assumption, which may (or may not) be the same as the assumption used to discount a plan's projected benefit payments to measure its liabilities. The applicable standards of practice emphasize that the actuary should consider the purpose of the measurement (e.g., contribution budgeting, defeasance or settlement, market measurements, pricing) as a primary factor in choosing a discount rate.

Optimistic and Conservative Assumptions: As previously noted, different investment advisors may have widely varying future capital market expectations. Therefore, it may also be interesting to consider the range of expected returns based on the assumptions provided by the most conservative and most optimistic advisors in the survey.

For this hypothetical asset allocation, the assumptions from the most conservative advisor indicate that the probability of beating the 7.00% benchmark assumption over the next 20 years is 31.4%. Using assumptions from the most optimistic advisor results in a probability of 64.7%. Again, reasonable people may differ.

Limitations: The following are some important limiting factors to keep in mind when reviewing these results.

- The asset classes in this survey do not always align perfectly with the asset classes provided by the investment advisors. Adjustments were made to standardize the different asset classes provided.
- Many of the advisors develop their future assumptions based on investment horizons of no more than 10 years, and returns are generally expected to be lower in the short term. The typical multiemployer pension plan will have an investment horizon that is longer than 10 years.
- The return expectations are generally based on market returns. In other words, they do not reflect any additional returns that may be earned due to active asset managers outperforming the market ("alpha").
- The return expectations do not adjust for plan size. Specifically, they do not take into account the fact that certain investment opportunities are more readily available to larger plans, as well as the fact that larger plans may often receive more favorable investment fee arrangements than smaller plans.
- The ranges of expected annualized returns were constructed using basic, often simplified, formulas and methodologies. More sophisticated investment models – which may consider various economic scenarios, non-normal distributions, etc. – could produce significantly different results.

Use of the Survey: This survey is not intended to be a substitute for the expectations of individual portfolio managers, advisors, or actuaries performing their own independent analyses. The actuarial standards of practice provide for various methods of selecting and supporting the investment return assumption. This survey is intended to be used in conjunction with these methods, with appropriate weighting of various resources based on the plan actuary's professional judgment.

Comparison with Prior Surveys

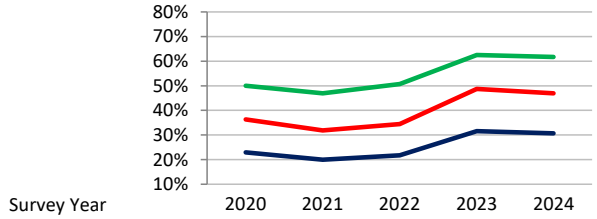
Exhibits 6 and 7 showed how expected returns for certain asset classes have changed over the past few years. Similarly, Exhibits 11 and 12 below show how return expectations for the hypothetical multiemployer pension plan whose asset allocation is shown in Exhibit 8 have changed from 2020 to 2024.

Both exhibits show the probabilities that the hypothetical pension plan will meet or exceed its 7.00% benchmark return on an annualized basis over the given time horizon. Exhibit 11 focuses on expected returns over a 10-year period and Exhibit 12 focuses on expected returns over a 20-year period. Probabilities are shown for the survey average for each year from 2020 through 2024. For comparison, probabilities are also shown for the most conservative and optimistic advisors in each survey.

See Exhibit 14 in the appendix for a more complete range of expected returns over a 20-year horizon for each survey from 2015 through 2024.

Exhibit 11

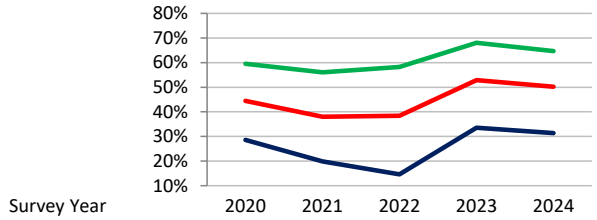
Probability of Meeting 7.00% Benchmark
Hypothetical Multiemployer Pension Fund
10-Year Horizon



Survey Year	2020	2021	2022	2023	2024
Most Optimistic	50.0%	46.9%	50.7%	62.5%	61.7%
Survey Average	36.4%	31.9%	34.5%	48.7%	46.9%
Most Conservative	22.9%	20.0%	21.8%	31.6%	30.6%

Exhibit 12

Probability of Meeting 7.00% Benchmark
Hypothetical Multiemployer Pension Fund
20-Year Horizon



Survey Year	2020	2021	2022	2023	2024
Most Optimistic	59.5%	56.1%	58.2%	68.0%	64.7%
Survey Average	44.5%	38.0%	38.4%	52.8%	50.2%
Most Conservative	28.6%	19.9%	14.6%	33.6%	31.4%

As shown in Exhibit 11, the probability that this hypothetical pension plan would meet or beat a benchmark return of 7.00% over a 10-year horizon stayed relatively flat from 2020 to 2022, increased sharply in 2023, and remained level from 2023 to 2024. Exhibit 12 shows that the probability this hypothetical pension plan would meet or beat a benchmark return of 7.00% over a 20-year horizon declined from 2020 to 2022 before rebounding in 2023 and declining slightly in 2024.

For example:

- Based on the average assumptions from the 2024 survey, the probability of this hypothetical plan meeting or exceeding an annualized return of 7.00% over the next 10 years is 46.9%. The probability was considerably lower (36.4%) five years ago when the 2020 survey was conducted.

- Based on the average assumptions from the 2024 survey, the probability of this hypothetical plan meeting or exceeding an annualized return of 7.00% over the next 20 years is 50.2%. This represents a slight decline from last year when the probability was 52.8% but remains higher than 2020 when the probability was 44.5%. The sharp increase from 2022 to 2023 was driven by increases in expectations across asset classes, with fixed income expectations rising the most.

