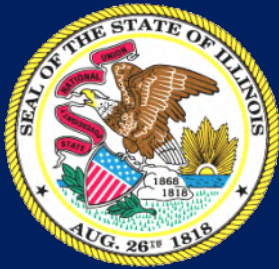

State of Illinois
Office of the Auditor General



State Actuary's Report of the

**Actuarial Assumptions and
Valuations of the State-
Funded Retirement Systems**

December 21, 2022

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Auditor General

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OFFICE OF THE AUDITOR GENERAL
FRANK J. MAUTINO

*To the Speaker and Minority Leader of the House of
Representatives, the President and Minority Leader
of the Senate, the members of the General Assembly,
and the Governor:*

This is our 2022 report on the actuarial assumptions and valuations of the State-funded retirement systems.

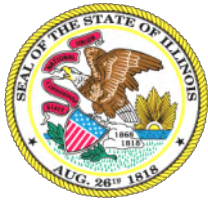
This report was conducted pursuant to Public Act 097-0694 which amended the Illinois State Auditing Act by adding a requirement for the Auditor General to annually review assumptions and valuations prepared by the actuaries of the five State-funded retirement systems. In addition, Public Act 100-0465 added a similar requirement to review the Public School Teachers' Pension and Retirement Fund of Chicago. The report is based on reports prepared by Cheiron, the State Actuary, on each of the State-funded retirement systems.

The report is transmitted in conformance with Section 5/2-8.1(c) of the Illinois State Auditing Act.

SIGNED ORIGINAL ON FILE

FRANK J. MAUTINO
Auditor General

Springfield, Illinois
December 2022



OFFICE OF THE AUDITOR GENERAL

December 21, 2022
State Actuary's Report

Report Highlights

Frank J. Mautino Auditor General

www.auditor.illinois.gov

State Actuary's Report of the

Actuarial Assumptions and Valuations of the State-Funded Retirement Systems

Background:

On June 18, 2012, Public Act 097-0694 was signed into law, which directed the Auditor General to contract with or hire an actuary to serve as the State Actuary. Cheiron was selected as the State Actuary. The Public Act directed the State Actuary to:

- Review assumptions and valuations prepared by actuaries of the State-funded retirement systems;
- Issue preliminary reports to the boards of trustees of the State-funded retirement systems concerning proposed certifications of required State contributions; and
- Identify recommended changes to actuarial assumptions that the boards must consider before finalizing their certifications of the required State contributions.

On August 31, 2017, Public Act 100-0465 was signed into law, which added a sixth retirement system to be reviewed by the State Actuary. The Illinois Pension Code was revised to require the Chicago Teachers' Pension Fund (CTPF) to submit information to the State Actuary similar to the requirement for the other State-funded retirement systems.

liability from increasing if all assumptions are met). Actual contributions have been significantly less than the tread water cost. Each year that total contributions remain below the tread water cost, the unfunded actuarial liability is expected to grow.

Key Findings:

- The State Actuary, Cheiron, reviewed the actuarial assumptions used in each of the six systems' actuarial valuations for the year ended June 30, 2022, and **concluded that they generally were reasonable**. Cheiron **did not recommend any changes** to the assumptions used in the June 30, 2022 actuarial valuations.
- The combined total of the required Fiscal Year 2024 State contribution for the six retirement systems was **\$11.14 billion, an increase of \$0.18 billion over the previous year**. Cheiron verified the arithmetic calculations made by the systems' actuaries to develop the required State contribution and reviewed the assumptions on which it was based.
- The Illinois Pension Code (for TRS, SURS, SERS, JRS, and GARS) establishes **a method that does not adequately fund the systems**. It requires the actuary to calculate the employer contribution as the level percentage of projected payroll that would accumulate assets equal to 90% of the actuarial accrued liability in the year 2045 if all assumptions are met. This methodology does not conform to generally accepted actuarial principles and practices. Generally accepted actuarial funding methods target the accumulation of assets equal to 100% of the actuarial liability, not 90%.
- According to the systems' 2022 actuarial valuation reports, the funded ratio of the retirement systems ranged from 45.2% (SURS) to 22.0% (GARS), based on the actuarial value of assets as a ratio to the actuarial liability. If there is a significant market downturn, the unfunded actuarial liability and the required State contribution rate could both increase significantly, putting the sustainability of the systems further into question.
- The interest rate assumption (also called the investment return or discount rate) is the most impactful assumption affecting the required State contribution amount. The retirement systems use varying interest rate assumptions ranging from 6.50 percent to 7.00 percent. The interest rate assumption remained unchanged for each of the systems for the 2022 actuarial valuations.
- One of the persistent sources of the increase in unfunded actuarial liability is due to actual contributions to the System being less than the tread water contribution (the amount needed to prevent the unfunded actuarial

Key Recommendations:

Cheiron made recommendations for additional disclosures for the 2022 valuations and recommended changes for future valuations. This year's report contains 39 recommendations compared to 36 in last year's report. Recommendations included the following:

- Cheiron recommends that the funding method be changed to employ a methodology that produces a Reasonable Actuarially Determined Contribution and fully funds plan benefits within a reasonable period.
- Cheiron recommends the Boards continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly. All of the systems complied with this recommendation prior to conducting the 2022 actuarial valuations.
- Because it is reasonable to anticipate future reductions in the discount rate, Cheiron recommended for three of the systems (TRS, SURS, and CTPF) that future stress testing include the impact to the required State contribution of potential reductions in the discount rate.
- Because experience studies are performed every three years, Cheiron recommended that the phase-in period for the impact of assumption changes be reduced to no longer than three years.
- Cheiron assessed compliance with Actuarial Standard of Practice 51 (assessment and disclosure of risk) and made recommendations to improve the disclosures related to that standard.

Background

On June 18, 2012, Public Act 097-0694 was signed into law, which directed the Auditor General to contract with or hire an actuary to serve as the State Actuary. The Public Act amended the Illinois State Auditing Act as well as sections of the Illinois Pension Code for each of the following State-funded retirement systems:

- The Teachers’ Retirement System (TRS);
- The State Universities Retirement System (SURS);
- The State Employees’ Retirement System (SERS);
- The Judges’ Retirement System (JRS); and
- The General Assembly Retirement System (GARS).

Requirements of Public Act 097-0694

Public Act 097-0694 requires the State Actuary to conduct an annual review of the valuations prepared by the actuaries of the State-funded retirement systems. Specifically the Act requires the State Actuary to:

- Review assumptions and valuations prepared by actuaries retained by the boards of trustees of the State-funded retirement systems;
- Issue preliminary reports to the boards of trustees of the State-funded retirement systems concerning proposed certifications of required State contributions submitted to the State Actuary by those boards; and
- Identify recommended changes to actuarial assumptions that the boards must consider before finalizing their certifications of the required State contributions.

On or before November 1 of each year, beginning November 1, 2012, the boards of each of the systems must submit to the State Actuary a proposed certification of the amount of the required State contribution to the system for the next fiscal year, along with all of the actuarial assumptions, calculations, and data upon which that proposed certification is based.

On or before January 1, 2013, and each January 1 thereafter, the Auditor General shall submit a written report to the General Assembly and Governor documenting the initial assumptions and valuations prepared by actuaries retained by the boards of trustees of the State-funded retirement systems, any changes recommended by the State Actuary in the actuarial assumptions, and the responses of each Board to the State Actuary's recommendations.

On or before January 15, 2013, and every January 15 thereafter, each Board shall certify to the Governor and the General Assembly the amount of the required State contribution for the next fiscal year. The Boards’ certification must note any deviations from the State Actuary's recommended changes, the reason or reasons for not following the State Actuary's recommended changes, and the

fiscal impact of not following the State Actuary's recommended changes on the required State contribution.

Requirements of Public Act 100-0465

On August 31, 2017, Public Act 100-0465 was signed into law, which added a sixth retirement system to be reviewed by the State Actuary. The Illinois Pension Code was revised to require the Chicago Teachers’ Pension Fund (CTPF) to submit information to the State Actuary similar to the requirement for the other State-funded retirement systems. Public Act 100-0465 specified the following regarding the Chicago Teachers’ Pension Fund:

- For State fiscal year 2018, the State shall contribute \$221,300,000 for the employer normal cost.
- Beginning in State fiscal year 2019, the State shall contribute an amount equal to the employer normal cost for that fiscal year.
- On or before November 1 of each year, beginning November 1, 2017, the Board shall submit to the State Actuary, the Governor, and the General Assembly a proposed certification of the amount of the required State contribution to the Fund for the next fiscal year, along with all of the actuarial assumptions, calculations, and data upon which that proposed certification is based.
- On or before January 1 of each year, beginning January 1, 2018, the State Actuary shall issue a preliminary report concerning the proposed certification and identifying, if necessary, recommended changes in actuarial assumptions that the Board must consider before finalizing its certification of the required State contributions.
- On or before January 15, 2018, and each January 15 thereafter, the Board shall certify to the Governor and the General Assembly the amount of the required State contribution for the next fiscal year. The Board's certification must note any deviations from the State Actuary's recommended changes, the reason or reasons for not following the State Actuary's recommended changes, and the fiscal impact of not following the State Actuary's recommended changes on the required State contribution.

Contracting with the State Actuary

On July 12, 2012, the Office of the Auditor General issued a Request for Proposals for the services of a State Actuary. On August 24, 2012, the contract was awarded to Cheiron. Cheiron is a full-service actuarial and consulting firm with offices in seven locations throughout the United States. Cheiron has experience working with multiple public pension plans around the country.

Review of the Actuarial Assumptions

Cheiron reviewed the actuarial assumptions used in each of the six systems’ actuarial valuations for the year ended June 30, 2022, and **concluded that they were reasonable. Cheiron did not recommend any changes to the assumptions used in the June 30, 2022 actuarial valuations.**

Cheiron did recommend additional disclosures for the 2022 valuations and also recommended changes for future valuations. The systems’ responses to Cheiron’s preliminary reports can be found in Appendix C of this report.

Digest Exhibit 1 summarizes the recommendations made to the retirement systems. At the end of each of the reports located in Chapters One through Six is a chart summarizing the status of recommendations made by the State Actuary in last year’s 2021 report. This year’s report contains 39 recommendations compared to 36 recommendations made in last year’s report.

The following sections discuss some of the key assumptions and recommendations. Further details on the assumptions and recommendations are contained in the State Actuary’s preliminary reports for each of the retirement systems, found in Chapters One through Six of this report.

Digest Exhibit 1

RECOMMENDATIONS TO THE RETIREMENT SYSTEMS

Recommendations	TRS	SURS	SERS	JRS	GARS	CTPF
Recommended Changes to Actuarial Assumptions used in the 2022 Actuarial Valuations:						
Cheiron reviewed the actuarial assumptions and concluded that they were reasonable. Consequently, Cheiron did not have any recommended changes to assumptions this year.						
Recommended Additional Disclosures for the 2022 Actuarial Valuations:						
• Include a more detailed explanation of how the new entrant assumption was developed	✓					
• Provide an explanation of the causes for the consistent losses in the retirement decrement assumption			✓			
• Explain the cause of the \$119 million gain in the “Other” category			✓			
• Disclose the retirement age assumption for deferred vested members					✓	
• Disclose whether members who leave active employment are assumed to elect a deferred annuity or a refund of contributions					✓	
Recommended Changes for Future Actuarial Valuations:						
• Annually review the economic assumptions (interest rate and inflation rate) and adjust assumptions accordingly	✓	✓	✓	✓	✓	✓
• Future stress testing include the impact to the required State contribution of potential reductions in the discount rate	✓	✓				✓
• To better comply with ASOP 51, explain how each risk identified would reasonably be anticipated to significantly affect the specific plan’s future financial condition		✓	✓	✓	✓	
• Related to ASOP 51, for each identified risk, provide an assessment, preferably quantitative, that considers the specific circumstances of this plan		✓	✓	✓	✓	
• Provide additional information about the new entrant population used in the projection such as the average age and service of the population each year	✓					
• Increase the Full-Time future service accrual rate assumption to 1.0 years of service and consider changes to non-full-time member future service accrual rates	✓					
• Provide explanation and justification for certain specific selections related to the mortality assumptions			✓			
• Consider the number of general assembly members that are in the defined contribution plan when projecting the ultimate number of active members in GARS					✓	
• Expand the participant data section to include average pay and service for active members and information on inactive members owed a benefit in the future					✓	
• Consider the average retirement age when reviewing the retirement assumption in the next experience study					✓	
• Review the retirement age experience for deferred vested members in the next experience study					✓	

Digest Exhibit 1 (continued)

RECOMMENDATIONS TO THE RETIREMENT SYSTEMS

Recommendations	TRS	SURS	SERS	JRS	GARS	CTPF
Other Recommendations:						
• Change the funding method to employ a methodology that produces a Reasonable Actuarially Determined Contribution and fully fund plan benefits within a reasonable period	✓	✓	✓	✓	✓	
• Reduce the phase-in period for the impact of assumption changes to no longer than three years	✓	✓	✓	✓	✓	

Source: OAG summary of Cheiron's preliminary reports to the six retirement systems.

