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January 31, 2023

CONFIDENTIAL

Ms. Erin Leonard
Executive Director
Minnesota State Retirement System
60 Empire Drive, Suite 300
St. Paul, MN 55103

Re: Projection of Contributions and Funding Status – Judges Retirement Fund

Dear Ms. Leonard:

Attached are 30-year projections of estimated funded status, required contributions, and statutory contributions under three asset return scenarios for the Judges Retirement Fund. 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 Judges Retirement Fund actuarial funding valuation as of July 1, 2022.

Basis for Projections

For all enclosed projections, liabilities are determined using the statutory investment return assumption of 7.5%. As required by the Minnesota Standards for Actuarial Work, the projections reflect three asset return scenarios (7.5%, 6.0% and 9.0%). Note that we believe the 7.5% and 9.0% rate of return assumptions are 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 2.50% per year over the long term, consistent with the valuation assumption for total payroll growth.

The projection is an open group projection; meaning, active members projected to retire or otherwise terminate in the future are replaced with new active members so that the total active membership of the fund remains at 320 members. The profile of these new members is the same as new members hired between July 1, 2016 and June 30, 2021. Average salary at hire increases at the assumed payroll growth rate.

- Average age at hire is 48.1
- Average salary at hire is $169,800
- Approximately 54% female, 46% 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 supplemental contributions of $6.0 million annually until the plan reaches 100% funding (on an Actuarial Value of Assets basis), or July 1, 2048 if earlier. This supplemental contribution is projected to be eliminated in fiscal years ending 2036, 2042 and 2049 in the 9.0%, 7.5% and 6.0% investment return scenarios, respectively.

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

- 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 Standard 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.

- The enclosed projections are based on assumptions as outlined in the Judges Retirement Fund actuarial funding valuation as of July 1, 2022. Please see that report for comments regarding the 7.5% statutory investment return assumption, and sensitivity test results based on alternate assumptions.

- Note that plan changes may result in behavior changes that are not anticipated in the current assumptions.

- In the 7.5% and 9.0% 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.

- A 2022 analysis of long-term rate of investment return and inflation assumptions concluded that the probability of exceeding the current 7.5% assumption over 10 years is only 34%. The statutory requirement for projections that are 1.5% above and 1.5% below the assumed rate may give the reader the impression that the 7.5% projection is an accurate (middle of the road) representation of the expected future results. Based on our modeling, the 7.5% scenario is optimistic and not representative of the expected (median) result. We caution against adjusting contribution rates without full consideration of the median results.

- 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 Directors. 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. MSRS is solely responsible for communicating to GRS any changes required thereto.

In a 2022 analysis of long-term rate of investment return and inflation assumptions, GRS suggested that an investment return assumption in the range of 5.64% to 6.84% would be reasonable for this valuation. This implies that the 7.5% and 9.0% rate of return assumptions would be outside the range of reasonable returns for this plan. Please see our letter dated July 12, 2022 for additional information. For informational purposes, results based on a 6.5% discount rate are shown on page 4 of the July 1, 2022 valuation report.

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 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, 2022 valuation report. This valuation report includes risk metrics on pages 5-8, 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.

The valuation was based upon information furnished by the Minnesota State Retirement System (MSRS), 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 MSRS.

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.

This report reflects the impact of COVID-19 through June 30, 2022. It does not reflect the ongoing impact of COVID-19, which is likely to influence demographic and investment experience, at least in the short term. We will continue to monitor these developments and their impact on the plan.

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 Judges Retirement Fund 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.

Brian B. Murphy, 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

Brian B. Murphy

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

Bonita J. Wurst

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

Sheryl Christensen

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

BBM/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 7.50% on the market 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 26 years; and
(3) The unfunded liability is expected to grow initially as a dollar amount before beginning to decline.

Limitations of Funded Status Measurements

Unless otherwise indicated, a funded status measurement presented in this report is based upon the actuarial accrued liability and the 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.

