



January 29, 2021

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 – State Patrol Retirement Fund

Dear Erin:

Attached are 30-year projections of estimated funded status, required contributions, and statutory contributions under three asset return scenarios for the State Patrol 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 State Patrol Retirement Fund actuarial funding valuation as of July 1, 2020.

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 9.0% 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 3.25% 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 937 members. The profile of these new members is the same as new members hired between July 1, 2014 and June 30, 2019:

- Average age at hire is 30.8
- Average salary at hire is \$68,700
- Approximately 16% female, 84% 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 \$1.0 million contribution to the fund each October 1 until both the State Patrol Fund and the PERA Police & Fire Plan become 90% funded (on an Actuarial Value basis) or July 1, 2048, if earlier. For purposes of the enclosed projections, we have assumed these contributions stop when the MSRS State Patrol Retirement Fund becomes 90% funded, or July 1, 2048 if earlier. These state contributions are projected to be eliminated in fiscal years ending 2028, 2032, and 2049 in the 9.0%, 7.5% and 6.0% investment return scenarios, respectively.

Additional state contributions of 5.0% of payroll in the fiscal year ending June 30, 2021, and 7.0% of payroll thereafter are expected until the plan reaches 100% funding (on a Market Value basis). The additional state contributions are projected to be eliminated in fiscal years ending 2030 and 2038 in the 9.0% and 7.5% 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 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 State Patrol Retirement Plan actuarial funding valuation as of July 1, 2020. 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 2019 analysis of long-term rate of investment return and inflation assumptions concluded that the probability of exceeding the current 7.5% assumption over 20 years is less than 50%. 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.



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 2019 analysis of long-term rate of investment return and inflation assumptions, GRS determined that an investment return assumption of 7.5% was reasonable. Please see our experience study report dated June 27, 2019 for additional information. This report also concluded that the probability of exceeding the current 7.50% assumption over 10 years is 44%. If capital market assumptions decline from present levels, the 7.50% return assumption might not comply with the actuarial standards for the July 1, 2021 valuation. For informational purposes, results based on a 6.5% discount rate are shown on page 3 of the July 1, 2020 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, 2020 valuation report. This valuation report includes risk metrics on page 7, 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 does not fully reflect the recent and still developing 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 State Patrol 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.

Bonita J. Wurst and Brian B. Murphy are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. The signing actuaries are independent of the plan sponsor. We are not aware of any relationship that would impair the objectivity of our work.

Sincerely,



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



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

BJW/BBM:bd
Enclosure



Other Observations

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

Given the plan's contribution allocation procedure, if there are no changes in benefits or contributions and all actuarial assumptions are met (including the assumption of the plan earning 7.50% on the market value of assets), it is expected that:

- (1) The normal cost of the plan is expected to remain approximately level as a percent of pay,
- (2) The funded status of the plan is expected to gradually improve and is expected to be 100% funded within the next 28 years, and
- (3) The unfunded liability will grow initially as a dollar amount before beginning to decline.