Economic Assumptions

Cheiron reviewed the economic assumptions utilized in the actuarial valuations for each of the six retirement systems. The following sections discuss two of those assumptions – the interest rate assumption and the inflation assumption.

Interest Rate Assumption

The interest rate assumption (also called the investment return or discount rate) is **the most impactful assumption affecting the required State contribution amount**. This assumption is used to value liabilities for funding purposes. The retirement systems use varying interest rate assumptions. Digest Exhibit 2 shows the interest rate assumptions for each of the six retirement systems for every year since 2012. As can be seen in the exhibit, the interest rate assumption remained unchanged for each of the systems for the 2022 actuarial valuations.

Digest Exhibit 2

INTEREST RATE ASSUMPTIONS

System	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
TRS	8.00%	7.50%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
SURS	7.75%	7.25%	7.25%	7.25%	7.25%	6.75%	6.75%	6.75%	6.75%	6.50%	6.50%
SERS	7.75%	7.25%	7.25%	7.25%	7.00%	7.00%	7.00%	7.00%	6.75%	6.75%	6.75%
JRS	7.00%	7.00%	7.00%	7.00%	7.00%	6.75%	6.75%	6.75%	6.75%	6.50%	6.50%
GARS	7.00%	7.00%	7.00%	7.00%	7.00%	6.75%	6.75%	6.75%	6.75%	6.50%	6.50%
CTPF	8.00%	7.75%	7.75%	7.75%	7.75%	7.25%	7.25%	7.00%	7.00%	6.75%	6.50%

Source: Retirement system actuarial reports.

Cheiron concluded that the interest rate assumptions for all of the systems were reasonable. However, because it is reasonable to anticipate future reductions in the discount rate, Cheiron recommended for three of the systems (TRS, SURS, and CTPF) that future stress testing include the impact to the required State contribution of potential reductions in the discount rate.

As it did in last year’s report, Cheiron again recommended that the Boards annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly. All of the systems complied with this recommendation prior to conducting the 2022 actuarial valuations.

Cheiron noted that declining interest rates have forced pension plans to either reduce their discount rates, increase their exposure to investment risk, or some combination of the two. For example, in 2002 the yield on 10-year Treasury bonds (a proxy for a risk free investment) was 4.9%. To achieve an assumed return of 8.0%, a system’s investments had to outperform the yield on the 10-year Treasury by 3.1%. In June 2020, the yield on the 10-year Treasury had dropped to 0.7%, and to achieve an assumed return of 6.5%, a system’s investments need to exceed the 10-year Treasury yield by 5.8%. Even though, in this example, a system reduced its assumption by 150 basis points, it still had to take more investment risk in 2020 to meet its assumption than it did in 2002. Since 2020, yields on 10-year Treasury bonds have increased, reducing the expected risk premium needed to achieve the System’s assumed return. With recent action by the Federal Reserve, 10-year Treasury bond yields have increased rapidly from 1.5% in December 2021 to 3.1% in June 2022 and 4.0% in October 2022. If these higher Treasury bond yields persist, plans may be able to achieve the expected return with less exposure to investment risk.

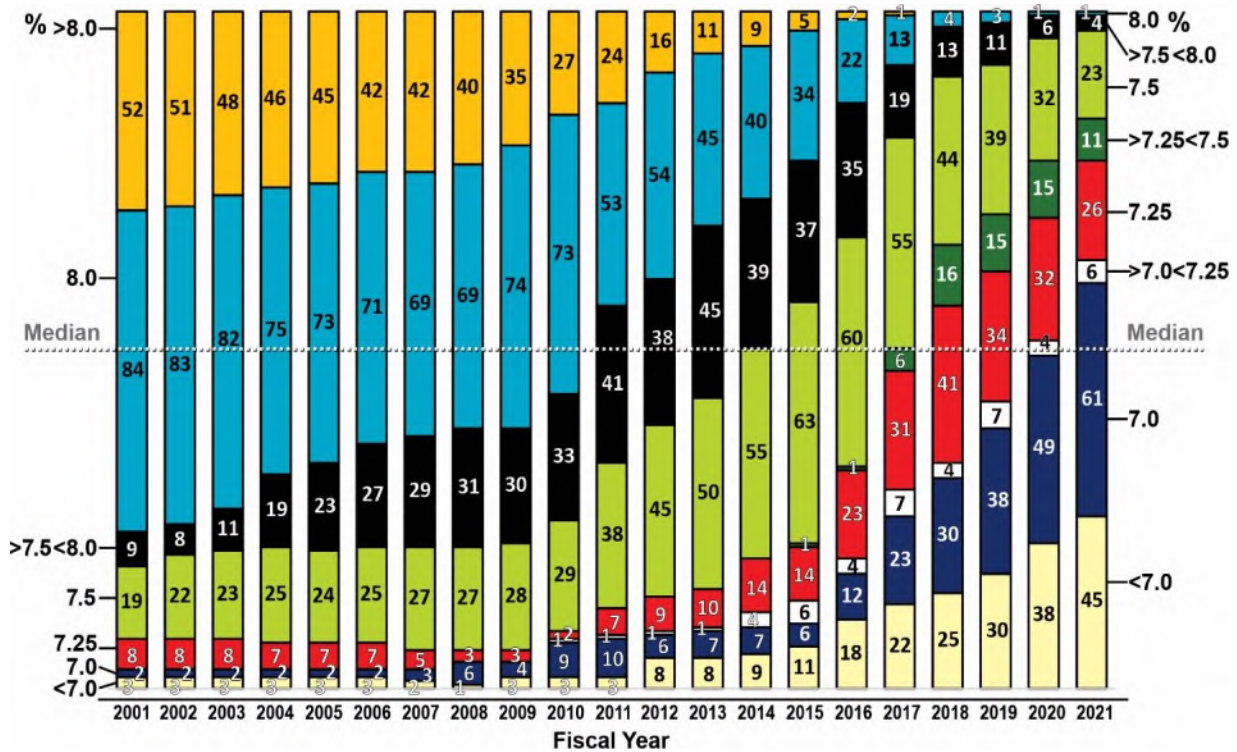
Cheiron discussed the nationwide movement among pension plans to lower the interest rate assumption. The Public Plans Database is maintained by a partnership between the Center for State and Local Government Excellence and the Center for Retirement Research at Boston College with support from the National Association of State Retirement Administrators. This database contains historical information on large public pension plans, including key assumptions used in their actuarial valuations. Digest Exhibit 3 shows the change in the interest rate assumptions for 177 public pension plans from 2001 through 2021 as of October 19, 2022.

The exhibit shows the shift to lower interest rate assumptions. In 2001, 136 of the 177 plans (77%) used an interest rate assumption of 8.0% or higher. The data as of October 19, 2022, shows that this number has dropped to only 1 of 177 plans (1%) that use an interest rate of 8.0% or higher. The median assumption has fallen to 7.00%. Since 2017, 113 of the 177 plans have reduced the interest rate assumption with an average reduction of 0.44%. In addition, in 2021, 106 plans have adopted a rate of 7.0% or lower.

Digest Exhibit 3

CHANGE IN INTEREST RATE ASSUMPTIONS SINCE 2001

177 Pension Plans in the Nation’s Largest Public Retirement Systems



Source: Public Pension Database as of October 19, 2022.

Inflation Assumption

Five of six retirement systems use an inflation assumption of 2.25% (see Digest Exhibit 4). TRS uses an inflation assumption of 2.50% which was increased for its 2022 valuation.

Cheiron concluded that the inflation assumptions used by the six retirement systems were reasonable. Cheiron’s rationale for concurring with the inflation assumptions includes the following:

- The June 2022 Old-Age, Survivors, and Disability Insurance Trustees Report projects that over the long-term (next 75 years), inflation will average between 1.8% and 3.0%. Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.4%.
- Cheiron presented three inflation comparisons: 1) the distribution of inflation expectations for the Third Quarter 2022 survey of professional economic forecasters published by the Philadelphia Federal Reserve; 2) the 2022 Horizon survey of investment consultant capital market assumptions (20-year); and 3) the 2021 inflation assumptions used by plans in the Public Plans Database. The 2.50% rate used by TRS is near the middle of the range used by investment consultants in the Horizon survey and by other public pension

plans, and is on the low end of the range projected by professional economic forecasters. The 2.25% rate used by the other five retirement systems is in the lower quartile of the range projected by professional economic forecasters and investment consultants and is on the low end of the range used by other public pension plans.

Digest Exhibit 4
INFLATION ASSUMPTIONS
 June 30, 2022 Valuation

System	Inflation Rate	Notes
Teachers' Retirement System	2.50%	Increased from 2.25% for the June 30, 2022 actuarial valuation
State Universities Retirement System	2.25%	Lowered from 2.75% for the June 30, 2018 actuarial valuation
State Employees' Retirement System	2.25%	Lowered from 2.50% for the June 30, 2019 actuarial valuation
Judges' Retirement System	2.25%	Lowered from 2.50% for the June 30, 2019 actuarial valuation
General Assembly Retirement System	2.25%	Lowered from 2.50% for the June 30, 2019 actuarial valuation
Chicago Teachers' Pension Fund	2.25%	Lowered from 2.50% for the June 30, 2020 actuarial valuation

Source: Retirement system actuarial reports.

The inflation assumption primarily impacts the salary increase assumption. The salary increase assumption is generally comprised of the inflation assumption and a productivity, or real wage growth assumption.

Demographic Assumptions

The retirement systems utilize a number of demographic assumptions such as mortality rates, disability rates, and termination rates. Cheiron reviewed the demographic assumptions and concluded that they were reasonable. Cheiron included additional analysis in its reports on each of the systems. Cheiron collected data from past valuation reports and presented a historical review of past demographic and salary increase experience gains and losses. Results were presented in a chart which showed the pattern of annual gains and losses attributable to different sources. These charts can be found in Chapters One through Six. Different measures were used for each system depending on the information available but sources used included:

- Active and retiree mortality;
- Disability;
- New entrants;
- Benefit recipients;
- Salary increases;

- Retirement; and
- Terminations.

An examination of these trends can be used to determine if adjustments need to be made to assumptions or if additional disclosures need to be made in the actuarial valuation reports. Additional details on the demographic assumptions examined can be found in the chapters for each of the six retirement systems.

Proposed Certification of Required State Contribution

Each of the six retirement systems submitted to the State Actuary a proposed certification of the amount of the required State contribution for that system. **Cheiron verified the arithmetic calculations made by the systems’ actuaries to develop the required State contribution and reviewed the assumptions on which it was based.** Digest Exhibit 5 shows the amounts of proposed State contributions submitted by the systems for Fiscal Year 2024 and compares it to the previous year’s contribution. Overall, the required State contribution increased from \$10.96 billion to \$11.14 billion, an increase of \$0.18 billion.

Digest Exhibit 5

AMOUNTS OF STATUTORILY REQUIRED STATE CONTRIBUTIONS

System	State Contribution (for Fiscal Year 2023)	State Contribution (for Fiscal Year 2024)
Teachers’ Retirement System	\$5,894,032,209	\$6,043,454,650
State Universities Retirement System	\$2,123,615,000	\$2,138,328,000
State Employees’ Retirement System	\$2,475,165,000	\$2,472,697,000
Judges’ Retirement System	\$142,659,000	\$147,838,000
General Assembly Retirement System	\$27,174,000	\$26,474,000
Chicago Teachers’ Pension Fund ¹	\$295,302,000	\$308,147,000
Total	\$10,957,947,209	\$11,136,938,650

¹The State contribution for CTPF is limited to the employer normal cost for that fiscal year.

Source: 2022 Retirement system actuarial valuation reports.

Cheiron noted that, in accordance with 30 ILCS 5/2-8.1, its review does not include a replication of the actuarial valuation results. Beginning with the December 2014 State Actuary Report, Cheiron recommended that the Boards periodically undertake a full scope actuarial audit, utilizing the services of a reviewing actuary. Such an audit should fully replicate the original actuarial valuation, based on the same census data, assumptions, and actuarial methods used by the Systems’ actuaries. With the recent replication audits at SERS, JRS, and GARS, all of the Boards have now complied with this recommendation. This does not apply to CTPF as Cheiron’s review of CTPF is more limited in scope.

Actuarial Funding Methods

Actuarial funding methods consist of three components: (1) the actuarial cost method, which is the attribution of total costs to past, current, and future years; (2) the asset valuation method (i.e., asset smoothing); and (3) the amortization method.

Actuarial Cost Method

All of the retirement systems use the Projected Unit Credit cost method to assign costs to years of service. This method is required under the Illinois Pension Code. Cheiron had no objection to using the Projected Unit Credit cost method as it is an acceptable method that is used by other public sector pension funds. However, Cheiron would prefer the Entry Age Normal funding method as it is more consistent with the Pension Code’s requirement for level percentage of pay funding.