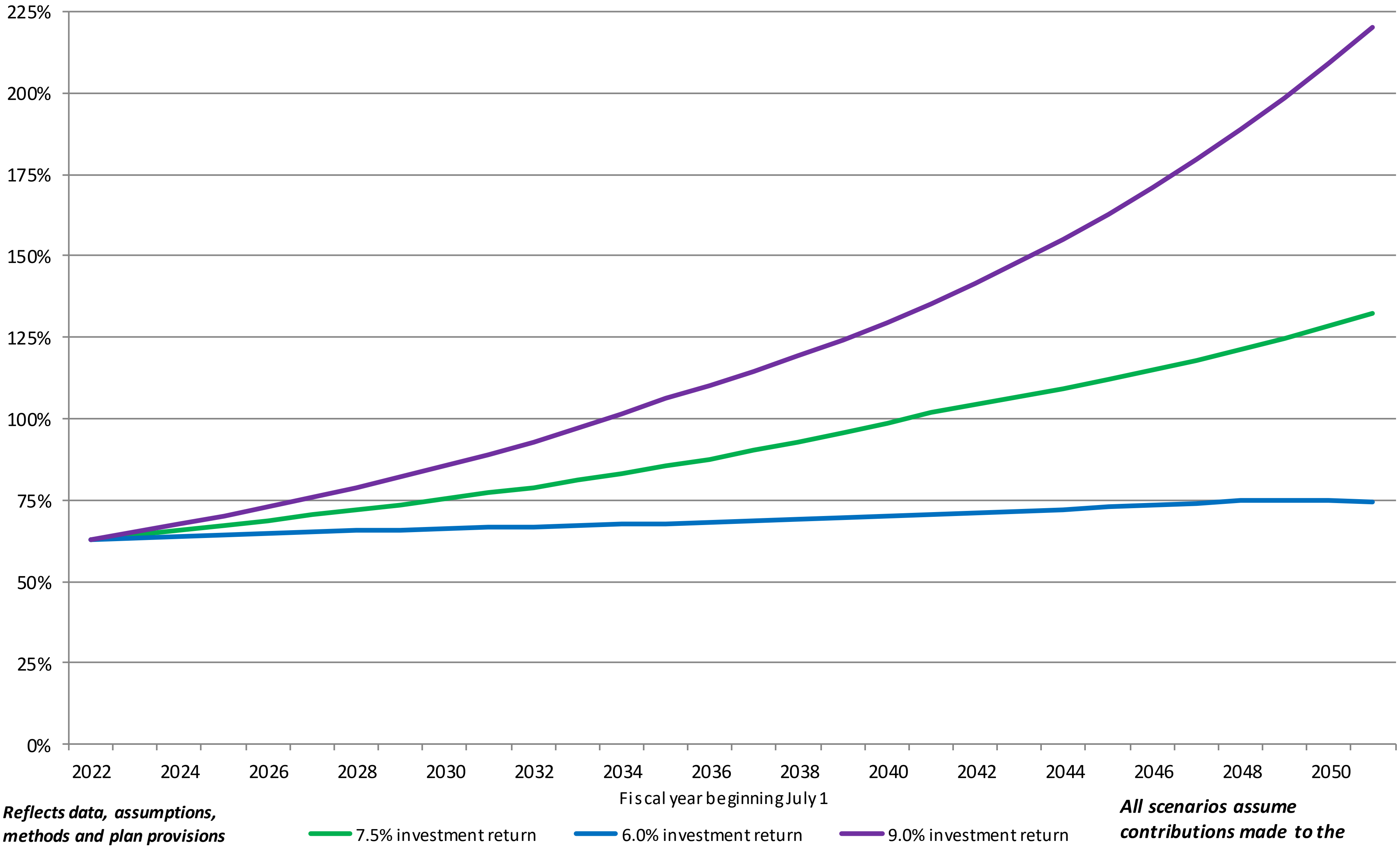
Limitations of Project Scope

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, 2023 letter to MSRS.