Limitations of Funded Status Measurements

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

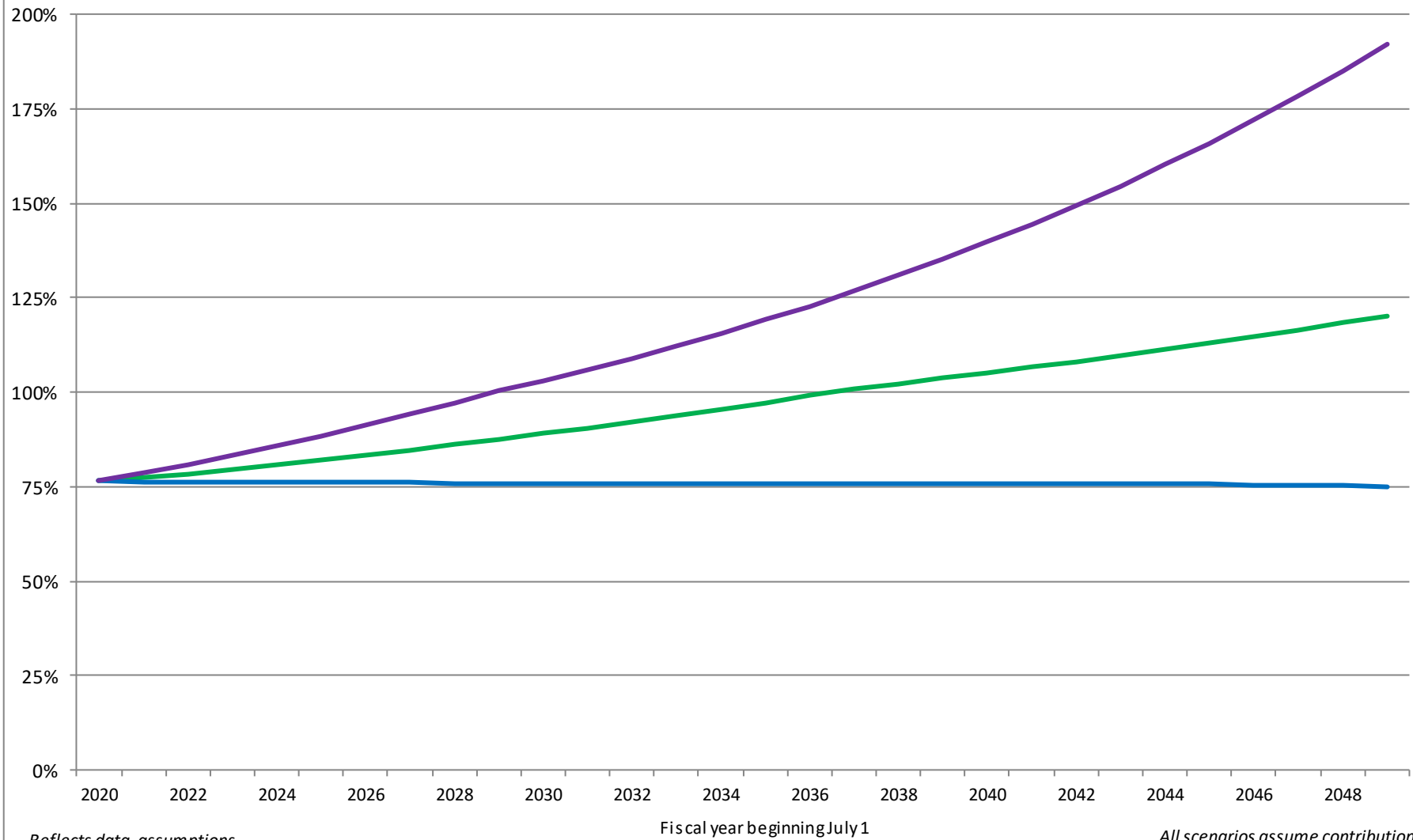
Limitations of Project Scope

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 29, 2021 letter to MSRS.

MSRS State Patrol Retirement Fund Estimated Funded Ratio

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



Reflects data, assumptions, methods and plan provisions as of July 1, 2020.