Under the Projected Unit Credit method, the benefits of active participants are calculated based on their compensation projected with assumed annual increases to ages at which they are assumed to leave the active workforce by any of these causes: retirement, disability, turnover, or death. Only past service (through the valuation date but not beyond) is taken into account in calculating these benefits. The present value of these benefits based on past service and future compensation is the actuarial accrued liability for a given active participant. Under the Projected Unit Credit cost method, the value of an active participant’s benefits tends to increase more sharply over their later years of service than over their earlier ones.

As a result of this pattern of benefit values increasing, while the Projected Unit Credit method is not an unreasonable method, more plans use the Entry Age Normal funding method to mitigate this effect. It should also be noted that the Entry Age Normal method is the required method to calculate liability for the Governmental Accounting Standards Board Statements 67 and 68.

Asset Valuation Method

The actuarial value of assets for the systems is a smoothed market value. Unanticipated changes in market value are recognized over five years for all of the systems except CTPF, which smooths over four years. The primary purpose for smoothing out gains and losses over multiple years is so fluctuations in the contributions will be less volatile over time than if based on the market value of assets. Cheiron concurred with the use of the asset smoothing method noting that smoothing the market gains and losses over a period of years to determine the actuarial value of assets is a generally accepted approach in determining actuarial cost.

Amortization Method

The mandated State contribution is based on a determination of the level percentage of payroll that is expected to achieve a 90% funded ratio in 2045 (2059 for CTPF). While not a traditional amortization method, this methodology

effectively amortizes a portion of the unfunded actuarial liability over the remaining period until 2045, which is currently 23 years.

One of the principles of funding public plans identified by the American Academy of Actuaries is that there should be “a plan to make up for any variations in actual assets from the funding target within a defined and reasonable time period.” Because it only targets 90%, the State method does not include a plan to achieve the funding target over any period of time.

Typical public plan amortization methods are designed to increase each year by expected payroll growth. Under the State mandated method, however, the effective amortization payment increases each year by more than the expected growth in payroll. As a result, the State mandated method defers payments on the unfunded actuarial liability further into the future than under typical public plan amortization methods.

Finally, as the remaining period to achieve 90% funding shortens, the State mandated method will also produce more volatile contributions. Instead of a single fixed period, typical public plan amortization methods use layered amortization bases such that new assumption changes and experience gains and losses are amortized over a new period (e.g., 20 years) while the remaining period for the prior amortization layers becomes one year shorter.

State Mandated Funding Method

The Illinois Pension Code (for TRS, SURS, SERS, JRS, and GARS) establishes a method that does not adequately fund the systems. It requires the actuary to calculate the employer contribution as the level percentage of projected payroll that would accumulate assets equal to 90% of the actuarial accrued liability in the year 2045 if all assumptions are met. This methodology does not conform to generally accepted actuarial principles and practices. Generally accepted actuarial funding methods target the accumulation of assets equal to 100% of the actuarial accrued liability, not 90%.

Cheiron recommended that the funding method be changed to employ a methodology that produces a Reasonable Actuarially Determined Contribution and fully funds plan benefits within a reasonable period. The State Mandated Method will soon enter a period in which the contribution amount it produces may be reasonable even though the overall methodology is not. This period offers an opportunity to change the methodology to one that is consistent with actuarial standards for a Reasonable Actuarially Determined Contribution without significantly affecting the immediate contribution amount. Such a method would set contributions at a level that is expected to prevent the unfunded actuarial liability from growing and remain high enough to reduce the unfunded actuarial liability each year until the plan is ultimately 100% funded within a reasonable period. While the State Mandated Method is inadequate, it will also produce more volatile contribution levels as the remaining period to achieve 90% funding shortens. Consequently, we recommend that the funding method be changed to one that produces more stable contribution requirements while targeting 100% funding within a reasonable period and meets the actuarial standards for a Reasonable Actuarially Determined Contribution.

In the actuarial valuation reports, the systems’ actuaries discuss their concerns with the State mandated funding method. The actuarial valuation reports include

recommended funding policies that conform to a goal of full funding within a reasonable time period and conform with generally accepted actuarial principles and practices.

Based on the systems’ 2022 actuarial valuation reports, the funded ratio of the systems ranged from 45.2% (SURS) to 22.0% (GARS) based on the actuarial value of assets as a ratio to the actuarial liability (see Digest Exhibit 6). If there is a significant market downturn, the unfunded actuarial liability and the required State contribution rate could both increase significantly, putting the sustainability of the systems further into question.

Digest Exhibit 6
**SYSTEM FUNDED RATIO
(ACTUARIAL VALUE OF ASSETS)**

System	Funded Ratio
Teachers’ Retirement System	43.8%
State Universities Retirement System	45.2%
State Employees’ Retirement System	44.0%
Judges’ Retirement System	44.3%
General Assembly Retirement System	22.0%
Chicago Teachers’ Pension Fund	44.1%
Source: 2022 actuarial valuation reports.	

Recognition of Changes in Actuarial Assumptions

Public Act 100-0023, effective July 6, 2017, modified the State’s funding policy to require that the contribution impact of all assumption changes be phased-in over a five-year period. As such, the Act delays the funding of the System. Assumption changes are intended to more accurately anticipate the obligations for funding based on the most recent experience analysis and forward-looking changes to future investment returns. However, only one-fifth of the impact of these changes are now recognized from the date of adoption. The remainder of the impact is recognized over four additional years such that the full impact is only recognized at the end of a five-year period beginning at the date of adoption. This phase-in provides time to adjust to a higher level of contributions.

However, the Conference of Consulting Actuaries White Paper on Actuarial Funding Policies and Practices for Public Pension Plans recommends that the “phase-in period should be no longer than the time period until the next review of assumptions.” Since experience studies are performed every three years, Cheiron recommended that the phase-in period for the impact of assumption changes be reduced to no longer than three years. However, changing the funding method is under the jurisdiction of State law and not the Retirement Systems.

Assessment and Disclosure of Risk

Actuarial Standard of Practice (ASOP) 51 provides guidance to actuaries on the assessment and disclosure of risks to help readers of the actuarial valuation report “*understand the effects of future experience differing from the assumptions used*” and “*the potential volatility of future measurements resulting from such differences.*”

Cheiron assessed compliance with ASOP 51 for five of the systems (TRS, SURS, SERS, JRS, and GARS.) For four of the systems (SURS, SERS, JRS, and GARS), Cheiron recommended:

- The actuary explain how each risk identified would significantly affect the specific plan’s future financial condition.
- For each identified risk the actuary provide an assessment, preferably quantitative, that considers the specific circumstances of this plan.

Analysis Of Funding Adequacy

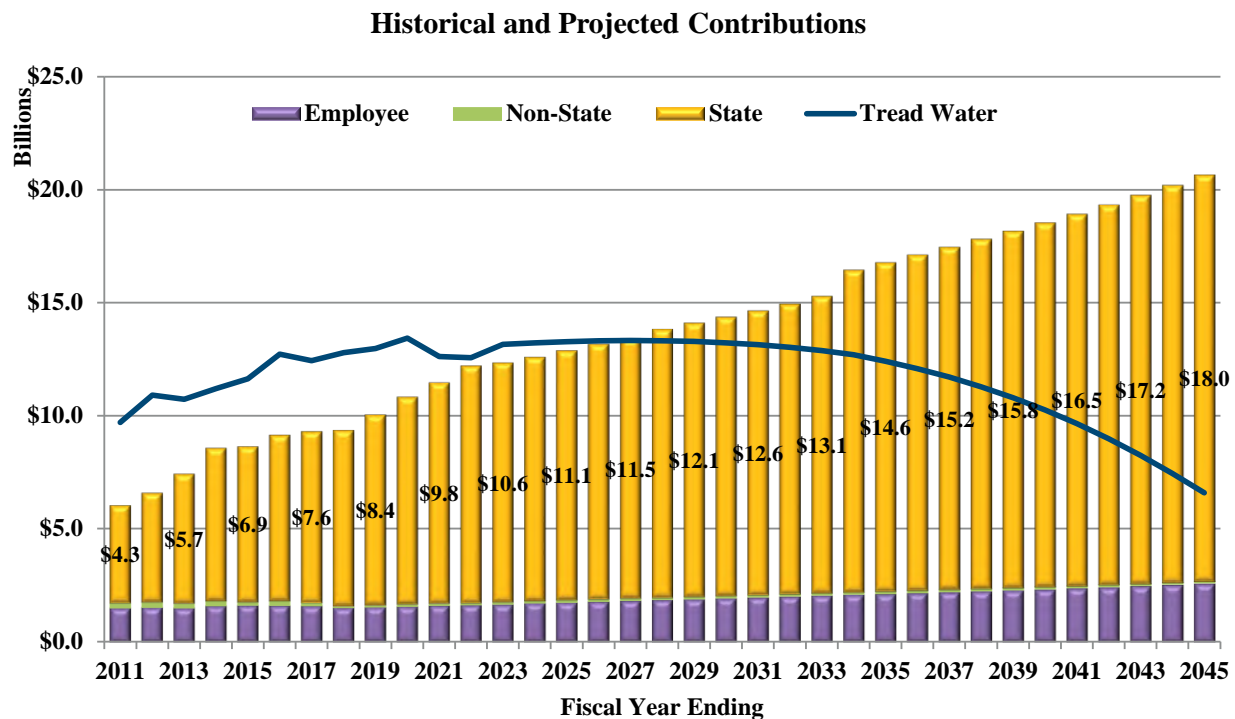
Cheiron examined the adequacy of the funding for the systems, including funded ratio, the sources of changes in the unfunded actuarial liability, and projections of the unfunded actuarial liability. This analysis is contained in the State Actuary’s preliminary reports for each of the retirement systems, found in Chapters One through Six of this report.

One of the persistent sources of the increase in unfunded actuarial liability is due to actual contributions to the System being less than the tread water contribution (the amount needed to prevent the unfunded actuarial liability from increasing if all assumptions are met).

Digest Exhibit 7 shows the combined historical and projected contributions for five of the systems (TRS, SURS, SERS, JRS, and GARS). As the chart below shows, actual contributions have been significantly less than the tread water cost. Each year that total contributions remain below the tread water cost (blue line), the unfunded actuarial liability is expected to grow. As shown in the graph below, the contributions from the State will need to increase before the total contribution reaches the tread water contribution and begins to pay down the unfunded actuarial liability.

Digest Exhibit 7

HISTORICAL AND PROJECTED CONTRIBUTIONS COMPARED TO TREAD WATER COST



Source: Cheiron analysis of system funding adequacy.

Responses to the Recommendations

Each of the six retirement systems provided responses to Cheiron’s recommendations contained in the preliminary reports. The systems generally agreed with Cheiron’s recommendations. The complete responses are in Appendix C.

This annual review was conducted by Cheiron, the State Actuary, with the assistance of the staff of the Office of the Auditor General.

SIGNED ORIGINAL ON FILE

JOE BUTCHER
Division Director

This report is transmitted in accordance with Section 5/2-8.1(c) of the Illinois State Auditing Act.

SIGNED ORIGINAL ON FILE

FRANK J. MAUTINO
Auditor General

FJM:DJB

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Glossary

Actuarial Assumptions	Estimates of future experience with respect to rates of mortality, disability, turnover, retirement, investment income, and salary increases. Demographic assumptions (rates of mortality, disability, turnover, and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (salary increases and investment income) consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation.
Actuarial Cost Method	A mathematical budgeting procedure for allocating the dollar amount of the Present Value of Future Benefits between the Present Value of Future Normal Cost and the Actuarial Liability. This is sometimes referred to as the "actuarial funding method."
Actuarial Gain (Loss)	A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions, during the period between two actuarial valuation dates, as determined in accordance with a particular Actuarial Cost Method.
Actuarial Liability	The Actuarial Liability is the Actuarial Present Value of all benefits accrued as of the valuation date using the methods and assumptions of the valuation. It is also referred to by some actuaries as the "accrued liability" or "actuarial accrued liability."
Actuarial Present Value	The amount of funds currently required to provide a payment or series of payments in the future. It is determined by discounting future payments at predetermined rates of interest and by probabilities of payment.
Actuarial Value of Assets (AVA)	The Actuarial Value of Assets equals the Market Value of Assets adjusted according to the smoothing method in accordance with Illinois Law. The smoothing method is intended to smooth out the short-term volatility of investment returns in order to stabilize contribution rates and the Funded Ratio.
Asset Smoothing Method	A method of asset valuation where the annual fluctuation in the Market Value of Assets is averaged over a period of years. See Actuarial Value of Assets above.
Entry Age Normal (EAN)	A method under which the Present Value of Future Benefits of each individual included in an actuarial valuation is allocated on a level basis over the earnings or service of the individual between entry age and assumed exit age(s). The portion of this Present Value of Future Benefits

Glossary

allocated to a valuation year is called the Normal Cost. The portion of this Present Value of Future Benefits not provided for at a valuation date by the Present Value of Future Normal Costs is called the Actuarial Liability.