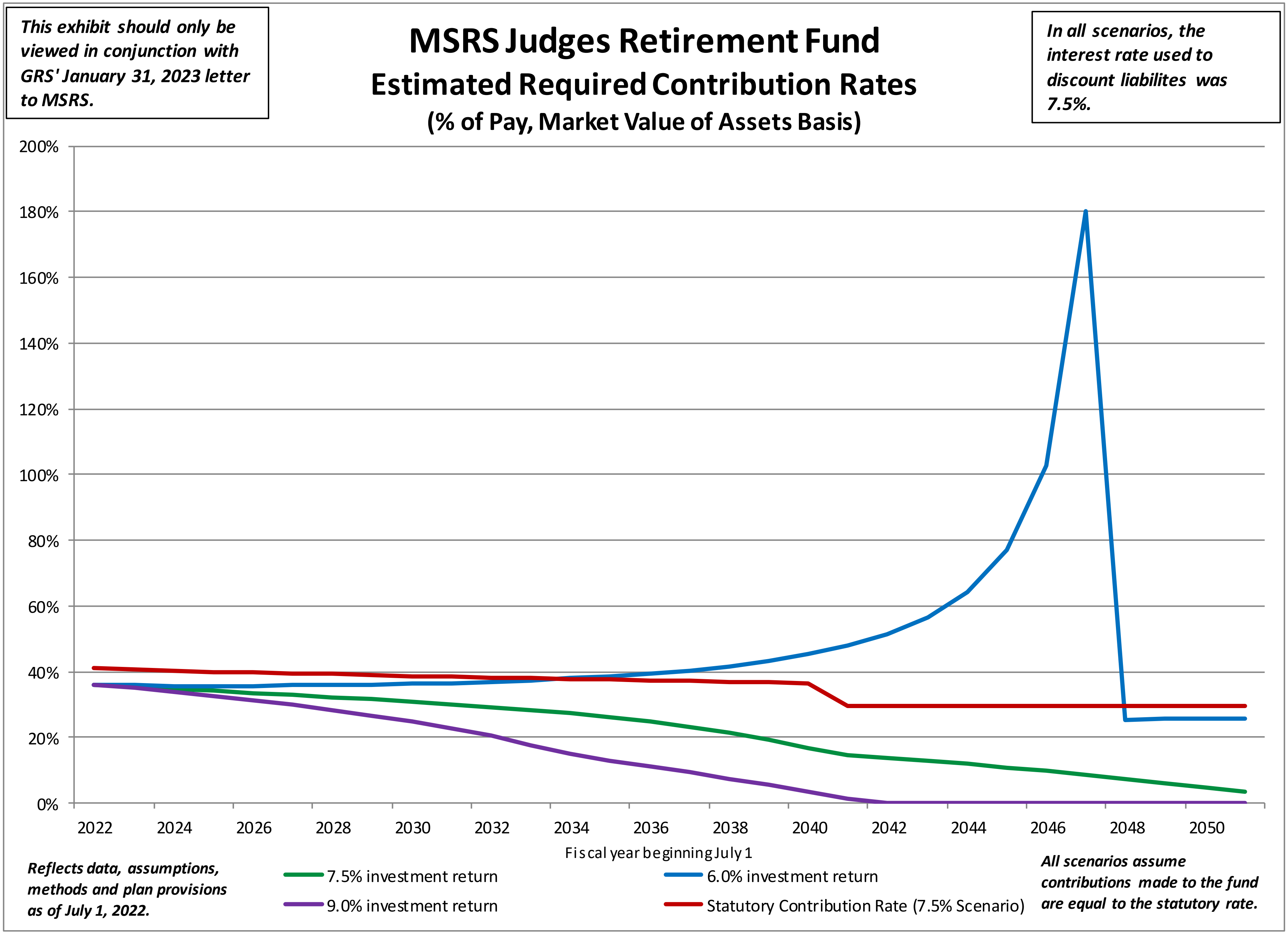
MSRS Judges Retirement Fund
Estimated Accrued Liability Funded Ratio
(Market Value of Assets Basis)

In all scenarios, the interest rate used to discount liabilites was 7.5%.