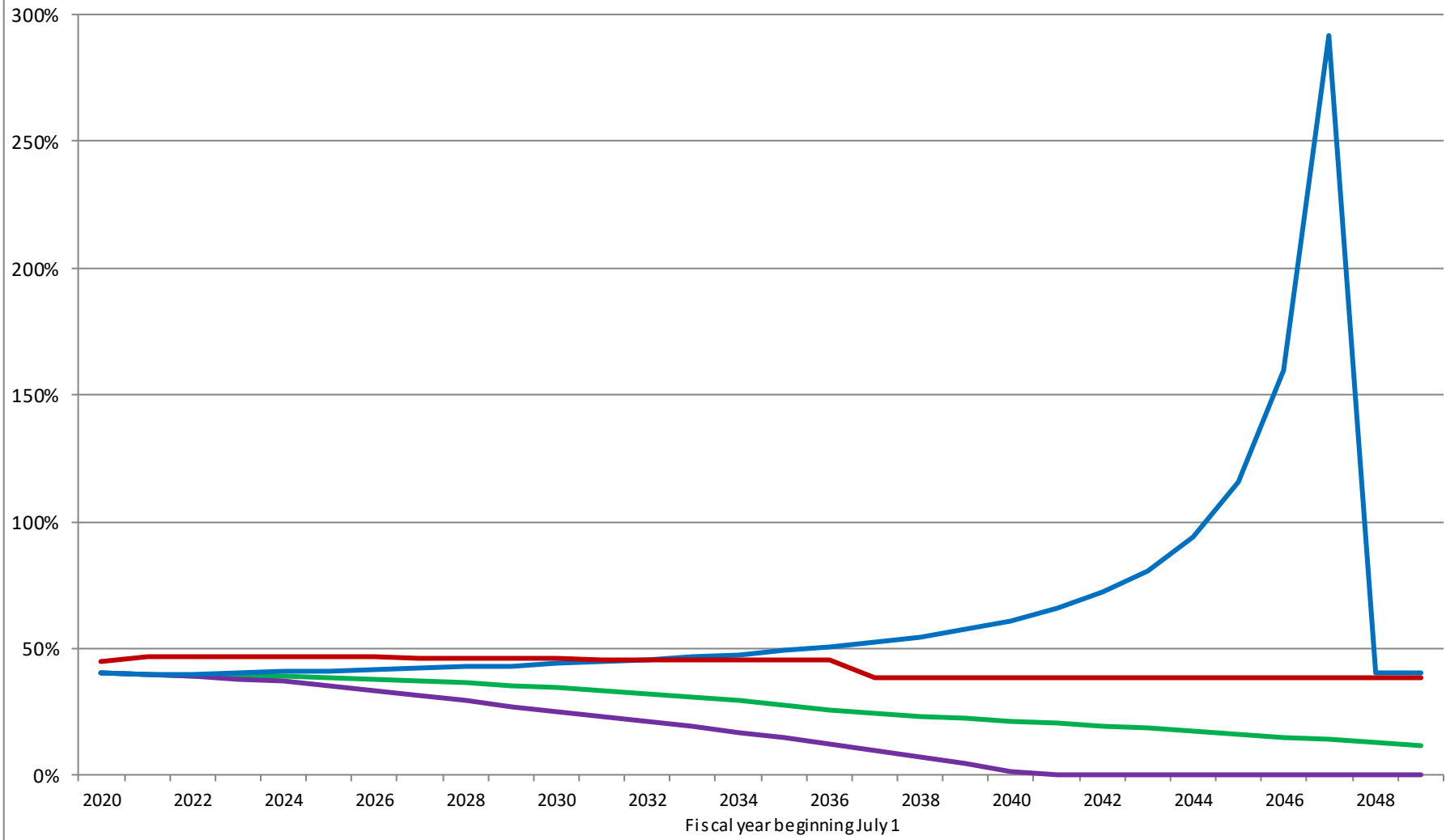
7.5% investment return 6.0% investment return 9.0% investment return

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

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MSRS State Patrol Retirement Fund Estimated Required Contribution Rates (% of Pay)

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



Reflects data, assumptions, methods and plan provisions as of July 1, 2020.

— 7.5% investment return
— 6.0% investment return

— 9.0% investment return
— Statutory Contribution Rate (7.5% Scenario)

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



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State Patrol Retirement Fund
Scenario: 7.5% investment return for all years
Fiscal year beginning July 1

\$ in Thousands	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Contributions (% of Payroll)										
Statutory - Chapter 352B	44.63%	46.59%	46.55%	46.51%	46.48%	46.44%	46.41%	46.38%	46.35%	46.32%
Required - Chapter 356 (MVA)	40.89%	40.49%	40.01%	39.48%	38.92%	38.31%	37.66%	36.97%	36.20%	35.34%
Sufficiency / (Deficiency)	3.74%	6.10%	6.54%	7.03%	7.56%	8.13%	8.75%	9.41%	10.15%	10.98%
Contributions										
Statutory - Chapter 352B	39,384	42,759	44,314	45,969	47,587	49,347	51,160	52,881	54,691	56,589
Required - Chapter 356 (MVA)	36,077	37,164	38,085	39,021	39,852	40,705	41,516	42,159	42,716	43,180
Sufficiency / (Deficiency)	3,307	5,595	6,229	6,948	7,735	8,642	9,644	10,722	11,975	13,409
Funding Ratios										
Current Assets (MVA)	757,590	789,599	825,997	864,956	906,603	951,007	998,352	1,048,974	1,102,714	1,159,771
Actuarial Accrued Liability (AAL)	989,045	1,019,933	1,052,535	1,086,700	1,122,418	1,159,687	1,198,518	1,239,149	1,281,370	1,325,170
Unfunded AAL	231,455	230,334	226,538	221,744	215,815	208,680	200,166	190,175	178,656	165,399
Funding Ratio	76.6%	77.4%	78.5%	79.6%	80.8%	82.0%	83.3%	84.7%	86.1%	87.5%
Benefit Payments										
Ratio of Assets to Benefit Payments	12.01	12.24	12.47	12.70	12.94	13.17	13.45	13.69	13.94	14.20