Funded Ratio	The Actuarial Value of Assets divided by the Actuarial Liability. The Funded Ratio represents the percentage of assets in the System compared to the budgeted amount under the Projected Unit Credit Actuarial Cost Method. The Funded Ratio can also be calculated using the Market Value of Assets.
Governmental Accounting Standards Board	The Governmental Accounting Standards Board (GASB) defines the accounting and financial reporting requirements for governmental entities. GASB Statement No. 67 defines the plan accounting and financial reporting for governmental pension plans, and GASB Statement No. 68 defines the employer accounting and financial reporting for participating in a governmental pension plan.
Market Value of Assets (MVA)	The fair value of the System's assets assuming that all holdings are liquidated on the measurement date.
Normal Cost	The annual cost assigned, under the Actuarial Cost Method, to current and subsequent plan years. Sometimes referred to as "current service cost." Any payment toward the Unfunded Actuarial Liability is not part of the Normal Cost.
Present Value of Future Benefits	The estimated amount of assets needed today to pay for all benefits promised in the future to current members of the System assuming all Actuarial Assumptions are met.
Present Value of Future Normal Costs	The Actuarial Present Value of retirement system benefits allocated to future years of service.
Projected Unit Credit (PUC)	A method under which the benefits of each individual included in an actuarial valuation are allocated by a consistent formula to the years in which they are earned. The Actuarial Present Value of benefits allocated to a valuation year is called the Normal Cost. The Actuarial Present Value of benefits allocated to all periods prior to a valuation year is called the Actuarial Liability.
Unfunded Actuarial Liability (UAL)	The Unfunded Actuarial Liability represents the difference between the Actuarial Liability and Actuarial Value of Assets. This is sometimes referred to as "unfunded accrued liability."

Chapter One

Preliminary Report on the Teachers' Retirement System

In accordance with 30 ILCS 5/2-8.1, Cheiron, the State Actuary, submitted a preliminary report to the Board of Trustees of the Teachers' Retirement System

(TRS) concerning proposed certifications of required State contributions submitted to Cheiron by the Board. The preliminary report was submitted to TRS on December 1, 2022. The preliminary report was based on Cheiron's review of actuarial assumptions included in TRS' 2022 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the Teachers' Retirement System. TRS' written response, provided on December 13, 2022, can be found in Appendix C.

OVERVIEW**TEACHERS' RETIREMENT SYSTEM**

as of June 30, 2022

Actuarial accrued liability	\$143,523,730,959
Actuarial value of assets	\$62,910,402,178
Unfunded liability	\$80,613,328,781
Funded ratio	43.8%

Employer normal cost	\$1,285,967,838
State contribution (FY24)	\$6,043,454,650

Active members	158,905
Inactive members	151,815
Current benefit recipients	128,116
Total membership	438,836

Interest rate assumption	7.00%
Inflation assumption	2.50%
Actuarial cost method	Projected Unit Credit
Asset valuation method	5-year Smoothing

Executive Director	Stan Rupnik
Actuarial Firm	Segal Consulting

Source: June 30, 2022 TRS actuarial valuation report.

December 15, 2022

Mr. Frank Mautino
Auditor General
740 East Ash Street
Springfield, Illinois 62703

Board of Trustees
Teachers' Retirement System of the State of Illinois
2815 West Washington Street
Springfield, Illinois 62702

Dear Trustees and Auditor General:

In accordance with the Illinois State Auditing Act (30 ILCS 5/2-8.1), Cheiron is submitting this preliminary report concerning the proposed certification prepared by Segal Consulting (Segal) of the required State contribution to the Teachers' Retirement System of the State of Illinois (TRS or System) for Fiscal Year 2024.

In summary, we believe that the assumptions and methods used in the draft June 30, 2022 Actuarial Valuation, which are used to determine the required Fiscal Year 2024 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, were properly calculated in accordance with State law.

Section I of this report describes the review process undertaken by Cheiron. Section II summarizes our findings and recommendations. Section III provides the supporting analysis for those findings and presents more details on our assessment of the actuarial assumptions and methods employed in Segal's Actuarial Certification, as well as our assessment of Segal's determination of the required State contribution for Fiscal Year 2024. Section III also includes comments on other issues impacting the funding of the Teachers' Retirement System, including the implications of Article 16 of the Illinois Pension Code, which establishes the statutory minimum funding requirements for the System. **We agree with Segal's opinion that the statutory mandated minimum funding requirements have produced inadequate funding of the Plan resulting in TRS being among the worst funded retirement systems in the country. In addition, this past inadequate funding has resulted in current and future contribution levels, measured as a percent of payroll, to be amongst the highest in the country. Making adequate contributions in the future to fully fund the system will be challenging.** Section IV reviews the projections contained in the draft June 30, 2022 Actuarial Valuation. Finally, Section V provides an analysis of funding adequacy.

In preparing this report, we relied on information (some oral and some written) supplied by TRS and Segal. This information includes actuarial assumptions and methods adopted by the TRS Board, plan provisions, the draft June 30, 2022 Actuarial Valuation, minutes of the 2022 plan year TRS Board of Trustee meetings, Segal's investment assumption presentation of August 2022, and

various studies and memos prepared by the System's advisors, staff, and Executive Director. A detailed description of all information provided for this review is contained in Appendix B.

This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys, and our firm does not provide any legal services or advice.

This report was prepared exclusively for the Office of the Auditor General and the Teachers' Retirement System of the State of Illinois for the purpose described herein. Other users of this report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to any other user.

Sincerely,
Cheiron

SIGNED ORIGINAL ON FILE

Coralie A. Taylor, FSA, EA, FCA, MAAA
Consulting Actuary

SIGNED ORIGINAL ON FILE

William R. Hallmark, ASA, EA, FCA, MAAA
Consulting Actuary

**THE STATE ACTUARY’S PRELIMINARY REPORT ON THE
TEACHERS’ RETIREMENT SYSTEM OF THE STATE OF ILLINOIS
PURSUANT TO 30 ILCS 5/2-8.1**

SECTION I – REPORT SCOPE

Illinois Public Act 097-0694 (the Act) amended the Illinois State Auditing Act (30 ILCS 5/2-8.1) and requires Cheiron, as the State Actuary, to review the actuarial assumptions and valuation of the Teachers’ Retirement System of the State of Illinois (TRS or System) and to issue to the TRS Board this preliminary report on the proposed certification prepared by Segal Consulting (Segal) of the required State contribution for Fiscal Year (FY) 2024. The purpose of this review is to identify any recommended changes to the actuarial assumptions and methods for the TRS Board to consider before finalizing its certification of the required State contribution for FY 2024.

While the Act states that just the actuarial assumptions and valuation are to be reviewed, we have also reviewed the actuarial methodologies (funding and asset smoothing methods) employed in preparing the Actuarial Certification, as these methods can have a material effect on the amount of the State contribution being certified. Finally, we have offered our opinion on the implications of Article 16-158 of the Illinois Pension Code, which impacts the contribution amount certified by Segal.

In conducting this review, Cheiron reviewed the draft June 30, 2022 Actuarial Valuation prepared by Segal, minutes of the 2022 Board of Trustees meetings, and various studies and memos prepared by the System’s advisors, staff, and Executive Director. A detailed description of all information reviewed is contained in Appendix B.

In addition to reviewing the Actuarial Certification of the required State contribution to TRS, the Act requires the State Actuary to conduct a review of the “actuarial practices” of the Board. While the term “actuarial practices” was not defined in the Act, we continue to interpret this language to mean that we reviewed: (1) the use of a qualified actuary (as defined in the Qualification Standards of the American Academy of Actuaries) to prepare the annual actuarial valuation for determining the required State contribution; and (2) the conduct of periodic formal experience studies to justify the assumptions used in the actuarial valuation. In addition, we have included comments on actuarial communication and compliance with Actuarial Standards of Practice (ASOP) reflected in the draft June 30, 2022 Actuarial Valuation.

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SECTION II – SUMMARY OF RECOMMENDATIONS

This section summarizes recommendations from our review of the actuarial assumptions and methods employed in the draft June 30, 2022 Actuarial Valuation of TRS as well as the “actuarial practices” of the TRS Board. Section III of this report provides detailed analysis and rationale for these recommendations.

Proposed Certification of the Required State Contribution

Segal has determined that the FY 2023 required State contribution calculated under the current statutory funding requirements is \$6,043,454,650. We have verified the arithmetic calculations made by Segal to develop this required State contribution and have reviewed the assumptions on which it was based. We have accepted Segal’s annual projections of future payroll, total normal costs, employee contributions, combined benefit payments and expenses, and total contributions.

State Mandated Funding Method

1. We recommend that the funding method be changed to employ a methodology that produces a Reasonable Actuarially Determined Contribution and fully funds plan benefits within a reasonable period. The State Mandated Method will soon enter a period in which the contribution amount it produces may be reasonable even though the overall methodology is not. This period offers an opportunity to change the methodology to one that is consistent with actuarial standards for a Reasonable Actuarially Determined Contribution (ADC) without significantly affecting the immediate contribution amount. Such a method would set contributions at a level that is expected to prevent the unfunded actuarial liability from growing and remain high enough to reduce the unfunded actuarial liability each year until the plan is ultimately 100% funded within a reasonable period. While the State Mandated Method is inadequate, it will also produce more volatile contribution levels as the remaining period to achieve 90% funding shortens. Consequently, we recommend that the funding method be changed to one that produces more stable contribution requirements while targeting 100% funding within a reasonable period and meets the actuarial standards for a Reasonable ADC. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

Recognition of Changes in Actuarial Assumptions

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modified the State’s funding policy to require that the contribution impact of all assumption changes be phased-in over a five-year period.

2. Because experience studies are performed every three years, we recommend that the phase-in period for the impact of assumption changes be reduced to no longer than three years. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

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SECTION II – SUMMARY OF RECOMMENDATIONS

Optional Hybrid Plan

P.A. 100-0023 created an Optional Hybrid Plan for current Tier 2 members and future new hires. The Optional Hybrid Plan consists of a reduced defined benefit plan and a defined contribution plan. Segal has not reflected the Hybrid Plan in the June 30, 2022 Actuarial Valuation. We understand that TRS will not implement the Optional Hybrid Plan until clarifying legislation is passed. Given the need for clarifying legislation, we believe it is reasonable not to reflect the Hybrid Plan in the current valuation.

Earnings That Exceed the Governor's Salary

P.A. 100-0023 requires employers to make an additional contribution for participants who have annual earnings that currently exceed, or are projected to exceed, the Governor's current or projected salary. The additional contribution is equal to the employer normal cost rate multiplied by salary in excess of the Governor's current or projected salary.

We have verified that Segal has reflected these additional employer contributions in the development of the net State contribution.

Accelerated Pension Benefit Payments

P.A. 100-0587 created two accelerated pension benefit payment options. Inactive vested members have the option of receiving a lump-sum equal to 60% of the present value of their benefits in lieu of their annuity benefits, and Tier 1 members have the option upon retirement of accepting a reduced automatic increase in exchange for a lump-sum equal to 70% of the present value of the reduced annuity benefits. Eligible members must make an election by June 30, 2026 (extended from June 30, 2024) if they want to receive the accelerated pension benefit payments.

On a preliminary basis, Segal had opted to use the same assumptions as the Illinois Legislature that 22% of inactive vested members will elect the accelerated pension benefit payment in lieu of their annuity benefits, and 15% (from 25% used by the Legislature) of eligible retiring Tier 1 members will elect the accelerated pension benefit payment for a reduction in their automatic annual increases. For the June 30, 2022 Actuarial Valuation, the assumptions have been set to 10% of future inactive vested members for the inactive vested member buyout, and 20% for the Automatic Annual Increase buyout based on recent plan experience. Segal will continue to monitor actual experience and may revise this assumption as experience emerges. We believe this approach is reasonable.

Assessment of Actuarial Assumptions Used in the 2022 Valuation

30 ILCS 5/2-8.1 requires the State actuary to identify recommended changes in actuarial assumptions that the TRS Board must consider before finalizing its certification of the required State contribution. We have reviewed all the actuarial assumptions used in the draft June 30, 2022

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SECTION II – SUMMARY OF RECOMMENDATIONS

Actuarial Valuation and conclude that the assumptions are reasonable in general, based on the evidence provided to us.

Recommended Additional Disclosures for the 2022 Valuation

3. We recommend that Segal include a more detailed explanation of how the new entrant assumption was developed.

Recommended Changes for Future Valuations

4. We continue to recommend that Segal provide additional information in the valuation report about the new entrant assumption used in its projection such as the average age and service of the active population in each year of the projection.
5. We recommend the TRS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly, as they did for this valuation.
6. We recommend that future stress testing include the impact to the required State contribution of potential reductions in the discount rate.
7. We recommend that Segal increase the Full-Time future service accrual rate assumption to 1.0 years of service and consider non-full-time member future service accrual rates that reflect recent experience on an individual basis.