Other points of note when comparing the results from the 2024 survey to those from prior years:

- The results for the most conservative advisor over a 10-year horizon hovered just above 20.0% from 2020 to 2022 before increasing to over 30.0% in 2023 and 2024. Over a 20-year horizon, the results for the most conservative advisor reached a low of 14.6% in 2022, before rebounding to over 30.0% in 2023 and 2024. In other words, the most conservative advisor in 2022 projected a mere 1 in 7 chance of meeting the 7.00% benchmark over a 20-year horizon while the most conservative advisors in 2023 and 2024 projected a 1 in 3 chance of meeting the same benchmark return.

- The results for the most optimistic advisor over a 10-year horizon remained level at about 62.0% in 2024. Over a 20-year horizon, the results for the most optimistic advisor dropped a few percentage points to 64.7% but still represent an approximately 2 in 3 chance of meeting the 7.00% benchmark.

- Note that the most conservative and most optimistic advisors are not necessarily the same from year to year or for different time horizons.

Glossary

The following are basic definitions of some of the investment terminology used in this report.

Expected Return

The *expected return* is the amount, as a percentage of assets, that an investment is expected to earn over a period of time. Expected returns in this survey are generally market returns that do not reflect value added or fees due to active management. Returns for asset classes where passive investments are not available (e.g., hedge funds and private equity) are generally net of fees.

Arithmetic vs. Geometric Returns

An *arithmetic* return is the average return in any one year. A *geometric* return is the annualized return over a multi-year period. In general, it is more appropriate to focus on geometric returns when evaluating expected returns over multi-year horizons. However, arithmetic returns are also important. For example, the expected return of a portfolio is calculated as the weighted average of arithmetic returns, not geometric returns.

This survey focuses on geometric returns. Many advisors provide both arithmetic and geometric expected returns. For advisors who provided expected returns only on an arithmetic basis, we converted them to geometric returns for consistency. The following formula was used to make this conversion.

$$E[R_G] = ((1 + E[R_A])^2 - VAR[R])^{1/2} - 1$$

In this formula, $E[R_G]$ is the expected geometric return, $E[R_A]$ is the expected arithmetic return, and VAR[R] is the variance of the expected annual (arithmetic) return.

Standard Deviation

The *standard deviation* is a measure of the expected volatility in the returns. Generally, the standard deviation expresses how much returns may vary in any one year. Assuming that returns are "normally distributed," there is about a 68% probability that the actual return for a given year will fall within one standard deviation (higher or lower) of the expected return. There is about a 95% probability that the actual return will fall within two standard deviations of the expected return.

Correlation

The degree to which the returns for two different asset classes move in tandem with one another is their *correlation*. For example, if two asset classes are perfectly correlated, their correlation coefficient will be 1.00; in other words, if one asset class has a return of X% in a given market environment, then the other asset class is expected to also have a return of X%. A portfolio becomes better diversified as its asset classes have lower (or even negative) correlations with each other.

Methodology

The following is a high-level description of the methodology used in compiling the survey results.

Standardized Asset Classes

Not all investment advisors use the same asset classes when developing their capital market assumptions. Some are very specific (more asset classes), while others keep things relatively simple (fewer asset classes).

We exercised judgment in classifying each advisor's capital market assumptions into a standard set of asset classes. In the event that an advisor did not provide assumptions for a given asset class, the average assumptions from the other advisors was used when developing expected returns for that advisor.

Investment Horizons

This survey considers "short-term" expected returns to apply to a 10-year investment horizon, and "long-term" expected returns to apply to a 20-year horizon.

In this 2024 edition of the survey, 15 of the 41 advisors provided only short-term assumptions, indicating a horizon of no more than 10 years. Included in this group is one advisor who provided assumptions over a horizon of seven years.

All 26 advisors who provided long-term assumptions over horizons of 20 years or more also provided short-term assumptions. In cases where such an advisor indicated a horizon shorter than 10 years, the shorter-term expected returns were combined with the longer-term expected returns to achieve a 10-year horizon. If an advisor indicated a time horizon longer than 20 years, the longer-term expected returns were combined with the shorter-term expected returns to achieve a 20-year horizon.

No Adjustment for Alpha

No adjustment was made to reflect the possible value added by an active investment manager outperforming market returns (earning "alpha").

Normally-Distributed Returns

This survey assumes that investment returns will be normally distributed according to the capital market assumptions provided. The survey also assumes that the investment return in one year does not affect the investment return in the following year.

Equal Weighting

Each unique assumption set was given equal weight in developing the average assumptions for the survey, regardless of factors such as total assets under advisement, research methodology, etc.

Exhibit 13

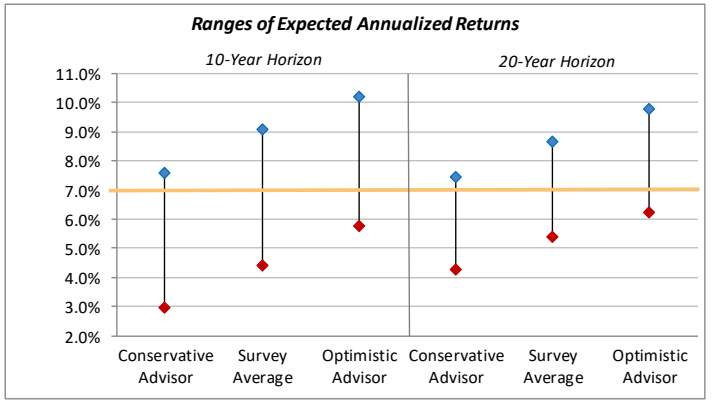
The following exhibit evaluates the investment return assumption for a hypothetical multiemployer pension plan. It reflects the same hypothetical asset allocation as shown in Exhibit 8, and it provides more detail than Exhibits 9 and 10. Note that the most conservative and optimistic advisors for the 10-year horizon are not necessarily the same as the most conservative and optimistic advisors for the 20-year horizon. This hypothetical pension plan has a benchmark return of 7.00% per year, which is indicated by the gold line in the exhibit below.