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.



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State Patrol Retirement Fund
Scenario: 7.5% investment return for all years
Fiscal year beginning July 1

\$ in Thousands	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Contributions (% of Payroll)										
Statutory - Chapter 352B	46.29%	45.50%	45.50%	45.50%	45.50%	45.50%	45.50%	38.50%	38.50%	38.50%
Required - Chapter 356 (MVA)	34.40%	33.37%	32.27%	31.00%	29.56%	27.88%	25.92%	24.22%	23.35%	22.44%
Sufficiency / (Deficiency)	11.89%	12.13%	13.23%	14.50%	15.94%	17.62%	19.58%	14.28%	15.15%	16.06%
Contributions										
Statutory - Chapter 352B	58,581	59,538	61,588	63,832	66,028	68,272	70,513	61,717	63,685	65,695
Required - Chapter 356 (MVA)	43,533	43,665	43,681	43,494	42,896	41,832	40,162	38,831	38,619	38,287
Sufficiency / (Deficiency)	15,048	15,873	17,907	20,338	23,132	26,440	30,351	22,886	25,066	27,408
Funding Ratios										
Current Assets (MVA)	1,220,373	1,284,849	1,352,071	1,423,475	1,499,850	1,581,521	1,668,701	1,761,668	1,849,444	1,942,682
Actuarial Accrued Liability (AAL)	1,370,601	1,417,818	1,466,614	1,517,230	1,570,161	1,625,600	1,683,485	1,743,867	1,807,051	1,873,107
Unfunded AAL	150,228	132,969	114,543	93,755	70,311	44,079	14,784	(17,801)	(42,393)	(69,575)
Funding Ratio	89.0%	90.6%	92.2%	93.8%	95.5%	97.3%	99.1%	101.0%	102.3%	103.7%
Benefit Payments										
Ratio of Assets to Benefit Payments	84,326	87,286	90,154	92,755	95,355	98,180	101,133	104,046	107,082	110,528
	14.47	14.72	15.00	15.35	15.73	16.11	16.50	16.93	17.27	17.58

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State Patrol Retirement Fund
Scenario: 7.5% investment return for all years
Fiscal year beginning July 1

\$ in Thousands	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Contributions (% of Payroll)										
Statutory - Chapter 352B	38.50%	38.50%	38.50%	38.50%	38.50%	38.50%	38.50%	38.50%	38.50%	38.50%
Required - Chapter 356 (MVA)	21.50%	20.53%	19.53%	18.49%	17.40%	16.27%	15.12%	13.90%	12.67%	11.35%
Sufficiency / (Deficiency)	17.00%	17.97%	18.97%	20.01%	21.10%	22.23%	23.38%	24.60%	25.83%	27.15%
Contributions										
Statutory - Chapter 352B	67,840	69,888	72,099	74,479	76,791	79,145	81,764	84,252	87,084	89,864
Required - Chapter 356 (MVA)	37,890	37,265	36,574	35,773	34,702	33,444	32,108	30,411	28,648	26,500
Sufficiency / (Deficiency)	29,950	32,623	35,525	38,706	42,089	45,701	49,656	53,841	58,436	63,364
Funding Ratios										
Current Assets (MVA)	2,041,409	2,145,939	2,256,189	2,372,414	2,495,334	2,625,072	2,761,564	2,905,499	3,056,935	3,216,615
Actuarial Accrued Liability (AAL)	1,941,842	2,013,296	2,087,262	2,163,658	2,242,852	2,324,755	2,408,997	2,495,789	2,584,966	2,676,672
Unfunded AAL	(99,567)	(132,643)	(168,927)	(208,756)	(252,482)	(300,317)	(352,567)	(409,710)	(471,969)	(539,943)
Funding Ratio	105.1%	106.6%	108.1%	109.6%	111.3%	112.9%	114.6%	116.4%	118.3%	120.2%
Benefit Payments										
Ratio of Assets to Benefit Payments	17.88	18.14	18.39	18.68	18.96	19.19	19.43	19.66	19.91	20.17

Numbers may not add due to rounding.