GASB 67 and 68

The 2022 TRS GASB Nos. 67 and 68 information was provided in the 2022 Valuation. We find that the assumptions and methods used to prepare the 2022 TRS GASB Nos. 67 and 68 schedules are reasonable based on the materials provided to us.

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SECTION III – SUPPORTING ANALYSIS

In this section, we provide detailed analysis and supporting rationale for the recommendations that were presented in Section II of this report.

Proposed Certification of the Required State Contribution

As stated in our summary of recommendations in Section II, we have verified the arithmetic calculations made by Segal to develop the required State contribution, reviewed the assumptions on which it is based, and accepted Segal's annual projections of future payroll, total normal costs, benefits, expenses, and total contributions. However, in accordance with 30 ILCS 5/2-8.1, our review does not include a replication of the actuarial valuation results.

State Mandated Methods

The Illinois Pension Code (40 ILCS 5/14-131) establishes a method that does not adequately fund the System. This law requires the actuary to calculate the employer contribution as the level percentage of projected payroll that would accumulate assets equal to 90% of the Actuarial Accrued Liability in the year 2045 if all assumptions are met. This contribution methodology does not conform to generally accepted actuarial principles and practices. Generally accepted actuarial funding methods target the accumulation of assets equal to 100% of the Actuarial Accrued Liability, not 90%.

We recommend that the funding method be changed to employ a methodology that produces a Reasonable Actuarially Determined Contribution and fully funds plan benefits within a reasonable period (Recommendation #1). The State Mandated Method will soon enter a period in which the contribution amount it produces may be reasonable even though the overall methodology is not. This period offers an opportunity to change the methodology to one that is consistent with actuarial standards for a Reasonable Actuarially Determined Contribution (ADC) without significantly affecting the immediate contribution amount. Such a method would set contributions at a level that is expected to prevent the unfunded actuarial liability from growing and remain high enough to reduce the unfunded actuarial liability each year until the plan is ultimately 100% funded within a reasonable period. While the State Mandated Method is inadequate, it will also produce more volatile contribution levels as the remaining period to achieve 90% funding shortens. Consequently, we recommend that the funding method be changed to one that produces more stable contribution requirements while targeting 100% funding within a reasonable period and meets the actuarial standards for a Reasonable ADC.

In its draft June 30, 2022 Actuarial Valuation on pages 15 through 18, Segal demonstrates the implications of the statutory funding amounts on the growth of the unfunded actuarial liability. With support of the TRS Board, Segal reports on an alternative funding policy that they consider adequate and refers to this method as the *Board-Adopted Actuarial Funding Policy*. We note that this policy meets the requirements of a Reasonable Actuarially Determined Contribution and will satisfy the requirement effective in 2023 to calculate and disclose a Reasonable Actuarially Determined Contribution (ADC). Using this methodology, the State's contribution amount would

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SECTION III – SUPPORTING ANALYSIS

be \$9,590,116,087 for FY 2024. While we concur with Segal's recommendations and demonstration of a Reasonable ADC, we do not believe that requesting the nearly \$10 billion in State contributions for FY 2024 is plausible. There are other funding policies that would also meet the requirements of a Reasonable ADC, and we would seek to modify this methodology to one that starts with a contribution that is plausible and targets 100% funding within a reasonable period.

The method Segal calls the *Board-Adopted Actuarial Funding Policy* is described in Section 2 beginning on page 42 of their Actuarial Valuation Report with the cost developed on page 43. The method includes the following provisions:

- The use of the Entry Age Normal Method (EAN) instead of the Projected Unit Credit (PUC) method. Actuarial methods differ in how they allocate the cost of benefits over a participant's lifetime. PUC, which is called for in the statutory contribution determination, determines the cost of benefits at the participant's attained age. Therefore, as a participant gets older and the anticipated benefits are discounted over a decreasing period from expected retirement to attained age, their cost—the normal cost—will increase. With a large group and stable population, the actual normal costs don't necessarily increase because the average age of the population remains constant. Under EAN, the normal cost is determined as a level percent of pay from age at entry into the system to normal retirement. This method typically provides a more stable cost as a percent of pay and is the same method required by GASB for Statement 67 and 68 disclosures.
- The unfunded liability under the *Board-Adopted Actuarial Funding Policy* is amortized over 20 years with the annual payments scheduled to increase by 2.0%. The rate of 2.0% is to reflect, according to Segal, the expected State revenue growth rate. This assumption should be documented, and a reference cited for the source in the valuation report, as well as an explanation of why revenue growth is expected to be lower than inflation. Amortizing the unfunded liability on an increasing basis can be an issue because it can result in the initial payments not being sufficient to cover the interest cost. However, selection of the 20 years and use of 2.0% for the annual increase rate results in the first and all future payments of each amortization base covering the interest cost on the unfunded liability as well as a portion of the principal. We have confirmed TRS' statement that, based on this method of amortization, the principal on the unfunded liability would begin to be paid down in the first year.
- All future changes to the unfunded liability not attributable to the current amortization amounts such as experience, benefit changes, and changes in assumptions are to be amortized using the same 20-year amortization methodology.

Recognition of Changes in Actuarial Assumptions

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modified the State's funding policy to require that the contribution impact of all assumption changes, including changes prior to P.A. 100-0023, be phased-in over a five-year period. As such, the Act delays the funding of the System. Assumption changes are intended to more accurately anticipate the obligations for funding

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based on the most recent experience analysis and forward-looking changes to future investment returns. However, only one-fifth of the impact of these changes are now recognized from the date of adoption. The remainder of the impact is recognized over four additional years such that the full impact is only recognized at the end of a five-year period beginning at the date of adoption. This phase-in provides time to adjust to a higher level of contributions. However, the Conference of Consulting Actuaries White Paper on Actuarial Funding Policies and Practices for Public Pension Plans recommends that the “phase-in period should be no longer than the time period until the next review of assumptions.” **Since experience studies are performed every three years, we recommend the phase-in period for the impact of assumption changes be reduced to no longer than three years (Recommendation #2).**

Optional Hybrid Plan

P.A. 100-0023 created an Optional Hybrid Plan (Tier 3) for current Tier 2 members and future new hires. The Optional Hybrid Plan consists of a reduced defined benefit plan and a defined contribution plan. In general, the defined benefit component is based on a ten-year final average pay (compared to an eight-year final average pay and unlimited pay for Tier 2), a 1.25% multiplier compared to 2.2% for Tier 2.

Segal has not reflected the Tier 3 Optional Hybrid Plan in the June 30, 2022 Actuarial Valuation. We understand that TRS will not implement the Optional Hybrid Plan until clarifying legislation is passed. Given the need for additional legislation, we believe it is reasonable not to reflect the Optional Hybrid Plan in the current valuation.

Earnings That Exceed the Governor's Salary

P.A. 100-0023 requires employers to make an additional contribution for participants who have annual earnings that currently exceed, or are projected to exceed, the Governor's current or projected salary. The additional contribution is equal to the employer normal cost rate multiplied by salary in excess of the Governor's current or projected salary. This provision has the effect of shifting contributions from the State to the employers.

We have verified that Segal has reflected these additional employer contributions in the development of the net State contribution.

Accelerated Pension Benefit Payments

P.A. 100-0587 created two accelerated pension benefit payment options. Inactive vested members have the option of receiving a lump sum equal to 60% of the present value of their benefits in lieu of their annuity benefits, the “Total Buyout.” The “COLA Buyout” program provides Tier 1 members the option upon retirement of accepting the reduced Tier 2 automatic annual increase (AAI) provision instead of their current three percent automatic annual increases. In exchange for electing the reduced AAI, members will receive a lump-sum equal to 70% of the present value of the reduced annuity benefits. Eligible members must make an election by June 30, 2026 if they

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SECTION III – SUPPORTING ANALYSIS

want to receive the accelerated pension benefit payments. PA 102-0718 extended the time period to June 30, 2026 provided that bond proceeds (limited to \$1 billion for all systems) are still available to fund the buyouts.

On a preliminary basis, Segal had opted to use the same assumptions as the Illinois Legislature that 22% of inactive vested members will elect the accelerated pension benefit payment in lieu of their annuity benefits, and 15% (from 25% used by the Legislature) of eligible retiring Tier 1 members will elect the accelerated pension benefit payment for a reduction in their automatic annual increases. For the June 30, 2022 Actuarial Valuation, the assumptions have been set to 10% of future inactive vested members for the inactive vested member buyout, and 20% for the Automatic Annual Increase buyout based on recent plan experience. Segal will continue to monitor actual experience and may revise this assumption as experience emerges. We believe this approach is reasonable.

Stress Testing

Based on the draft June 30, 2022 Actuarial Valuation and the State mandated funding method, the funded ratio, measured as the ratio of the Actuarial Value of Assets to the actuarial liability, is currently at 43.8%. The unfunded actuarial liability is currently about \$80.6 billion and is expected to decrease in the future as asset gains are recognized. The required State contribution rate is 49.6% of payroll for FY 2022 and is projected to be about 49.8% of payroll for FY 2024. The required State contribution rate is expected to increase to about 54.6% of payroll for FY 2034 when the pension obligation bonds have been paid off. If there is a significant market downturn, the unfunded actuarial liability and the required State contribution rate could both increase significantly, putting the sustainability of the system further into question. Stress testing should be performed to better understand these risks and the potential advantages of additional contributions in the near term to maintain the sustainability of the system.

Actuarial Standard of Practice 51

Actuarial Standard of Practice (ASOP) 51 provides guidance to actuaries on the assessment and disclosure of risks to help readers of the actuarial valuation report “*understand the effects of future experience differing from the assumptions used*” and “*the potential volatility of future measurements resulting from such differences.*”

ASOP 51's first requirement is to “*identify risks that, in the actuary's professional judgment, may reasonably be anticipated to significantly affect the plan's future financial condition.*” Segal identified four sources of risk to TRS: investment risk, longevity risk, contribution risk, and demographic risk. With the exception of the contribution risk due to the statutorily required amount of contributions, the risks Segal identified are relatively generic and would apply to most pension plans. There are other risks specific to TRS that we believe Segal should also address. For example, the current projected growth rate for contributions under the statutorily required method significantly exceeds the projected growth rate for State revenues under TRS' assumptions, creating what appears to be a significant risk to future contributions.

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ASOP 51 requires the actuary to assess each of the risks identified. While the assessment does not have to be quantitative, it does have to take into account the specifics of the individual plan. ASOP 51 also describes several quantitative methods that may be used to assess risk.

- Investment Risk. Segal describes the impact of a 1% variation in the investment return in the next year, quantifies the impact of a 10% investment gain or loss, and references the additional sensitivity projections in Section 1 of their report. These sensitivity projections provide an appropriate but limited assessment of investment risk.
- Longevity Risk. Segal applies a benchmark for a 10% reduction in mortality to TRS to provide an assessment of the impact on the unfunded actuarial liability.
- Contribution Risk. Segal discusses several issues with the statutorily required contribution amounts in the risk section as well as in other parts of the valuation report and quantifies the impact of the statutorily required contributions versus the board-adopted contribution policy.
- Demographic Risk. Segal provides an explanation of demographic risks, shows projections assuming higher and lower salary increases, and uses the Plan's historical experience to provide an assessment of the risk.

ASOP 51 requires the actuary to recommend a more detailed assessment of risks if it “*would be significantly beneficial.*” While there is a fair amount of risk assessment included in the valuation report, Segal recommends an additional more detailed assessment.

ASOP 51 requires the actuary to “*calculate and disclose plan maturity measures that ... are significant to understanding the risks associated with the plan.*” Segal calculates the Full-Time actives to non-active ratio, the retired life liability as a percentage of total liability, and the current year's net cash flow. There is a brief explanation of how these measures indicate a greater reliance on investment returns and a higher volatility in contribution requirements. There are also other maturity measures, such as the assets to payroll ratio and the actuarial liability to payroll ratio that provide significant information about the potential effects of investment risk and demographic risk. Segal discusses the importance of monitoring the continued maturation of the plan but doesn't provide any projections of any of these maturity measures even though most are readily available given the projections required to determine the statutory contribution amounts.

ASOP 51 requires the actuary to “*identify and disclose relevant historical values of the plan's actuarial measurements that, in the actuary's professional judgment, are significant to understanding the risks identified....*” Segal uses some relevant historical information in the assessment of each risk except longevity. No historical information is provided on net cash flow. On page 28, Segal provides the active to non-active member ratio for the last 10 years, and on page 32, Segal provides a chart comparing contributions to benefit payments and expenses for the last 10 years. While it would also be useful to show the historical retired life liability as a percentage of total liability, we agree that these historical measures provide context to the current maturity measures.

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Changes to Actuarial Standard of Practice 4

Actuarial Standard of Practice No. 4 (ASOP 4) was amended and the changes will become effective for TRS' actuarial valuations starting June 30, 2023. There are three primary changes that will affect the TRS actuarial valuation:

1. The requirement to calculate and disclose a Reasonable Actuarially Determined Contribution as defined in ASOP 4,
2. The requirement to assess the implications of the funding policy, including four specific assessments, and
3. The requirement to calculate, disclose, and explain a Low-Default-Risk Obligation Measure (LDROM).