Hypothetical Multiemployer Plan

2024 Survey of Capital Market Assumptions

		Average Survey Assumptions		
Asset Class	Portfolio Weight	10-Year Horizon	20-Year Horizon	Standard Deviation
US Equity - Large Cap	20.0%	6.46%	6.96%	16.52%
US Equity - Small/Mid Cap	10.0%	7.07%	7.50%	20.57%
Non-US Equity - Developed	7.5%	7.08%	7.52%	18.06%
Non-US Equity - Emerging	5.0%	7.70%	8.24%	23.61%
US Corporate Bonds - Core	7.5%	4.93%	4.88%	5.90%
US Corporate Bonds - Long Duration	2.5%	5.05%	5.16%	10.98%
US Corporate Bonds - High Yield	5.0%	6.13%	6.36%	9.94%
Non-US Debt - Developed	5.0%	3.66%	3.71%	7.33%
Non-US Debt - Emerging	2.5%	6.17%	6.28%	10.76%
US Treasuries (Cash Equivalents)	5.0%	3.68%	3.43%	1.10%
TIPS (Inflation-Protected)	5.0%	4.38%	4.27%	6.10%
Real Estate	7.5%	6.06%	6.17%	16.61%
Hedge Funds	5.0%	5.90%	6.17%	8.03%
Commodities	2.5%	4.92%	4.95%	17.81%
Infrastructure	2.5%	7.26%	7.36%	16.02%
Private Equity	5.0%	9.09%	9.71%	22.57%
Private Debt	2.5%	8.32%	8.44%	12.00%
Inflation	N/A	2.42%	2.44%	1.86%
TOTAL PORTFOLIO	**100.0%**	*Expected returns are geometric.*		

	10-Year Horizon			*20-Year Horizon*		
	Conservative Advisor	**Survey Average**	**Optimistic Advisor**	**Conservative Advisor**	**Survey Average**	**Optimistic Advisor**
Expected Returns						
Average Annual Return (Arithmetic)	5.83%	7.29%	8.49%	6.38%	7.56%	8.63%
Annualized Return (Geometric)	5.28%	6.73%	7.98%	5.85%	7.01%	7.99%
Annual Volatility (Standard Deviation)	10.77%	10.98%	10.49%	10.59%	10.87%	11.74%
Range of Expected Annualized Returns						
75th Percentile	7.57%	9.07%	10.22%	7.45%	8.65%	9.76%
25th Percentile	2.98%	4.39%	5.75%	4.25%	5.38%	6.22%
Probabilities of Exceeding Certain Returns						
7.50% per Year, Annualized	25.7%	41.2%	55.8%	24.3%	42.1%	57.4%
7.00% per Year, Annualized	30.6%	46.9%	61.7%	31.4%	50.2%	64.7%
6.50% per Year, Annualized	36.0%	52.7%	67.3%	39.2%	58.4%	71.5%



Considerations and Limitations

- Allocations may be approximated if certain asset classes are not included in the survey.
- Many investment advisors provided only shorter-term assumptions (10 years or less).
- Assumptions are generally based on indexed returns and do not reflect anticipated alpha.
- Assumptions do not reflect investment opportunities or fee considerations available to larger funds.

SOURCE: Horizon Actuarial 2024 Survey of Capital Market Assumptions

Expected returns over a 10-year horizon include all 41 survey participants.

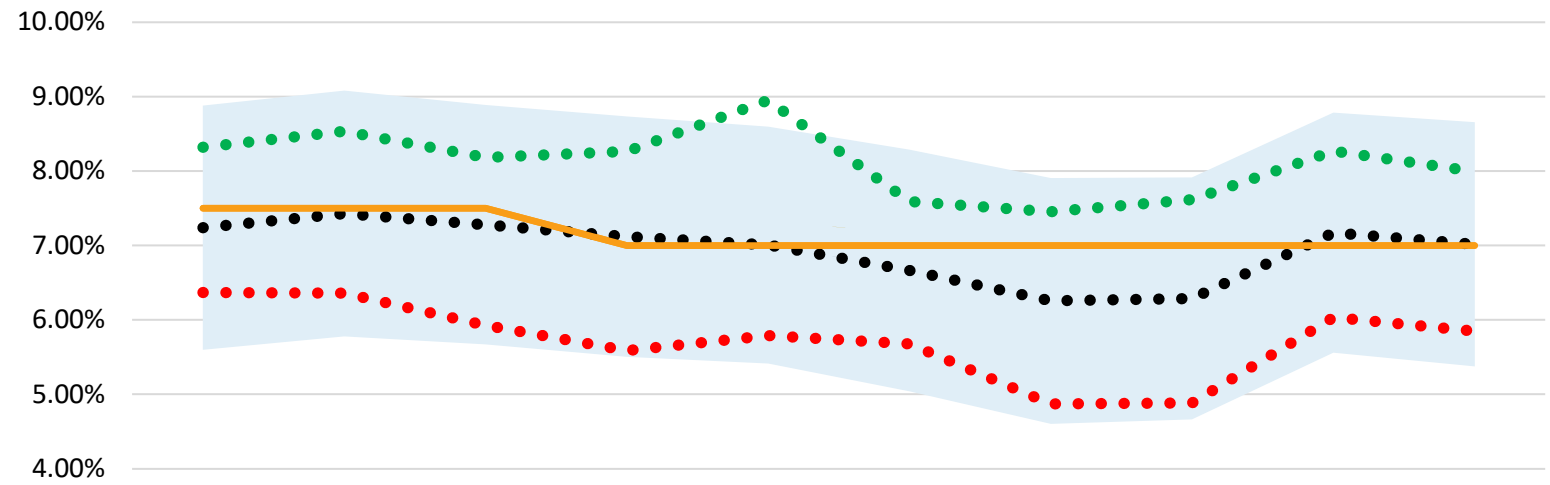
Expected returns over a 20-year horizon are based a subset of 26 survey participants who provided long-term assumptions.