Reflects data, assumptions, methods and plan provisions as of July 1, 2022.

All scenarios assume contributions made to the fund are equal to the


This exhibit should only be viewed in conjunction with GRS' January 31, 2023 letter to MSRS.
MSRS Judges Retirement Fund
Estimated Required Contribution Rates
(% of Pay, Market Value of Assets Basis)
In all scenarios, the interest rate used to discount liabilites was 7.5%.
200%
180%
160%
140%
120%
100%
80%
60%
40%
20%
0%
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
2048
2050
Fiscal year beginning July 1
Reflects data, assumptions, methods and plan provisions as of July 1, 2022.
7.5% investment return
9.0% investment return
6.0% investment return
Statutory Contribution Rate (7.5% Scenario)
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, 2023 letter to MSRS.

Judges Retirement Fund

Scenario: 7.5% Investment Return for All Years

Fiscal Year Beginning July 1

$ in Thousands	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Contributions (% of Payroll)										
Statutory - Chapter 490	40.96%	40.76%	40.41%	40.05%	39.77%	39.51%	39.25%	38.96%	38.71%	38.47%
Required - Chapter 356 (MVA)	35.86%	35.50%	34.80%	34.14%	33.58%	32.98%	32.36%	31.65%	30.91%	30.15%
Sufficiency / (Deficiency)	5.10%	5.26%	5.61%	5.91%	6.19%	6.53%	6.89%	7.31%	7.80%	8.32%
Contributions										
Statutory - Chapter 490	$ 22,680	$ 22,839	$ 23,269	$ 23,752	$ 24,137	$ 24,529	$ 24,908	$ 25,378	$ 25,825	$ 26,261
Required - Chapter 356 (MVA)	19,857	19,889	20,043	20,245	20,375	20,476	20,536	20,611	20,626	20,581
Sufficiency / (Deficiency)	2,823	2,950	3,226	3,507	3,762	4,053	4,372	4,767	5,199	5,680
Funding Ratios										
Current Assets (MVA)	$253,971	$266,299	$278,702	$291,186	$303,984	$317,182	$330,712	$344,558	$358,669	$373,286
Actuarial Accrued Liability (AAL)	403,368	413,408	423,284	432,696	441,839	450,873	459,685	468,231	476,335	484,219
Unfunded AAL	149,397	147,109	144,582	141,510	137,855	133,691	128,973	123,673	117,666	110,933
Funding Ratio	63.0%	64.4%	65.8%	67.3%	68.8%	70.3%	71.9%	73.6%	75.3%	77.1%
Benefit Payments	$ 29,086	$ 30,062	$ 31,308	$ 32,389	$ 33,312	$ 34,335	$ 35,387	$ 36,601	$ 37,578	$ 38,607
Ratio of Assets to Benefit Payments	8.73	8.86	8.90	8.99	9.13	9.24	9.35	9.41	9.54	9.67

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2023 letter to MSRS.