The requirement to calculate and disclose a Reasonable ADC is already incorporated in the TRS actuarial valuation and has been discussed in our analysis above. This section will discuss the remaining two requirements that will become effective for the June 30, 2023 actuarial valuation.

Implications of the Funding Policy

Effective with the 2023 actuarial valuation, changes to ASOP No. 4 will require Segal to make four specific assessments of the State Mandated Funding Policy:

1. A qualitative assessment of the implications of the funding policy on expected future contributions and funded status,
2. An estimate of how long until contributions under the funding policy will exceed normal cost plus interest on the unfunded actuarial liability,
3. An estimate of how long until the unfunded actuarial liability is expected to be paid off, and
4. An assessment of whether the funding policy is significantly inconsistent with accumulating assets adequate to make benefit payments, and, if applicable, an estimate of the approximate time until assets are depleted.

Segal already provides the qualitative assessment required and discusses the principal issues but will need to add the specific estimates in future valuation reports.

Calculation and Disclosure of LDROM

The LDROM is calculated using a discount rate derived from low-default-risk fixed income securities whose cash flows are reasonably consistent with the plan's projected benefit payments. Consequently, the discount rate is likely to be significantly lower than the funding discount rate and the LDROM significantly higher than the actuarial liability.

The actuary has a few choices in the calculation of the LDROM, and those choices may depend on how the actuary wants to explain the significance of the LDROM as required by ASOP 4 "with respect to the funded status of the plan, plan contributions, and the security of participant benefits."

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Public plan actuaries may explain the LDROM in terms of the expected taxpayer savings from investing in a diversified portfolio or the cost to eliminate investment risk. Using this framework for the explanation, actuaries would likely elect to use the same actuarial cost method as is used for funding and to derive the discount rate from yields on high quality corporate bonds. However, multiple other options are also possible.

Our review of this new disclosure will focus on the consistency between the explanation of LDROM's significance and the selected cost method and basis for discount rate.

Assessment of Actuarial Assumptions Used in the 2022 Valuation

A. Economic Assumptions

1. The Interest Rate

The interest rate assumption (also called the investment return or discount rate) is the most impactful assumption affecting the required State contribution amount. This assumption, which is used to value liabilities for funding purposes, was reduced to 7.00% for the June 30, 2016 Actuarial Valuation. This change was recommended by Segal and supported by their report and presentation to the Board in August of 2016.

This assumption has been reviewed annually, and most recently was reviewed in August 2022. Segal stated that the assumption can remain at 7.00% or be reduced for additional conservatism.

After reviewing all the materials (see Appendix B of the report) that were made available, Cheiron concludes that the interest rate of 7.00% for this valuation is reasonable. Because it is reasonable to anticipate future reductions in the discount rate, we recommend that future stress testing include the impact to the required State contribution of potential reductions in the discount rate (Recommendation #6).

We recommend that the TRS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly, as they did for this valuation. (Recommendation #5).

The items we considered and our rationale for this recommendation are as follows:

- A review of the interest and inflation rates does not involve the collection of significant data and can be updated annually. In addition, it keeps the Board focused more closely on these very important assumptions.
- In Segal's August 12, 2022 review of the investment return assumption, they presented the 10 and 20-year expectations for the TRS portfolio based on the average capital

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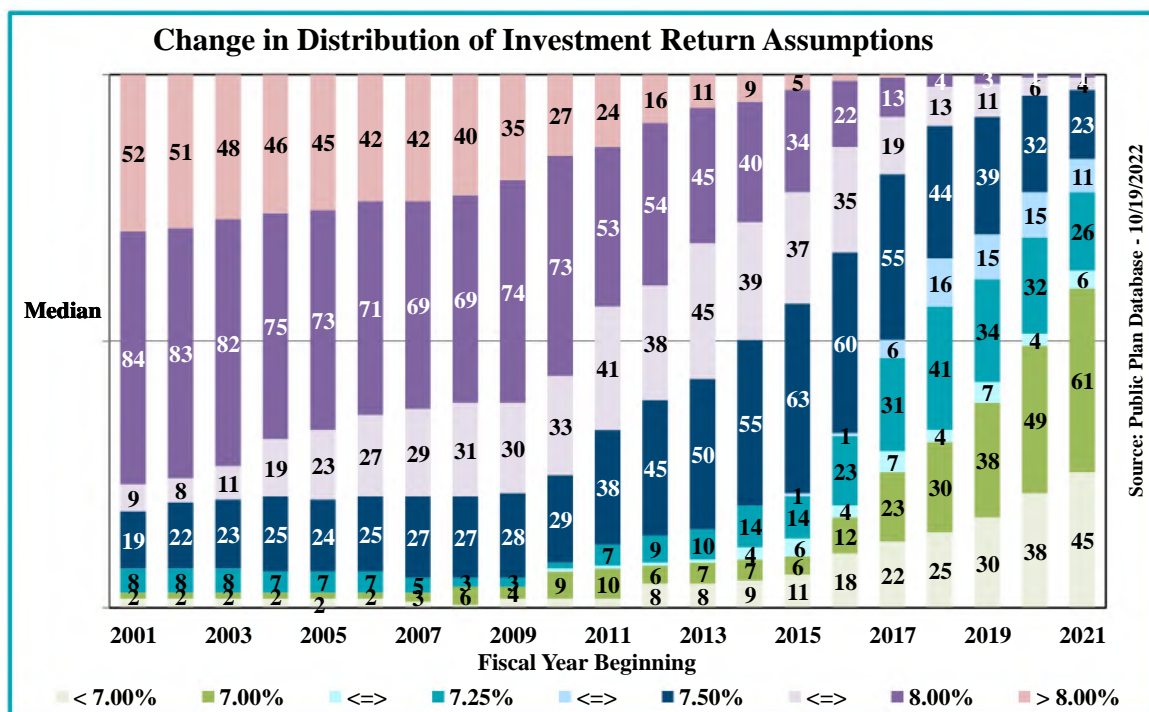
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market assumptions in the 2021 Horizon survey of investment consultants. Using a weighting of 40% on the 10-year expectation and 60% on the 20-year expectation and adjusting for differences in inflation assumptions and an expected difference between 2021 and 2022 capital market assumptions, Segal calculated an expected geometric return of 7.08% for the TRS portfolio.

- TRS' investment consultant, RVK, develops capital market assumptions for a 10 to 20-year horizon. Based on those assumptions for 2022, TRS' target portfolio is expected to earn a 6.5% compound return.
- As is the case with most maturing pension plans, TRS is experiencing negative cash flows measured as contributions less benefits and expenses. TRS' negative cash flow is currently 1.6% and projected to average about 1.9% of assets. When short-term returns are expected to be lower than the long-term expectations, which is the case with TRS, a plan with negative cash flows will have actuarial returns (i.e., dollar weighted returns) that are less than their "time weighted" returns.
- While the discount rate assumption should be based on the future expected investment returns for the System's investment portfolio, survey information can provide an important context for evaluating the assumption. The Public Plans Database is maintained by a partnership between the Center for State and Local Government Excellence (SLGE) and the Center for Retirement Research at Boston College with support from the National Association of State Retirement Administrators (NASRA). This database contains historical information on large public pension plans, including key assumptions used in their actuarial valuations. The following chart shows the distribution of investment return assumptions for the 177 plans in the Public Plans Database with consistent information from 2001 through 2021 as of October 19, 2022.

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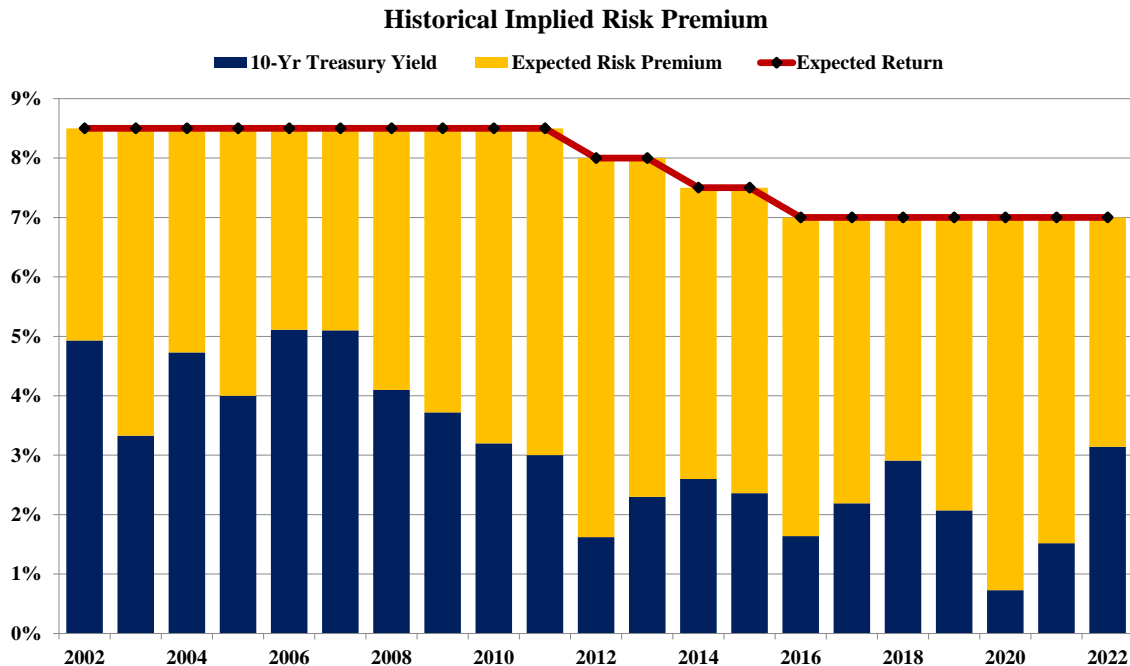
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- Over the period shown, there continues to be a pattern of reducing discount rates partially reflecting long-term changes in capital markets, interest rates and underlying inflation. Of the 177 plans shown, 113 have reduced their discount rate assumption since 2017. For these 113 plans, the average reduction is 0.44%.
- Over the last two decades, declining interest rates have forced pension plans to either reduce their discount rates, increase their exposure to investment risk, or some combination of the two. For example, as shown in the following chart, in June 2002, the yield on 10-year Treasury bonds (a proxy for a risk-free investments) was 4.9%. To achieve TRS' then assumed return of 8.50%, the System's investments had to outperform the yield on the 10-year Treasury by 3.6%. In June 2020, the yield on the 10-year Treasury had dropped to 0.7%, and to achieve TRS' assumed return of 7.00%, the System's investments need to exceed the 10-year Treasury yield by 6.3%. Even though TRS had reduced its return assumption by 150 basis points over the period, it still had to take more investment risk in 2020 to meet its assumption than it did in 2002. Since 2020, yields on 10-year Treasury bonds have increased, reducing the expected risk premium needed to achieve the System's assumed return. With recent action by the Federal Reserve, 10-year Treasury bond yields have increased rapidly from 1.5% in December 2021 to 3.1% in June 2022 and 4.0% in October 2022. If these higher Treasury bond yields persist, plans may be able to achieve the expected return with less exposure to investment risk. However, if these higher Treasury bond yields prove temporary, plans could quickly find the pressure returning to further reduce discount rates or increase their exposure to investment risk.

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- While pension plans are long-term propositions, approximately 40% of the projected benefit payments for members as of the valuation date will be paid within the next 10 years and the System's assets will be affected by investment returns within the next 10 years. We concur with Segal's approach to weight the 10-year capital market assumptions by 40% and the 20-year assumptions by 60%.

Segal's analysis based on the average capital market assumptions from the Horizon survey support the current assumption of 7.0%. TRS' investment consultant's assumptions, however, are lower and would indicate that a reduction in the assumption may be appropriate. Segal also suggests a lower assumption to increase the confidence level of achieving the assumption. While 7.0% is reasonable, consideration should be given to a lower assumption.

2. Inflation Assumption

As recommended in Segal's August 12, 2022 Review, the inflation assumption was increased from 2.25% to 2.50% for the June 30, 2022 Actuarial Valuation due to recent spikes in inflation indicators.