Exhibit 14

The following exhibit shows the range of expected annualized returns for each of the surveys from 2015 to 2024 over a 20-year horizon. The results for 2019 through 2024 reflect the same hypothetical asset allocation as shown in Exhibit 13. Note that the hypothetical asset allocation was modified slightly in 2019 to include a small allocation to private debt. Please refer to the 2018 survey for the hypothetical asset allocation used to develop the results for 2015 through 2018. Similar to Exhibit 13, the benchmark return for this hypothetical plan is indicated by the gold line. The most conservative advisor in each survey is indicated by the red dotted line and the most optimistic advisor in each survey is indicated by the green dotted line. The black dotted line shows the survey average return and the blue shaded region shows the 25th – 75th percentile of returns assuming a normal distribution using the survey average return and survey average standard deviation.

Range of Expected Annualized Returns: 2015 - 2024 Surveys

Hypothetical Multiemployer Plan | Geometric Returns | 20-Year Horizon

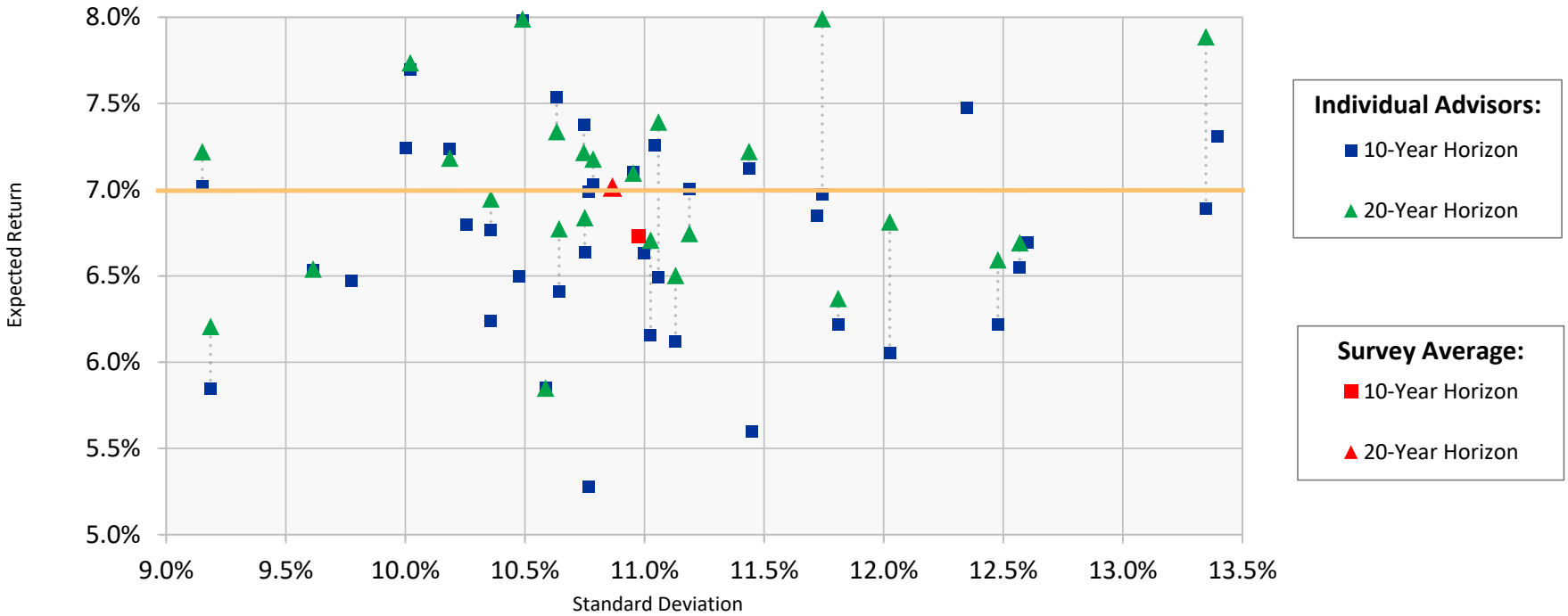


Survey Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Benchmark Return	7.50%	7.50%	7.50%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
Survey Average	7.24%	7.43%	7.28%	7.12%	7.01%	6.66%	6.25%	6.29%	7.17%	7.01%

SOURCE: Horizon Actuarial 2024 Survey of Capital Market Assumptions
Expected returns over a 20-year horizon are based a subset of 26 survey participants who provided long-term assumptions.

Exhibit 15

The following exhibit shows the distribution of expected annualized returns and annual standard deviations for the same hypothetical asset allocation that is shown in Exhibit 13. The expected annualized return and annual standard deviation of the hypothetical asset allocation are shown separately for each advisor who participated in the survey. Individual advisors are shown separately by investment horizon, and the short- and long-term assumptions for advisors who provided both are connected by a dotted line. The survey average assumptions are shown in red. Similar to Exhibit 13, the benchmark return of 7.00% for this hypothetical plan is indicated by the gold line. The exhibit shows that there are a wide variety of investment return assumptions that could be considered to be reasonable for any given asset allocation.