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State Patrol Retirement Fund
Scenario: 6.0% investment return for all years
Fiscal year beginning July 1

\$ in Thousands	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Contributions (% of Payroll)										
Statutory - Chapter 352B	44.63%	46.59%	46.55%	46.51%	46.48%	46.44%	46.41%	46.38%	46.35%	46.32%
Required - Chapter 356 (MVA)	40.89%	41.25%	41.57%	41.91%	42.30%	42.71%	43.17%	43.72%	44.31%	44.96%
Sufficiency / (Deficiency)	3.74%	5.34%	4.98%	4.60%	4.18%	3.73%	3.24%	2.66%	2.04%	1.36%
Contributions										
Statutory - Chapter 352B	39,384	42,759	44,314	45,969	47,587	49,347	51,160	52,881	54,691	56,589
Required - Chapter 356 (MVA)	36,077	37,857	39,574	41,426	43,311	45,380	47,592	49,856	52,289	54,931
Sufficiency / (Deficiency)	3,307	4,902	4,740	4,543	4,276	3,967	3,568	3,025	2,402	1,658
Funding Ratios										
Current Assets (MVA)	757,590	778,414	802,462	827,786	854,395	882,239	911,366	941,969	973,734	1,006,697
Actuarial Accrued Liability (AAL)	989,045	1,019,933	1,052,535	1,086,700	1,122,418	1,159,687	1,198,518	1,239,149	1,281,370	1,325,170
Unfunded AAL	231,455	241,519	250,073	258,914	268,023	277,448	287,152	297,180	307,636	318,473
Funding Ratio	76.6%	76.3%	76.2%	76.2%	76.1%	76.1%	76.0%	76.0%	76.0%	76.0%
Benefit Payments										
Ratio of Assets to Benefit Payments	63,068	64,517	66,226	68,098	70,058	72,185	74,252	76,616	79,103	81,699
	12.01	12.07	12.12	12.16	12.20	12.22	12.27	12.29	12.31	12.32

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The interest rate used to discount liabilities was 7.5%.

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State Patrol Retirement Fund
Scenario: 6.0% investment return for all years
Fiscal year beginning July 1

\$ in Thousands	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Contributions (% of Payroll)										
Statutory - Chapter 352B	46.29%	46.26%	46.24%	46.21%	46.19%	46.17%	46.15%	46.12%	46.10%	46.09%
Required - Chapter 356 (MVA)	45.69%	46.55%	47.52%	48.57%	49.82%	51.27%	52.99%	55.01%	57.52%	60.63%
Sufficiency / (Deficiency)	0.60%	(0.29)%	(1.28)%	(2.36)%	(3.63)%	(5.10)%	(6.84)%	(8.89)%	(11.42)%	(14.54)%
Contributions										
Statutory - Chapter 352B	58,581	60,538	62,588	64,832	67,028	69,272	71,513	73,938	76,264	78,640
Required - Chapter 356 (MVA)	57,820	60,917	64,324	68,139	72,296	76,923	82,125	88,188	95,151	103,454
Sufficiency / (Deficiency)	761	(379)	(1,736)	(3,307)	(5,268)	(7,651)	(10,612)	(14,250)	(18,887)	(24,814)
Funding Ratios										
Current Assets (MVA)	1,040,909	1,076,507	1,113,197	1,151,234	1,191,172	1,233,077	1,276,886	1,322,575	1,370,489	1,420,534
Actuarial Accrued Liability (AAL)	1,370,601	1,417,818	1,466,614	1,517,230	1,570,161	1,625,600	1,683,485	1,743,867	1,807,051	1,873,107
Unfunded AAL	329,692	341,311	353,417	365,996	378,989	392,523	406,599	421,292	436,562	452,573
Funding Ratio	75.9%	75.9%	75.9%	75.9%	75.9%	75.9%	75.8%	75.8%	75.8%	75.8%
Benefit Payments										
Ratio of Assets to Benefit Payments	84,326	87,286	90,154	92,755	95,355	98,180	101,133	104,046	107,082	110,528
	12.34	12.33	12.35	12.41	12.49	12.56	12.63	12.71	12.80	12.85