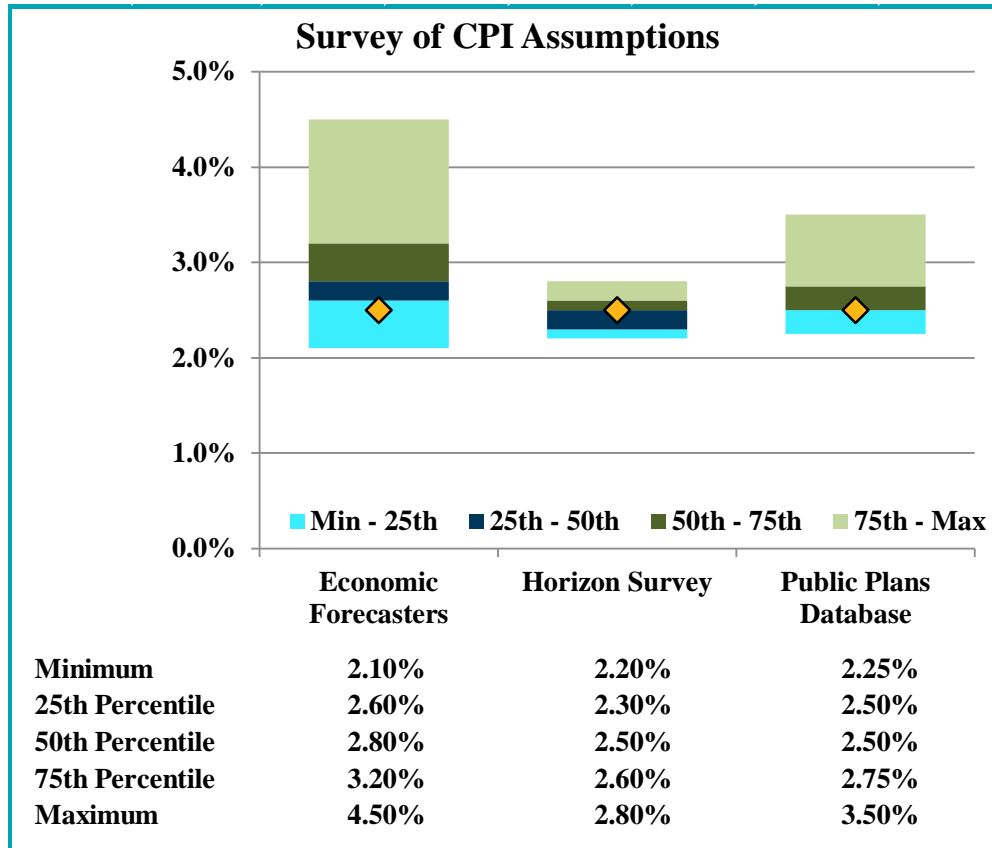
We find the 2.50% inflation assumption and the basis for setting it reasonable.

The items we considered and our rationale for concurring with the assumption are as follows:

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- The June 2022 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (next 75 years), inflation will average between 1.8% and 3.0% (<http://www.ssa.gov/oact/tr/2022/tr2022.pdf>). Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.4%.
- The following chart shows the distribution of inflation expectations for the Third Quarter 2022 survey of professional economic forecasters published by the Philadelphia Federal Reserve, the 2022 Horizon survey of investment consultant capital market assumptions (20-year), and the 2021 inflation assumptions used by plans in the Public Plans Database compared to the TRS assumption (indicated by the gold diamonds). The assumption of 2.50% is near the middle of the range used by investment consultants in the Horizon survey and by other public pension plans, and is on the low end of the range projected by professional economic forecasters.



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3. Salary (Annual Compensation) Increase Assumption

As recommended in Segal's September 30, 2021 Experience Review, the salary increase assumption was decreased for the June 30, 2021 actuarial valuation, but was then increased 25 basis points for the June 30, 2022 actuarial valuation due to the change in inflation assumption. The salary assumption, which is service based, ranges from 8.75% (at one-year of service) to 3.75% (at 20 or more years of service) and includes an inflation component of 2.50% and a real wage growth component of 1.25%.

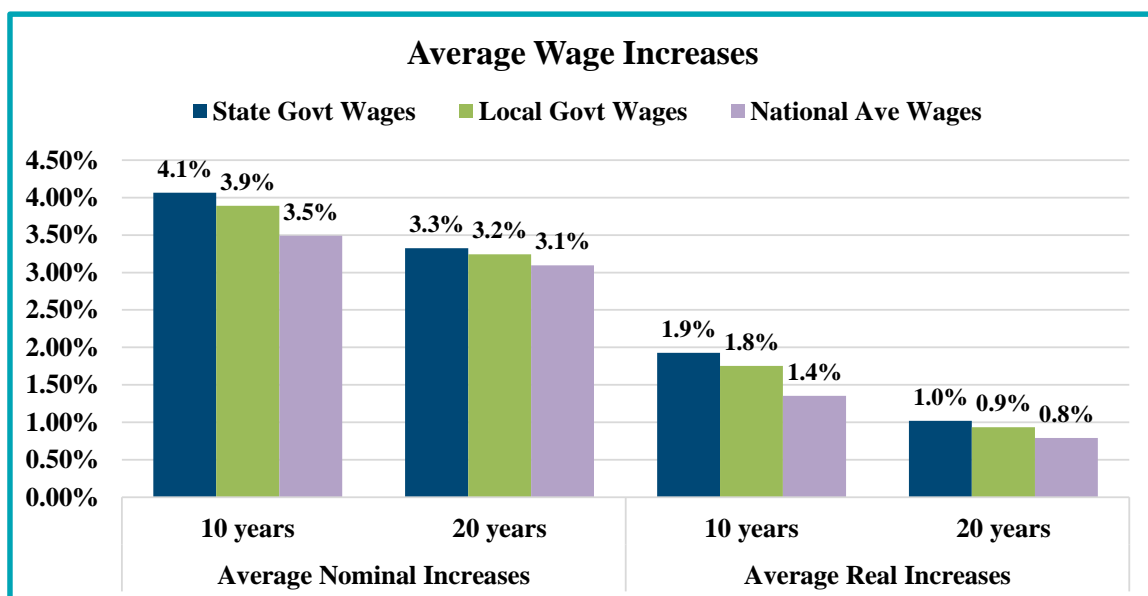
We find the assumption to be reasonable.

The items we considered and our rationale for finding the salary increase assumption to be reasonable are as follows:

- Based on the actuarial valuation reports, actual salaries have been lower than expected in eight of the last ten years. Based on the 3-year pattern of experience, the salary increase assumption was reduced in 2015, increased in 2018, and reduced in 2021. In 2022, the salary increase assumption was increased again due to higher expected inflation.
- To develop this assumption, Segal analyzed the real wage increase experience of the System over the prior three years, subtracting actual inflation of 2.0% from the actual salary increases. Segal developed an assumed real rate of increase for each service group that was generally between the prior assumption and the three-year experience. Then, Segal added its assumed inflation of 2.25% at the time to develop the nominal salary increase assumption.
- We expect the relationship between inflation and wage increases to be more stable over longer periods, but over short periods it can be volatile. In the prior experience study, real wage increases were relatively high because inflation was lower than anticipated by bargaining agreements and by Segal. During the current three-year period, inflation was only slightly lower than anticipated. Given the recent increase in inflation, using the same Segal methodology, the next study is likely to show relatively low real wage increases simply because inflation was higher than anticipated. Over longer periods, real wage growth is more consistent.
- The following chart shows the average nominal and real increases in wages over the last 10 and 20 years for State governments, local governments, and National Average Wages. State and local government data is from the Quarterly Census of Employment and Wages as published by the Bureau of Labor Statistics. National Average Wages is published by the Social Security Administration.

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- The June 2022 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (next 75 years), real wage differential will average somewhere between 0.53% and 1.77%. Under the intermediate cost projection, the Social Security Administration uses an assumption of 1.15%.
- While the current assumption is reasonable, we encourage Segal to modify their methodology to develop an across-the-board wage inflation assumption that is composed of price inflation plus real wage growth over a longer period of time and to study the merit and longevity component of salary increases separately from the across-the-board salary increases during the three-year experience study period. Such an approach would prevent short-term fluctuations in actual inflation from affecting the long-term salary scale assumption.

4. Cost of Living for Tier 2 Assumption

For Tier 2 participants, benefits are increased annually equal to 50% of the consumer price index urban rates with a maximum of 3.0%. Therefore, the COLA assumption is 50% of assumed inflation, or 1.25%.

We find the assumption and the basis for setting it reasonable.

5. Tier 2 Capped Pay Assumption

Benefits for members hired after January 1, 2011, are calculated using pay that is capped under 40 ILCS 5/1-160. The pay cap increase assumption is 1.25%.

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We find the assumption and the basis for setting it reasonable.

6. Severance Pay Assumption

18% percent of retirees are expected to receive additional pay of 8% of compensation in the final year before retirement.

We find the assumption and the basis for setting it reasonable.

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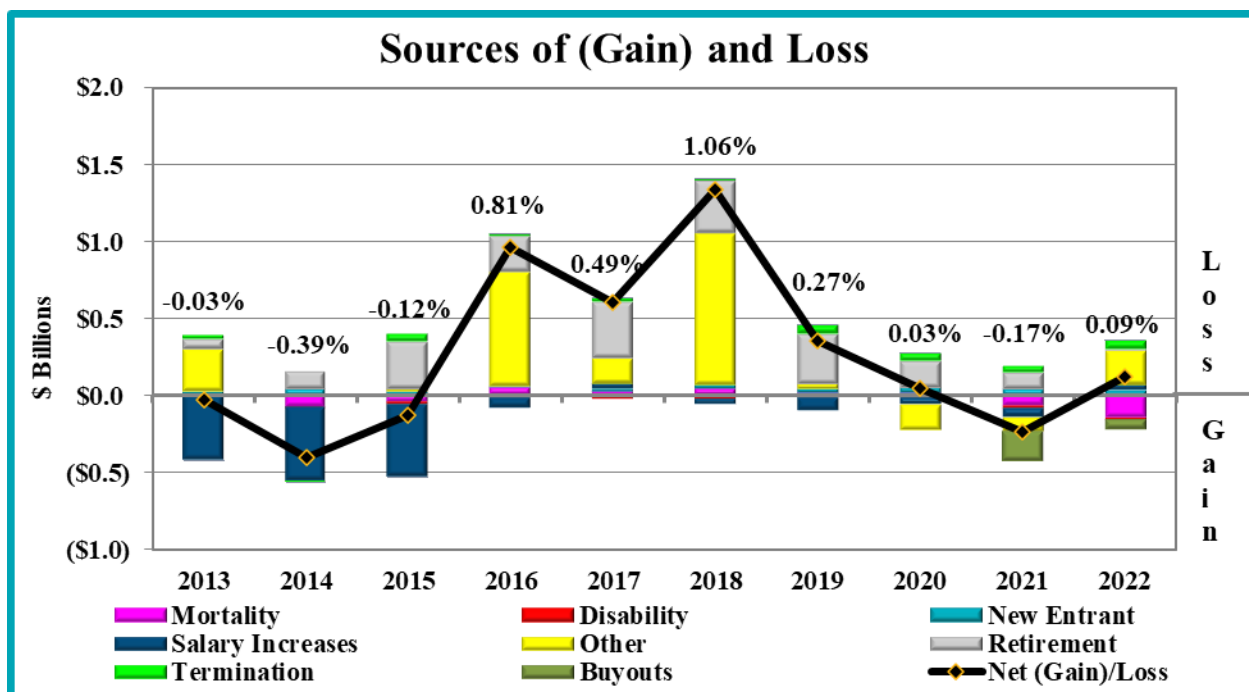
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B. Demographic Assumptions

All demographic assumptions were reviewed as part of an experience study with appropriate assumption changes adopted by the Board in September 2021.

In its annual actuarial valuation reports, TRS regularly reports sources of liability gains and losses. In the 2022 report, these are shown in Section 2 on page 41. In the chart below, we have collected similar data from TRS valuation reports dating back to 2013 and use these to present a historical review of past demographic and salary increase experience gains and losses.

The following chart shows the pattern of historical gains and losses attributable to eight different sources as shown in the legend. When the colored bar slices appear above zero on the Y-axis, they represent experience losses with the values representing the increases in liabilities over what was expected. When the bar slices are below zero, they represent experience gains with the values representing the reductions in the liabilities for that year versus what was expected. The net liability (gain)/loss is shown by the black line on the graph below. This net (gain)/loss as a percent of liability for each year is shown as the percentage above the bars.



The percentages shown above the bars refer to net (gain)/loss as a percentage of liability.

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As a result of the experience study and assumption changes implemented in the June 30, 2015 Actuarial Valuation, a number of the consistent prior trends have been addressed. However, retirement experience continued to generate consistent losses, even after the changes made in 2018. The retirement losses in 2022 are smaller than prior years which indicates that the additional changes made in 2021 may have addressed the pattern of retirement losses. The new entrant losses include both new hires and rehires. In 2021, there was a noticeable gain due to the buyout program, but that gain was reduced by two thirds in 2022. The “other” loss for 2016 is primarily due to the change in actuary, and the significant “other” loss for 2018 is due to “programming enhancements” that affected a subgroup of members. The “other” loss for 2022 is unexplained in the valuation report.

The demographic assumptions are summarized below. We reviewed the development of these assumptions based on the experience study dated September 30, 2021 and changes to the buyout assumption in 2022, and we have concluded all of the demographic assumptions are reasonable and meet the requirements of ASOP No. 35, Section 3.3.4. We have noted comments on specific assumptions below, but do not believe they would have a material effect.