SOURCE: Horizon Actuarial 2024 Survey of Capital Market Assumptions
Expected returns over a 10-year horizon include all 41 survey participants.
Expected returns over a 20-year horizon are based a subset of 26 survey participants who provided long-term assumptions.

Exhibit 16

The following exhibit provides the average capital market assumptions for all 41 investment advisors in the 2024 survey. Each unique assumption set was given equal weight in determining the average assumptions. For reference, expected returns are shown over 10-year and 20-year horizons. Expected returns are also provided on both an arithmetic basis (one-year average) and geometric basis (multi-year annualized). The standard deviations (volatilities) and correlations apply to both arithmetic and geometric expected returns.

Horizon Actuarial 2024 Survey of Capital Market Assumptions

Average Survey Assumptions

		Expected Returns					*Correlation Matrix*															
		10-Year Horizon		20-Year Horizon		Standard																
	Asset Class	Arith.	Geom.	Arith.	Geom.	Deviation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	US Equity - Large Cap	7.74%	6.46%	8.25%	6.96%	16.52%	1.00																
2	US Equity - Small/Mid Cap	9.04%	7.07%	9.50%	7.50%	20.57%	0.90	1.00															
3	Non-US Equity - Developed	8.61%	7.08%	9.08%	7.52%	18.06%	0.81	0.76	1.00														
4	Non-US Equity - Emerging	10.31%	7.70%	11.00%	8.24%	23.61%	0.70	0.67	0.79	1.00													
5	US Corporate Bonds - Core	5.10%	4.93%	5.04%	4.88%	5.90%	0.28	0.23	0.26	0.24	1.00												
6	US Corporate Bonds - Long Duration	5.64%	5.05%	5.71%	5.16%	10.98%	0.27	0.22	0.25	0.23	0.88	1.00											
7	US Corporate Bonds - High Yield	6.61%	6.13%	6.86%	6.36%	9.94%	0.68	0.67	0.64	0.62	0.49	0.43	1.00										
8	Non-US Debt - Developed	3.95%	3.66%	4.00%	3.71%	7.33%	0.21	0.17	0.32	0.28	0.61	0.59	0.30	1.00									
9	Non-US Debt - Emerging	6.73%	6.17%	6.89%	6.28%	10.76%	0.53	0.50	0.57	0.63	0.58	0.54	0.66	0.49	1.00								
10	US Treasuries (Cash Equivalents)	3.69%	3.68%	3.44%	3.43%	1.10%	(0.03)	(0.06)	(0.02)	(0.02)	0.14	0.08	(0.03)	0.14	0.06	1.00							
11	TIPS (Inflation-Protected)	4.57%	4.38%	4.48%	4.27%	6.10%	0.17	0.13	0.17	0.19	0.66	0.59	0.33	0.49	0.43	0.13	1.00						
12	Real Estate	7.43%	6.06%	7.38%	6.17%	16.61%	0.57	0.57	0.50	0.45	0.27	0.25	0.49	0.20	0.40	(0.03)	0.21	1.00					
13	Hedge Funds	6.24%	5.90%	6.52%	6.17%	8.03%	0.71	0.70	0.68	0.66	0.26	0.24	0.63	0.20	0.50	(0.01)	0.18	0.45	1.00				
14	Commodities	6.45%	4.92%	6.56%	4.95%	17.81%	0.34	0.35	0.42	0.42	0.06	0.03	0.37	0.13	0.28	(0.00)	0.20	0.25	0.40	1.00			
15	Infrastructure	8.56%	7.26%	8.56%	7.36%	16.02%	0.66	0.63	0.64	0.60	0.29	0.32	0.60	0.30	0.52	(0.01)	0.21	0.50	0.57	0.42	1.00		
16	Private Equity	11.55%	9.09%	12.33%	9.71%	22.57%	0.75	0.96	0.66	0.61	0.18	0.21	0.55	0.16	0.43	(0.07)	0.11	0.48	0.62	0.29	0.56	1.00	
17	Private Debt	9.02%	8.32%	9.09%	8.44%	12.00%	0.55	0.55	0.52	0.50	0.17	0.20	0.66	0.10	0.41	(0.08)	0.09	0.37	0.55	0.33	0.48	0.58	1.00
	Inflation	2.43%	2.42%	2.44%	2.44%	1.86%																	

Expected returns over a 10-year horizon include all 41 survey participants.

Expected returns over a 20-year horizon are based a subset of 26 survey participants who provided long-term assumptions.

Exhibit 17

Earlier in this report, Exhibit 5 showed the distribution of expected returns and standard deviations for all 41 advisors who provided short-term assumptions. The exhibit below shows the same distribution, broken out by asset type: equities, fixed income, and alternatives. Note that the average expected return and standard deviation from the 2024 survey are listed in brackets for each asset class. Also note that not every advisor provided expectations for every asset class.