Judges Retirement Fund

Scenario: 7.5% Investment Return for All Years

Fiscal Year Beginning July 1

$ in Thousands	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
Contributions (% of Payroll)										
Statutory - Chapter 490	38.21%	37.96%	37.75%	37.56%	37.33%	37.12%	36.92%	36.73%	36.55%	29.51%
Required - Chapter 356 (MVA)	29.28%	28.34%	27.33%	26.21%	24.88%	23.37%	21.58%	19.43%	16.78%	14.77%
Sufficiency / (Deficiency)	8.93%	9.62%	10.42%	11.35%	12.45%	13.75%	15.34%	17.30%	19.77%	14.74%
Contributions										
Statutory - Chapter 490	$ 26,774	$ 27,297	$ 27,795	$ 28,238	$ 28,823	$ 29,408	$ 29,986	$ 30,555	$ 31,170	$ 25,819
Required - Chapter 356 (MVA)	20,518	20,378	20,122	19,705	19,215	18,513	17,529	16,165	14,313	12,926
Sufficiency / (Deficiency)	6,256	6,919	7,673	8,533	9,608	10,895	12,457	14,390	16,857	12,893
Funding Ratios										
Current Assets (MVA)	$388,381	$404,127	$420,817	$438,586	$457,361	$477,296	$498,658	$521,636	$546,302	$572,855
Actuarial Accrued Liability (AAL)	491,822	499,195	506,577	514,070	521,592	529,098	536,784	544,768	553,050	561,695
Unfunded AAL	103,441	95,068	85,760	75,484	64,231	51,802	38,126	23,132	6,748	(11,160)
Funding Ratio	79.0%	81.0%	83.1%	85.3%	87.7%	90.2%	92.9%	95.8%	98.8%	102.0%
Benefit Payments	$ 39,583	$ 40,331	$ 40,993	$ 41,749	$ 42,570	$ 43,218	$ 43,781	$ 44,381	$ 44,958	$ 45,497
Ratio of Assets to Benefit Payments	9.81	10.02	10.27	10.51	10.74	11.04	11.39	11.75	12.15	12.59

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.

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Judges Retirement Fund

Scenario: 7.5% Investment Return for All Years

Fiscal Year Beginning July 1

$ in Thousands	**2042**	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**	**2051**
Contributions (% of Payroll)										
Statutory - Chapter 490	29.51%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%
Required - Chapter 356 (MVA)	13.86%	12.91%	11.92%	10.88%	9.80%	8.66%	7.47%	6.21%	4.88%	3.48%
Sufficiency / (Deficiency)	15.65%	16.59%	17.58%	18.62%	19.70%	20.84%	22.03%	23.29%	24.62%	26.02%
Contributions										
Statutory - Chapter 490	$ 26,435	$ 27,131	$ 27,830	$ 28,535	$ 29,286	$ 30,028	$ 30,815	$ 31,635	$ 32,446	$ 33,253
Required - Chapter 356 (MVA)	12,415	11,870	11,242	10,526	9,730	8,812	7,798	6,663	5,372	3,922
Sufficiency / (Deficiency)	14,020	15,261	16,588	18,009	19,556	21,216	23,017	24,972	27,074	29,331
Funding Ratios										
Current Assets (MVA)	$595,286	$619,424	$645,441	$673,523	$703,779	$736,402	$771,538	$809,380	$850,198	$894,221
Actuarial Accrued Liability (AAL)	570,790	580,330	590,322	600,862	611,951	623,624	635,908	648,818	662,437	676,832
Unfunded AAL	(24,496)	(39,094)	(55,119)	(72,661)	(91,828)	(112,778)	(135,630)	(160,562)	(187,761)	(217,389)
Funding Ratio	104.3%	106.7%	109.3%	112.1%	115.0%	118.1%	121.3%	124.7%	128.3%	132.1%
Benefit Payments	$ 46,086	$ 46,713	$ 47,299	$ 47,935	$ 48,589	$ 49,264	$ 49,979	$ 50,662	$ 51,332	$ 52,067
Ratio of Assets to Benefit Payments	12.92	13.26	13.65	14.05	14.48	14.95	15.44	15.98	16.56	17.17

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.