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State Patrol Retirement Fund
Scenario: 6.0% investment return for all years
Fiscal year beginning July 1

\$ in Thousands	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Contributions (% of Payroll)										
Statutory - Chapter 352B	46.07%	46.05%	46.03%	46.02%	46.00%	45.99%	45.97%	45.96%	45.50%	45.50%
Required - Chapter 356 (MVA)	64.50%	69.62%	76.42%	85.89%	100.26%	124.33%	172.20%	316.64%	41.44%	41.94%
Sufficiency / (Deficiency)	(18.43)%	(23.57)%	(30.39)%	(39.87)%	(54.26)%	(78.34)%	(126.23)%	(270.68)%	4.06%	3.56%
Contributions										
Statutory - Chapter 352B	81,175	83,595	86,208	89,021	91,753	94,534	97,630	100,570	102,917	106,203
Required - Chapter 356 (MVA)	113,659	126,386	143,120	166,154	199,981	255,585	365,702	692,927	93,744	97,898
Sufficiency / (Deficiency)	(32,484)	(42,791)	(56,912)	(77,133)	(108,228)	(161,051)	(268,072)	(592,357)	9,173	8,305
Funding Ratios										
Current Assets (MVA)	1,472,464	1,526,322	1,581,690	1,638,517	1,697,194	1,757,438	1,818,785	1,881,529	1,945,232	2,009,167
Actuarial Accrued Liability (AAL)	1,941,842	2,013,296	2,087,262	2,163,658	2,242,852	2,324,755	2,408,997	2,495,789	2,584,966	2,676,672
Unfunded AAL	469,378	486,974	505,572	525,141	545,658	567,317	590,212	614,260	639,734	667,505
Funding Ratio	75.8%	75.8%	75.8%	75.7%	75.7%	75.6%	75.5%	75.4%	75.3%	75.1%
Benefit Payments										
Ratio of Assets to Benefit Payments	114,202	118,279	122,686	126,998	131,610	136,815	142,110	147,757	153,570	159,446
	12.89	12.90	12.89	12.90	12.90	12.85	12.80	12.73	12.67	12.60

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State Patrol Retirement Fund
Scenario: 9.0% investment return for all years
Fiscal year beginning July 1

\$ in Thousands	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Contributions (% of Payroll)										
Statutory - Chapter 352B	44.63%	46.59%	46.55%	46.51%	46.48%	46.44%	46.41%	45.50%	45.50%	38.50%
Required - Chapter 356 (MVA)	40.89%	39.74%	38.42%	36.98%	35.40%	33.65%	31.74%	29.61%	27.29%	24.68%
Sufficiency / (Deficiency)	3.74%	6.85%	8.13%	9.53%	11.08%	12.79%	14.67%	15.89%	18.21%	13.82%
Contributions										
Statutory - Chapter 352B	39,384	42,759	44,314	45,969	47,587	49,347	51,160	51,881	53,691	47,037
Required - Chapter 356 (MVA)	36,077	36,471	36,575	36,547	36,241	35,755	34,986	33,766	32,199	30,148
Sufficiency / (Deficiency)	3,307	6,288	7,739	9,422	11,346	13,592	16,174	18,115	21,492	16,889
Funding Ratios										
Current Assets (MVA)	757,590	800,783	849,867	903,198	961,093	1,023,830	1,091,821	1,165,655	1,244,406	1,329,525
Actuarial Accrued Liability (AAL)	989,045	1,019,933	1,052,535	1,086,700	1,122,418	1,159,687	1,198,518	1,239,149	1,281,370	1,325,170
Unfunded AAL	231,455	219,150	202,668	183,502	161,325	135,857	106,697	73,494	36,964	(4,355)
Funding Ratio	76.6%	78.5%	80.7%	83.1%	85.6%	88.3%	91.1%	94.1%	97.1%	100.3%
Benefit Payments										
Ratio of Assets to Benefit Payments	63,068	64,517	66,226	68,098	70,058	72,185	74,252	76,616	79,103	81,699
	12.01	12.41	12.83	13.26	13.72	14.18	14.70	15.21	15.73	16.27

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 29, 2021 letter to MSRS.