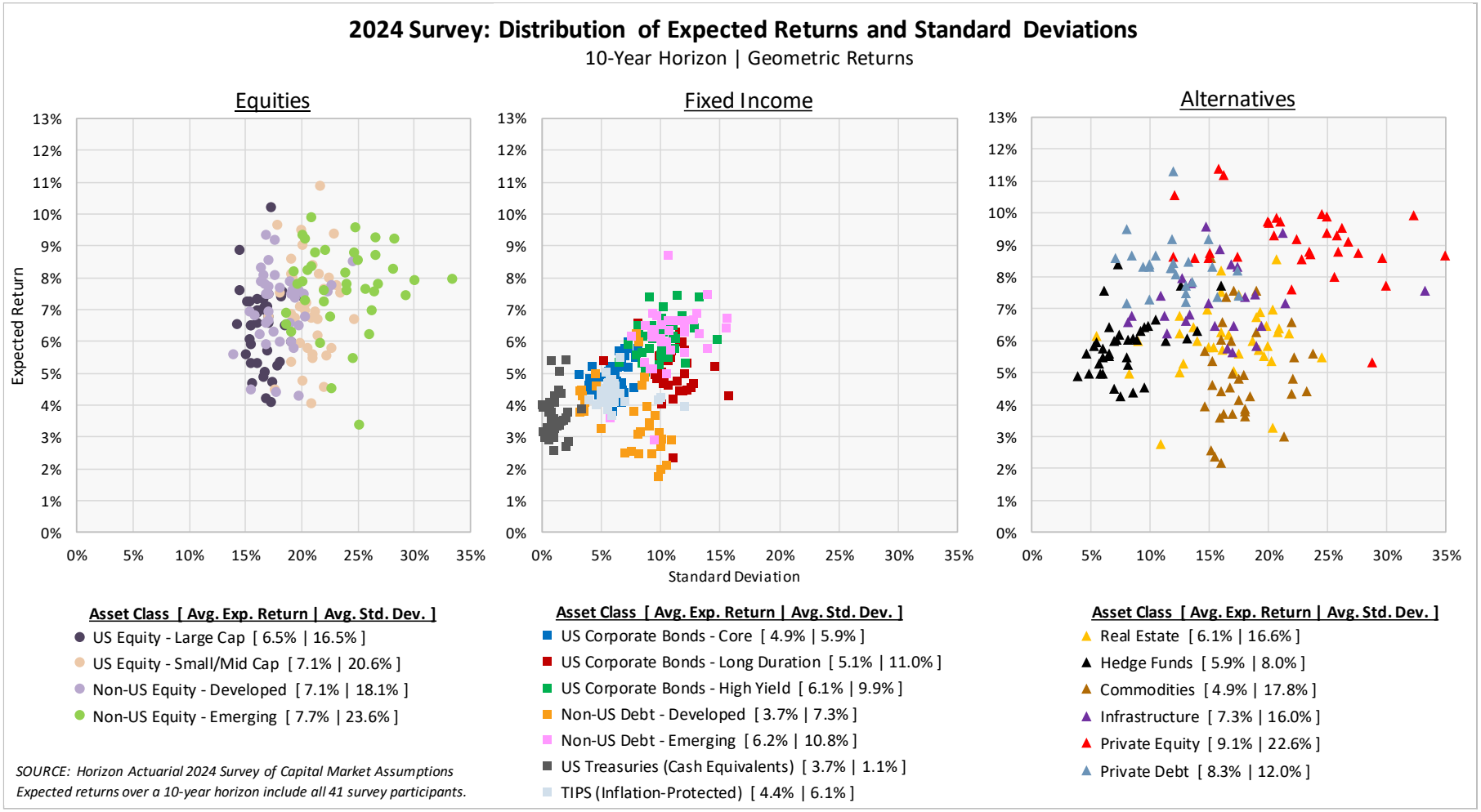
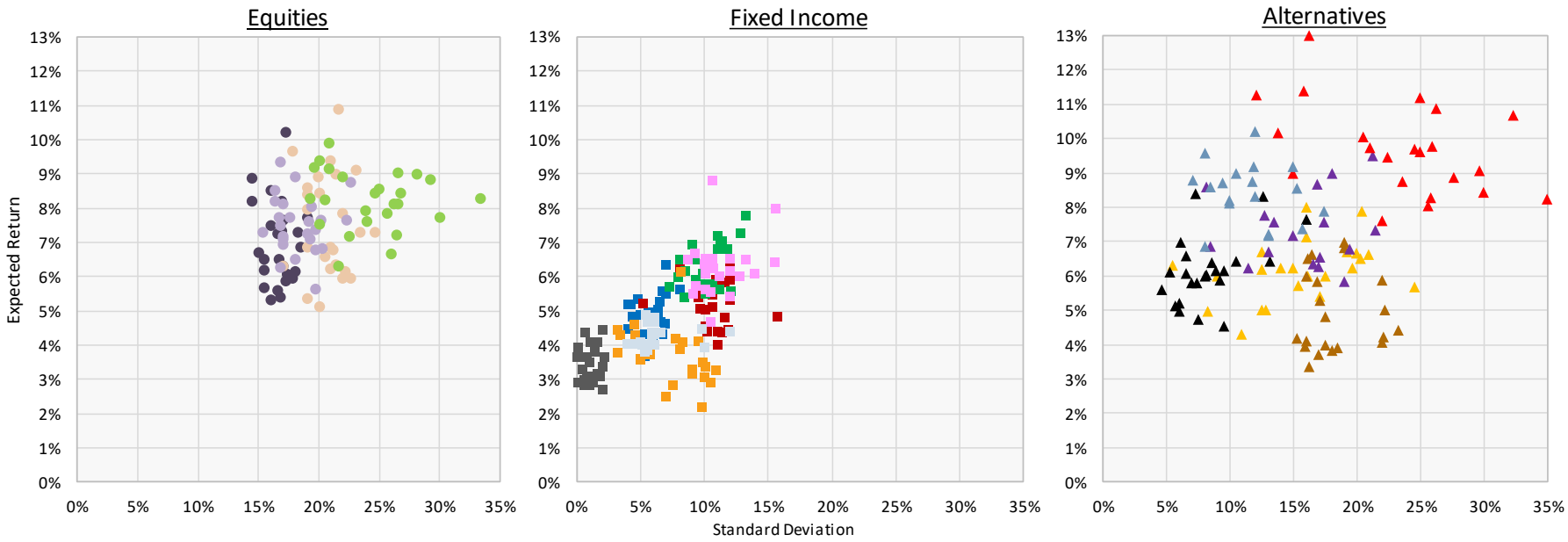


Exhibit 18

Exhibit 17 showed the distribution of expected returns and standard deviations over an investment horizon of 10 years. The exhibit below shows the same distribution, but for a horizon of 20 years. Note that while Exhibit 17 included all 41 advisors in the survey, the exhibit below only includes assumptions for the 26 advisors who provided longer-term assumptions (horizons of 20 years or more). Also note that not every advisor provided expectations for every asset class.