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Judges Retirement Fund

Scenario: 6.0% Investment Return for All Years

Fiscal Year Beginning July 1

$ in Thousands	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Contributions (% of Payroll)										
Statutory - Chapter 490	40.96%	40.76%	40.41%	40.05%	39.77%	39.51%	39.25%	38.96%	38.71%	38.47%
Required - Chapter 356 (MVA)	35.86%	35.96%	35.78%	35.67%	35.73%	35.83%	35.98%	36.11%	36.33%	36.65%
Sufficiency / (Deficiency)	5.10%	4.80%	4.63%	4.38%	4.04%	3.68%	3.27%	2.85%	2.38%	1.82%
Contributions										
Statutory - Chapter 490	$ 22,680	$ 22,839	$ 23,269	$ 23,752	$ 24,137	$ 24,529	$ 24,908	$ 25,378	$ 25,825	$ 26,261
Required - Chapter 356 (MVA)	19,857	20,150	20,605	21,155	21,684	22,244	22,834	23,520	24,242	25,018
Sufficiency / (Deficiency)	2,823	2,689	2,664	2,597	2,453	2,285	2,074	1,858	1,583	1,243
Funding Ratios										
Current Assets (MVA)	$253,971	$262,538	$270,775	$278,664	$286,409	$294,061	$301,521	$308,734	$315,612	$322,354
Actuarial Accrued Liability (AAL)	403,368	413,408	423,284	432,696	441,839	450,873	459,685	468,231	476,335	484,219
Unfunded AAL	149,397	150,870	152,509	154,032	155,430	156,812	158,164	159,497	160,723	161,865
Funding Ratio	63.0%	63.5%	64.0%	64.4%	64.8%	65.2%	65.6%	65.9%	66.3%	66.6%
Benefit Payments	$ 29,086	$ 30,062	$ 31,308	$ 32,389	$ 33,312	$ 34,335	$ 35,387	$ 36,601	$ 37,578	$ 38,607
Ratio of Assets to Benefit Payments	8.73	8.73	8.65	8.60	8.60	8.56	8.52	8.44	8.40	8.35

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.

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Judges Retirement Fund

Scenario: 6.0% Investment Return for All Years

Fiscal Year Beginning July 1

$ in Thousands	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Contributions (% of Payroll)										
Statutory - Chapter 490	38.21%	37.96%	37.75%	37.56%	37.33%	37.12%	36.92%	36.73%	36.55%	36.37%
Required - Chapter 356 (MVA)	36.98%	37.40%	37.97%	38.72%	39.51%	40.51%	41.77%	43.37%	45.39%	48.02%
Sufficiency / (Deficiency)	1.23%	0.56%	(0.22)%	(1.16)%	(2.18)%	(3.39)%	(4.85)%	(6.64)%	(8.84)%	(11.65)%
Contributions										
Statutory - Chapter 490	$ 26,774	$ 27,297	$ 27,795	$ 28,238	$ 28,823	$ 29,408	$ 29,986	$ 30,555	$ 31,170	$ 31,819
Required - Chapter 356 (MVA)	25,911	26,893	27,959	29,114	30,509	32,095	33,923	36,076	38,713	42,017
Sufficiency / (Deficiency)	863	404	(164)	(876)	(1,686)	(2,687)	(3,937)	(5,521)	(7,543)	(10,198)
Funding Ratios										
Current Assets (MVA)	$328,887	$335,335	$341,934	$348,757	$355,666	$362,743	$370,177	$378,070	$386,402	$395,271
Actuarial Accrued Liability (AAL)	491,822	499,195	506,577	514,070	521,592	529,098	536,784	544,768	553,050	561,695
Unfunded AAL	162,935	163,860	164,643	165,313	165,926	166,355	166,607	166,698	166,648	166,424
Funding Ratio	66.9%	67.2%	67.5%	67.8%	68.2%	68.6%	69.0%	69.4%	69.9%	70.4%
Benefit Payments	$ 39,583	$ 40,331	$ 40,993	$ 41,749	$ 42,570	$ 43,218	$ 43,781	$ 44,381	$ 44,958	$ 45,497
Ratio of Assets to Benefit Payments	8.31	8.31	8.34	8.35	8.35	8.39	8.46	8.52	8.59	8.69

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2023 letter to MSRS.