State Patrol Retirement Fund
Scenario: 9.0% investment return for all years
Fiscal year beginning July 1

\$ in Thousands	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Contributions (% of Payroll)										
Statutory - Chapter 352B	38.50%	38.50%	38.50%	38.50%	38.50%	38.50%	38.50%	38.50%	38.50%	38.50%
Required - Chapter 356 (MVA)	23.00%	21.18%	19.25%	17.23%	15.08%	12.80%	10.37%	7.84%	5.12%	2.23%
Sufficiency / (Deficiency)	15.50%	17.32%	19.25%	21.27%	23.42%	25.70%	28.13%	30.66%	33.38%	36.27%
Contributions										
Statutory - Chapter 352B	48,722	50,379	52,113	54,012	55,870	57,769	59,665	61,717	63,685	65,695
Required - Chapter 356 (MVA)	29,111	27,712	26,060	24,173	21,888	19,204	16,072	12,567	8,463	3,811
Sufficiency / (Deficiency)	19,611	22,667	26,053	29,839	33,982	38,565	43,593	49,150	55,222	61,884
Funding Ratios										
Current Assets (MVA)	1,412,629	1,502,216	1,598,491	1,702,235	1,814,569	1,936,225	2,067,848	2,210,199	2,364,448	2,531,449
Actuarial Accrued Liability (AAL)	1,370,601	1,417,818	1,466,614	1,517,230	1,570,161	1,625,600	1,683,485	1,743,867	1,807,051	1,873,107
Unfunded AAL	(42,028)	(84,398)	(131,877)	(185,005)	(244,408)	(310,625)	(384,363)	(466,332)	(557,397)	(658,342)
Funding Ratio	103.1%	106.0%	109.0%	112.2%	115.6%	119.1%	122.8%	126.7%	130.8%	135.1%
Benefit Payments										
Ratio of Assets to Benefit Payments	16.75	17.21	17.73	18.35	19.03	19.72	20.45	21.24	22.08	22.90

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State Patrol Retirement Fund
Scenario: 9.0% investment return for all years
Fiscal year beginning July 1

\$ in Thousands	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Contributions (% of Payroll)										
Statutory - Chapter 352B	38.50%	38.50%	38.50%	38.50%	38.50%	38.50%	38.50%	38.50%	38.50%	38.50%
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)	38.50%	38.50%	38.50%	38.50%	38.50%	38.50%	38.50%	38.50%	38.50%	38.50%
Contributions										
Statutory - Chapter 352B	67,840	69,888	72,099	74,479	76,791	79,145	81,764	84,252	87,084	89,864
Required - Chapter 356 (MVA)	-	-	-	-	-	-	-	-	-	-
Sufficiency / (Deficiency)	67,840	69,888	72,099	74,479	76,791	79,145	81,764	84,252	87,084	89,864
Funding Ratios										
Current Assets (MVA)	2,711,966	2,907,116	3,117,694	3,344,914	3,590,548	3,855,869	4,142,073	4,451,221	4,784,873	5,145,419
Actuarial Accrued Liability (AAL)	1,941,842	2,013,296	2,087,262	2,163,658	2,242,852	2,324,755	2,408,997	2,495,789	2,584,966	2,676,672
Unfunded AAL	(770,124)	(893,820)	(1,030,432)	(1,181,256)	(1,347,696)	(1,531,114)	(1,733,076)	(1,955,432)	(2,199,907)	(2,468,747)
Funding Ratio	139.7%	144.4%	149.4%	154.6%	160.1%	165.9%	171.9%	178.3%	185.1%	192.2%
Benefit Payments										
Ratio of Assets to Benefit Payments	23.75	24.58	25.41	26.34	27.28	28.18	29.15	30.13	31.16	32.27

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