2024 Survey: Distribution of Expected Returns and Standard Deviations

20-Year Horizon | Geometric Returns



Asset Class [Avg. Exp. Return | Avg. Std. Dev.]

- US Equity - Large Cap [7.0% | 16.7%]
- US Equity - Small/Mid Cap [7.5% | 20.8%]
- Non-US Equity - Developed [7.5% | 18.3%]
- Non-US Equity - Emerging [8.2% | 24.4%]

Asset Class [Avg. Exp. Return | Avg. Std. Dev.]

- US Corporate Bonds - Core [4.9% | 5.8%]
- US Corporate Bonds - Long Duration [5.2% | 10.7%]
- US Corporate Bonds - High Yield [6.4% | 10.2%]
- Non-US Debt - Developed [3.7% | 7.3%]
- Non-US Debt - Emerging [6.3% | 11.2%]
- US Treasuries (Cash Equivalents) [3.4% | 1.1%]
- TIPS (Inflation-Protected) [4.3% | 6.3%]

Asset Class [Avg. Exp. Return | Avg. Std. Dev.]

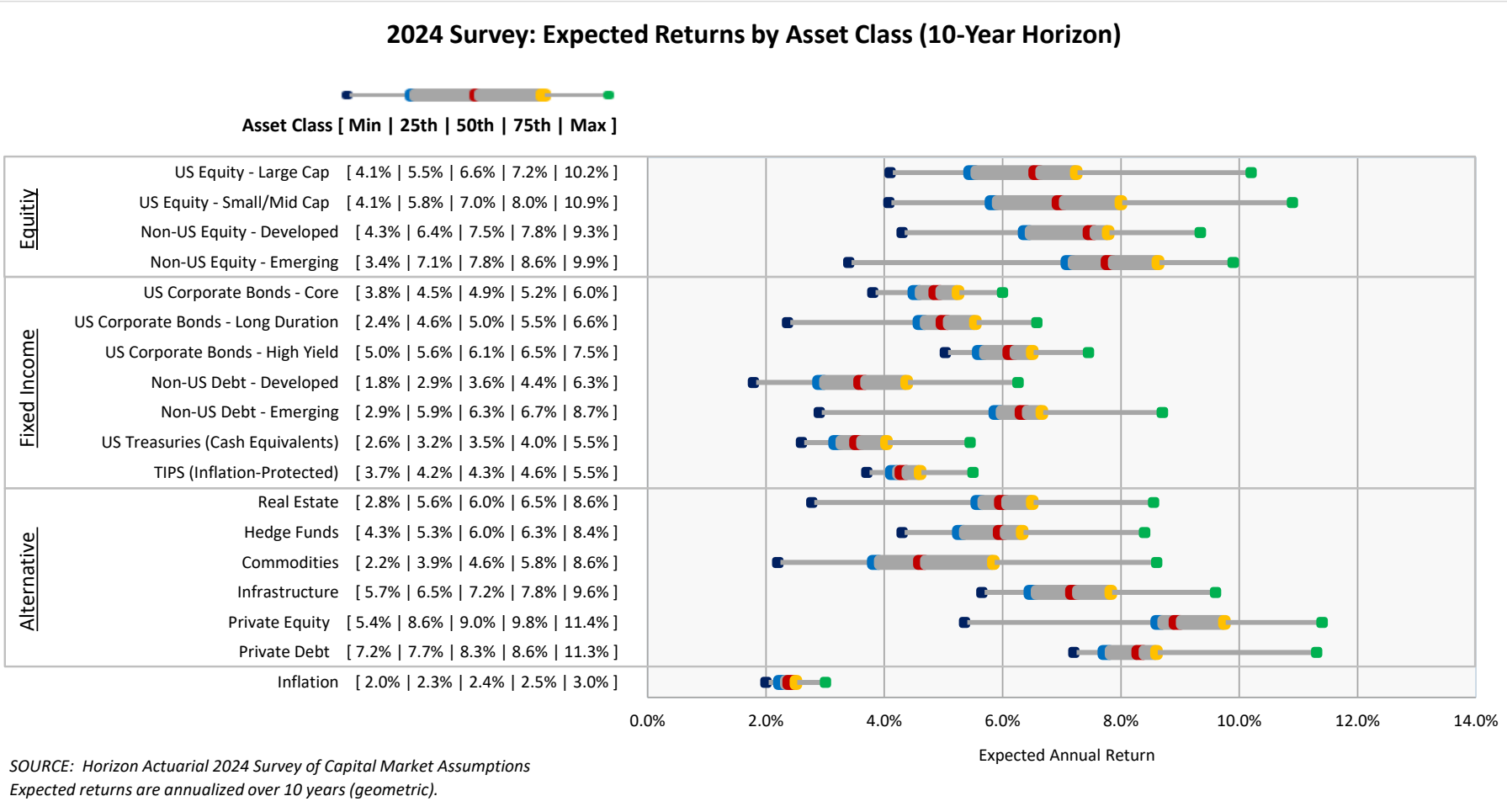
- Real Estate [6.2% | 15.5%]
- Hedge Funds [6.2% | 8.3%]
- Commodities [4.9% | 18.3%]
- Infrastructure [7.4% | 15.7%]
- Private Equity [9.7% | 23.4%]
- Private Debt [8.4% | 11.6%]

SOURCE: Horizon Actuarial 2024 Survey of Capital Market Assumptions
Expected returns over a 20-year horizon are based a subset of 26 survey participants who provided long-term assumptions.