Judges Retirement Fund

Scenario: 6.0% Investment Return for All Years

Fiscal Year Beginning July 1

$ in Thousands	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051
Contributions (% of Payroll)										
Statutory - Chapter 490	36.20%	36.03%	35.86%	35.70%	35.54%	35.39%	29.50%	29.50%	29.50%	29.50%
Required - Chapter 356 (MVA)	51.63%	56.66%	64.28%	77.10%	102.75%	180.09%	25.42%	25.58%	25.75%	25.94%
Sufficiency / (Deficiency)	(15.43)%	(20.63)%	(28.42)%	(41.40)%	(67.21)%	(144.70)%	4.08%	3.92%	3.75%	3.56%
Contributions										
Statutory - Chapter 490	$ 32,435	$ 33,131	$ 33,830	$ 34,535	$ 35,286	$ 36,028	$ 30,815	$ 31,635	$ 32,446	$ 33,253
Required - Chapter 356 (MVA)	46,264	52,103	60,639	74,572	102,007	183,317	26,549	27,428	28,320	29,237
Sufficiency / (Deficiency)	(13,829)	(18,972)	(26,809)	(40,037)	(66,721)	(147,289)	4,266	4,207	4,126	4,016
Funding Ratios										
Current Assets (MVA)	$404,782	$414,889	$425,670	$437,211	$449,512	$462,648	$476,638	$485,358	$494,737	$504,822
Actuarial Accrued Liability (AAL)	570,790	580,330	590,322	600,862	611,951	623,624	635,908	648,818	662,437	676,832
Unfunded AAL	166,008	165,441	164,652	163,651	162,439	160,976	159,270	163,460	167,700	172,010
Funding Ratio	70.9%	71.5%	72.1%	72.8%	73.5%	74.2%	75.0%	74.8%	74.7%	74.6%
Benefit Payments	$ 46,086	$ 46,713	$ 47,299	$ 47,935	$ 48,589	$ 49,264	$ 49,979	$ 50,662	$ 51,332	$ 52,067
Ratio of Assets to Benefit Payments	8.78	8.88	9.00	9.12	9.25	9.39	9.54	9.58	9.64	9.70

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.

This exhibit should only be viewed in conjunction with GRS' January 31, 2023 letter to MSRS.

Judges Retirement Fund

Scenario: 9.0% Investment Return for All Years

Fiscal Year Beginning July 1

$ in Thousands	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Contributions (% of Payroll)										
Statutory - Chapter 490	40.96%	40.76%	40.41%	40.05%	39.77%	39.51%	39.25%	38.96%	38.71%	38.47%
Required - Chapter 356 (MVA)	35.86%	35.03%	33.81%	32.56%	31.32%	29.96%	28.47%	26.77%	24.91%	22.84%
Sufficiency / (Deficiency)	5.10%	5.73%	6.60%	7.49%	8.45%	9.55%	10.78%	12.19%	13.80%	15.63%
Contributions										
Statutory - Chapter 490	$ 22,680	$ 22,839	$ 23,269	$ 23,752	$ 24,137	$ 24,529	$ 24,908	$ 25,378	$ 25,825	$ 26,261
Required - Chapter 356 (MVA)	19,857	19,627	19,472	19,310	19,009	18,604	18,066	17,438	16,621	15,593
Sufficiency / (Deficiency)	2,823	3,212	3,797	4,442	5,128	5,925	6,842	7,940	9,204	10,668
Funding Ratios										
Current Assets (MVA)	$253,971	$270,059	$286,741	$304,068	$322,329	$341,667	$362,085	$383,636	$406,347	$430,546
Actuarial Accrued Liability (AAL)	403,368	413,408	423,284	432,696	441,839	450,873	459,685	468,231	476,335	484,219
Unfunded AAL	149,397	143,349	136,543	128,628	119,510	109,206	97,600	84,595	69,988	53,673
Funding Ratio	63.0%	65.3%	67.7%	70.3%	73.0%	75.8%	78.8%	81.9%	85.3%	88.9%
Benefit Payments	$ 29,086	$ 30,062	$ 31,308	$ 32,389	$ 33,312	$ 34,335	$ 35,387	$ 36,601	$ 37,578	$ 38,607
Ratio of Assets to Benefit Payments	8.73	8.98	9.16	9.39	9.68	9.95	10.23	10.48	10.81	11.15

Numbers may not add due to rounding.

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Judges Retirement Fund

Scenario: 9.0% Investment Return for All Years

Fiscal Year Beginning July 1

$ in Thousands	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Contributions (% of Payroll)										
Statutory - Chapter 490	38.21%	37.96%	37.75%	29.58%	29.56%	29.54%	29.53%	29.52%	29.51%	29.51%
Required - Chapter 356 (MVA)	20.49%	17.84%	15.14%	12.99%	11.27%	9.47%	7.56%	5.53%	3.41%	1.19%
Sufficiency / (Deficiency)	17.72%	20.12%	22.61%	16.59%	18.29%	20.07%	21.97%	23.99%	26.10%	28.32%
Contributions										
Statutory - Chapter 490	$ 26,774	$ 27,297	$ 27,795	$ 22,238	$ 22,823	$ 23,408	$ 23,986	$ 24,555	$ 25,170	$ 25,819
Required - Chapter 356 (MVA)	14,360	12,824	11,147	9,765	8,704	7,501	6,139	4,603	2,911	1,037
Sufficiency / (Deficiency)	12,414	14,473	16,648	12,473	14,119	15,907	17,847	19,952	22,259	24,782
Funding Ratios										
Current Assets (MVA)	$456,301	$483,889	$513,721	$546,064	$574,719	$605,703	$639,407	$676,157	$716,181	$759,843
Actuarial Accrued Liability (AAL)	491,822	499,195	506,577	514,070	521,592	529,098	536,784	544,768	553,050	561,695
Unfunded AAL	35,521	15,306	(7,144)	(31,994)	(53,127)	(76,605)	(102,623)	(131,389)	(163,131)	(198,148)
Funding Ratio	92.8%	96.9%	101.4%	106.2%	110.2%	114.5%	119.1%	124.1%	129.5%	135.3%
Benefit Payments	$ 39,583	$ 40,331	$ 40,993	$ 41,749	$ 42,570	$ 43,218	$ 43,781	$ 44,381	$ 44,958	$ 45,497
Ratio of Assets to Benefit Payments	11.53	12.00	12.53	13.08	13.50	14.02	14.60	15.24	15.93	16.70

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.

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Judges Retirement Fund

Scenario: 9.0% Investment Return for All Years

Fiscal Year Beginning July 1

$ in Thousands	**2042**	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**	**2051**
Contributions (% of Payroll)										
Statutory - Chapter 490	29.51%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%
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)	29.51%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%	29.50%
Contributions										
Statutory - Chapter 490	$ 26,435	$ 27,131	$ 27,830	$ 28,535	$ 29,286	$ 30,028	$ 30,815	$ 31,635	$ 32,446	$ 33,253
Required - Chapter 356 (MVA)	-	-	-	-	-	-	-	-	-	-
Sufficiency / (Deficiency)	26,435	27,131	27,830	28,535	29,286	30,028	30,815	31,635	32,446	33,253
Funding Ratios										
Current Assets (MVA)	$807,547	$859,570	$916,343	$978,341	$1,045,987	$1,119,820	$1,200,364	$1,288,229	$1,384,140	$1,488,828
Actuarial Accrued Liability (AAL)	570,790	580,330	590,322	600,862	611,951	623,624	635,908	648,818	662,437	676,832
Unfunded AAL	(236,757)	(279,240)	(326,021)	(377,479)	(434,036)	(496,196)	(564,456)	(639,411)	(721,703)	(811,996)
Funding Ratio	141.5%	148.1%	155.2%	162.8%	170.9%	179.6%	188.8%	198.6%	208.9%	220.0%
Benefit Payments	$ 46,086	$ 46,713	$ 47,299	$ 47,935	$ 48,589	$ 49,264	$ 49,979	$ 50,662	$ 51,332	$ 52,067
Ratio of Assets to Benefit Payments	17.52	18.40	19.37	20.41	21.53	22.73	24.02	25.43	26.96	28.59

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.