Exhibit 19

The exhibit below shows the ranges of expected annual returns for different asset classes over a 10-year investment horizon. The ranges shown below include assumptions for all 41 advisors in the 2024 survey. Expected returns shown below are annualized (geometric).

To illustrate the distribution of expected returns, the exhibit shows the range of the middle 50 percent of results: the range between the 25th and 75th percentiles. It also shows the median expected return for each asset class: the 50th percentile. Note that the expected returns for the *median* advisor shown below are not the same as the *average* expected returns shown elsewhere in the report. In most cases, however, the differences between median and average expected returns are relatively small.



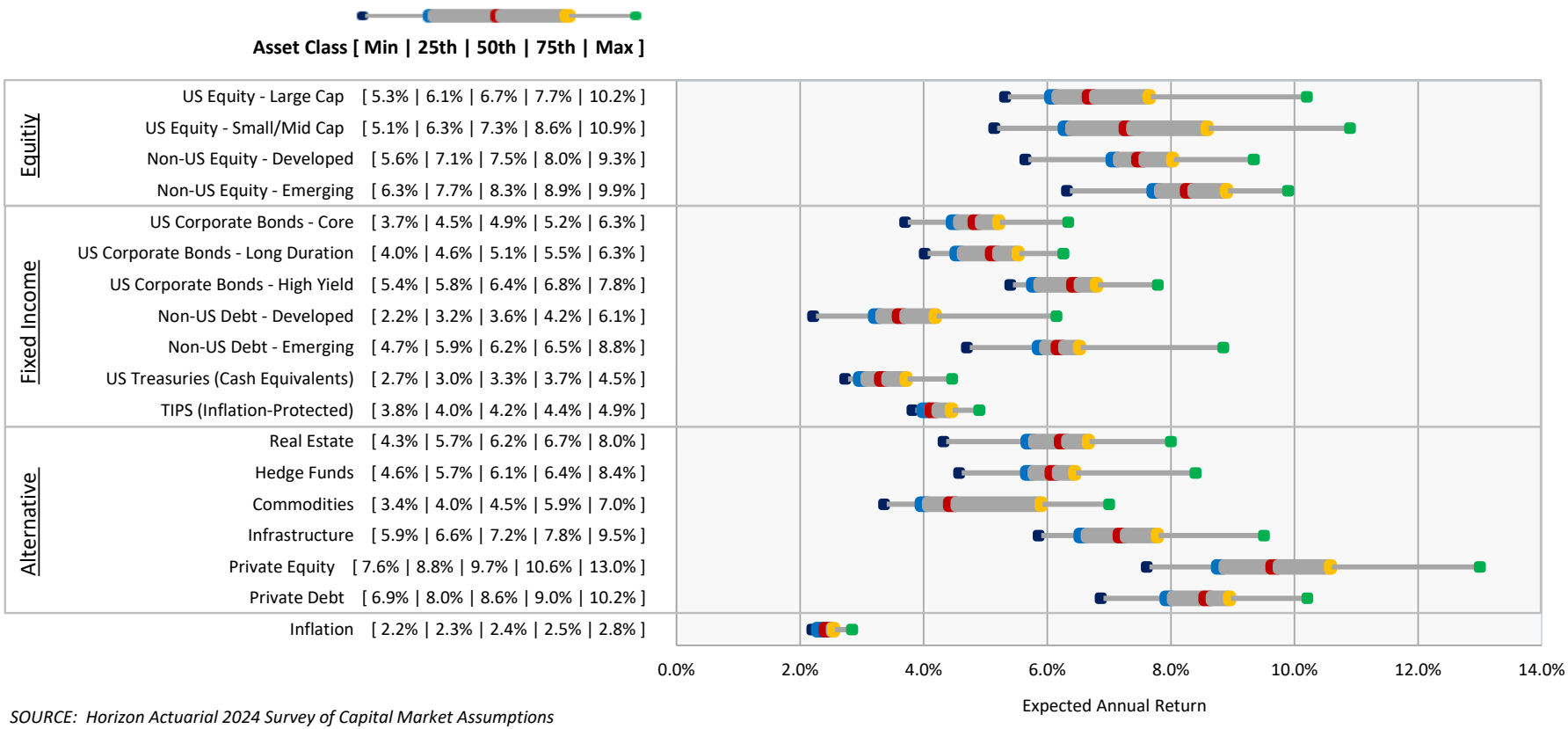
SOURCE: Horizon Actuarial 2024 Survey of Capital Market Assumptions
Expected returns are annualized over 10 years (geometric).

Exhibit 20

The exhibit below shows the ranges of expected annual returns for different asset classes over a 20-year investment horizon. The ranges shown below are based on the assumptions for 26 advisors who provided longer-term assumptions (horizons of 20 years or more). Expected returns shown below are annualized (geometric). Note that the ranges of expected returns are somewhat narrower when the investment horizon is longer.

To illustrate the distribution of expected returns, the exhibit shows the range of the middle 50 percent of results: the range between the 25th and 75th percentiles. It also shows the median expected return for each asset class: the 50th percentile. Note that the expected returns for the *median* advisor shown below are not the same as the *average* expected returns shown elsewhere in the report. In most cases, however, the differences between median and average expected returns are relatively small.

2024 Survey: Expected Returns by Asset Class (20-Year Horizon)



SOURCE: Horizon Actuarial 2024 Survey of Capital Market Assumptions
Expected returns are annualized over 20 years (geometric), based on a subset of 26 advisors who provided longer term assumptions.