1. Rates of Termination

Termination rates based on service, for causes other than death, disability, or retirement.

Age	<u>Under 5 Years of Service</u>		<u>5 or More Years of Service</u>	
	Male	Female	Male	Female
25	6.50%	6.25%	4.50%	4.50%
30	6.75%	6.75%	3.00%	4.25%
35	7.00%	7.25%	1.50%	2.50%
40	9.50%	7.25%	1.50%	1.25%
45	11.25%	7.25%	1.00%	1.00%
50	11.75%	8.50%	1.00%	1.25%
55	11.25%	10.25%	1.75%	2.00%
60	12.25%	13.00%	3.50%	2.25%
65	29.25%	32.50%	3.50%	2.50%

Comment: We support Segal’s recommendation of reducing termination rates indicated by the most recent experience.

2. Rates of Mortality

Healthy Post-Retirement: PUB-T-2010 Retiree Mortality Table projected generationally with Scale MP-2020, with female rates multiplied by 91% for ages under 75 and 109% for ages 75 and older and male rates multiplied by 105% for ages under 85 and 115% for ages 85 and older.

Disabled Post-Retirement: PubNS-2010 Non-Safety Disabled Retiree Table projected generationally with Scale MP-2020, with no adjustments to female and male rates.

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Beneficiary Post-Retirement: Pub-2010 Contingent Survivor Mortality Table projected generationally with Scale MP-2020, with female rates multiplied by 98% for all ages and male rates multiplied by 110% for all ages.

Pre-Retirement: PubT-2010 Employee Mortality Table projected generationally with Scale MP-2020, with female and male rates multiplied by 90% for all ages.

Comment: Normally a published mortality table is adjusted for a system's individual experience by multiplying the mortality rate for each age by a constant factor such that the shape of the curve of mortality rates from the published table is maintained. Segal, however, applied different factors for different groups of ages. TRS has sufficient data, and Segal provides a breakdown of experience based on the two age groups they selected to justify the different factors. We suggest that in future studies, Segal provide the data on 5-year age groups so that the rationale for the particular age groups Segal selected is clearer. In addition, we suggest Segal consider a transition period between the factors so that mortality rates do not jump abruptly when switching from one factor to another.

3. Rates of Disability

Age	Males	Females
25	0.01%	0.02%
30	0.01%	0.03%
35	0.02%	0.05%
40	0.02%	0.06%
45	0.04%	0.09%
50	0.08%	0.15%
55	0.11%	0.17%
60	0.14%	0.23%
65	0.19%	0.26%

Comment: The result is reasonable, but it appears that more credibility is being given to recent experience for males than for females even though there is less experience for males. In the future, we suggest Segal consider applying limited fluctuation credibility procedures similar to what they do for mortality to adjust the current assumption. The result this year would be very similar for females but would produce higher assumptions for males.

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4. Rates of Retirement

a. For Members Hired before January 1, 2011:

Age	Service			
	5 – 18	19 - 29	30-33	34+
54	0%	7%	8%	45%
55	0%	6%	8%	44%
56	0%	6%	7%	46%
57	0%	7%	8%	46%
58	0%	8%	12%	45%
59	0%	33%	40%	48%
60	21%	33%	46%	44%
61	17%	28%	35%	41%
62	17%	28%	43%	41%
63	16%	29%	35%	44%
64	26%	40%	50%	40%
65	27%	40%	52%	43%
66	23%	42%	42%	38%
67	25%	39%	43%	38%
68	23%	39%	40%	35%
69	28%	38%	32%	44%
70	100%	100%	100%	31%
71	100%	100%	100%	39%
72	100%	100%	100%	24%
73	100%	100%	100%	36%
74	100%	100%	100%	36%
75	100%	100%	100%	100%

b. For Members Hired on or after January 1, 2011:

Age	Service				
	9 – 18	19 - 30	31	32-33	34+
≤ 61	0%	0%	0%	0%	0%
62	13%	15%	20%	25%	25%
63	8%	10%	15%	20%	20%
64	8%	10%	15%	20%	20%
65	8%	10%	15%	20%	20%
66	20%	10%	15%	20%	20%
67	20%	40%	70%	70%	70%
68	20%	40%	40%	40%	40%
69	20%	40%	40%	40%	40%
70	100%	100%	100%	100%	100%

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5. Percent Married

For valuation purposes, 85% of members are assumed to be married. Male members are assumed to be three years older than their spouses, and female members are assumed to be three years younger than their spouses.

6. Inactive Vested Buyout

Ten percent of future inactive vested members are assumed to receive a lump-sum buyout in lieu of an annuity at retirement.

Comment: The assumption was altered in the 2022 valuation report from 5 percent of all inactive vested members to 10 percent of future inactive members. We believe this is a better structure for the assumption as it takes into account that current inactive members have already been offered a buyout and not taken it. In the experience study last year, it was reported that approximately 15% of new vested terminations elected the buyout. The new assumption provides a margin of conservatism compared to the limited experience, and we find the assumption reasonable.

7. Automatic Annual Increase Buyout

Twenty percent of eligible retiring Tier 1 members are assumed to receive a lump-sum buyout and a retirement annuity with automatic annual increases of 1.5% of the originally granted retirement benefit starting at the later of January 1 following age 67 and the first anniversary of retirement.

Comment: Based on the data presented, the assumption appears reasonable.

8. Optional Service Purchases

The liability for retirement benefits for active members who have not previously purchased optional service is increased to cover the employer cost of out-of-system service purchased in the last two years prior to retirement. The amount purchased varies by the amount of regular service at retirement. Representative amounts purchased at retirement, and other assumptions used, are as follows:

Regular Service at Retirement	Maximum Service Purchased
10 years	0.158 years
20 years	0.531 years
25 years	0.712 years
30 years	0.673 years
34 or more	None

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- a. Actual optional service credit for each current member is provided by TRS;
- b. No additional service purchases will be assumed for members who currently have optional service credit;
- c. Members will not purchase service if it does not improve their pension benefit; and
- d. When optional service is purchased within the last two years prior to retirement, 25% of the cost is covered by member payments and the remaining cost is the responsibility of the employer.

9. Sick Leave Service Credit

The assumed unused and uncompensated sick leave service credit at retirement varies by the amount of regular service at retirement. Representative assumed amounts of unused and uncompensated sick leave service are as follows:

Regular Service at Retirement	Sick Leave Service Credit
20 years	0.963 years
25 years	1.154 years
30 years	1.369 years
34 years	1.612 years
35 or more	None

10. Future Service Accrual Rate:

0.98 years of service per year for Full-time and Regular Part-Time members.

0.275 years of service per year for Substitute, Part-Time, and Hourly-Paid members

Comment: This assumption was not studied in the prior experience study, but is disclosed effective with Segal's 2021 actuarial valuation report. Based on the most recent experience study, the average service accrual rate was 0.993 for full-time and regular part-time members and 0.317 for substitute, part-time and hourly-paid members. Segal applied 50% credibility to the prior assumption to develop the proposed assumption, but since it isn't clear when the assumption was last studied, we don't believe it should be given credibility. It also is not clear why full-time members and regular part-time members should have the same future service accrual assumption. Finally, for non-full-time members, we believe it is more common to assume future service accrual rates reflect recent experience on an individual basis rather than an average over the entire population. **We recommend that Segal increase the Full-Time future service accrual rate assumption to 1.0 years of service and consider non-full-time member future service accrual rates that reflect recent experience on an individual basis (Recommendation #7).**

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SECTION III – SUPPORTING ANALYSIS

11. Administrative Expenses

The \$39,887,064 of administrative expenses is expected to be paid for the year beginning July 1, 2022. \$44,854,616 of administrative expenses is expected to be paid for the year beginning July 1, 2023. Each year thereafter, administrative expenses are assumed to increase by the rate at which payroll is expected to increase.

12. 2.2 Upgrade Assumption

For those active members who have already made a payment to upgrade past service prior to June 30, 1998, their benefits are based on their upgrading at the valuation date. For all other active members, they are assumed to upgrade at retirement.

13. Census and Assets

The current actuarial valuation was based on the latest membership data available, which were submitted by the System for active, inactive, and retired members as of the prior valuation date. The valuation assumptions were used to project results to account for the one-year difference in the census date and the valuation date. Any change in liability due to changes in census between the collection date of the census information and the valuation date is captured in the next actuarial valuation.

14. New Entrant Assumption for Projections

The State contribution is based on the projected actuarial liability as of June 30, 2045. A critical set of assumptions used in projecting the actuarial liability are the demographic characteristics of projected new entrants. Segal assumes that the active population will remain constant and describes the demographic characteristics of projected new hires on page 108 of the report. The rationale provided for these demographic characteristics is just that they were “based on previous plan experience.” It is unclear from the disclosure in the report what period is analyzed for the new entrant profile, and no analysis was provided in the experience study. Furthermore, the new entrant assumption appears to have changed somewhat since the last valuation. For example, the proportion of full-time or regular part-time females aged 27 decreased from 27.2% in the 2021 valuation to 26.7% in the 2022 valuation while the proportion of female substitutes, part-time, and hourly paid new entrants at age 22 increased from 17.4% in the 2021 valuation to 18.7% in the 2022 valuation.

New entrant salaries are assumed to increase at 2.50% each year in step with the inflation assumption. However, the salaries for each age and sex group in the 2022 valuation are not 2.5% greater than the salaries for the same group in the 2021 valuation. Consequently, it appears that the new entrant assumption was revised for the 2022 valuation without explanation.

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If the new entrant assumption is a rolling average of a certain number of years of prior new entrants (with adjustments for salary increases), the assumption should be stated as such with the tables showing the current year's average. If the new entrant assumption is the proportions and salaries shown in the tables on page 108 of the valuation, then an explanation and rationale should be provided when it is changed.

Given the critical nature of these assumptions in developing the State contribution, **we recommend that Segal include a more detailed explanation of how the new entrant assumption was developed** (Recommendation #3).

The demographic detail provided on new entrants is helpful, but doesn't provide much information about how the active population's demographic characteristics are assumed to change over time. It would be helpful, for example, to provide the average age and service for the active population as an extension of Table 10. This information is a standard output of most actuarial projection software. Historically, both the average age and service of the active population have been steadily increasing. It isn't clear whether the new entrant assumptions will continue this trend, stabilize it, or reverse the trend. These demographic changes can have a material impact on the projections, and as a result, on the State's contribution. **We continue to recommend that Segal provide additional information in the valuation report about the new entrant assumption used in its projection such as the average age and service of the active population in each year of the projection** (Recommendation #4).

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SECTION III – SUPPORTING ANALYSIS

C. Funding Method

Actuarial funding methods consist of three components: (1) the actuarial cost method, which is the attribution of total costs to past, current, and future years; (2) the asset valuation method (i.e., asset smoothing); and (3) the amortization method.

1. Actuarial Cost Method

The System uses the Projected Unit Credit (PUC) cost method to assign costs to years of service, as required under the Pension Code (40 ILCS 5/16). **We have no objections with respect to using the PUC method, although we, as Segal does, would prefer the Entry Age Normal (EAN) cost method as it is more consistent with the requirement in 40 ILCS 5/16 -158 for level percentage of pay funding.**

Under the PUC method, which is used by some public sector pension funds, the benefits of active participants are calculated based on their compensation projected with assumed annual increases to ages at which they are assumed to leave the active workforce by any of these causes: retirement, disability, turnover, or death. Only past service (through the valuation date but not beyond) is taken into account in calculating these benefits. The present value of these benefits based on past service and future compensation is the actuarial liability for a given active participant. Under the PUC cost method, the value of an active participant's benefits tends to increase more sharply over his or her later years of service than over his or her earlier ones. While the PUC method is not an unreasonable method, as a result of this pattern of benefit value increasing, more plans use the EAN cost method to mitigate this effect. It should also be noted that the EAN cost method is the required method to calculate liability for GASB Nos. 67 and 68.

2. Asset Valuation Method

The Actuarial Value of Assets for the System is a smoothed market value. Unanticipated changes in market value are recognized over five years in the Actuarial Value of Assets. The primary purpose for smoothing out gains and losses over multiple years is so fluctuations in the contributions will be less volatile over time than if based on the Market Value of Assets.

The 2021 Public Retirement Systems Study by the National Conference on Public Employee Retirement Systems (NCPERS) survey of 156 public retirement funds found that the majority of plans responding to the survey have a five-year smoothing period.

Smoothing the market gains and losses over a period of five years to determine the Actuarial Value of Assets is a generally accepted approach in determining actuarial cost, and we concur with its use.

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3. Amortization Method

The mandated State contribution is based on a determination of the level percentage of payroll that is expected to achieve a 90% funded ratio in 2045. While not a traditional amortization method, this methodology effectively amortizes a portion of the unfunded actuarial liability over the remaining period until 2045, which is currently 23 years.

One of the principles of funding public plans identified by the American Academy of Actuaries is that there should be “a plan to make up for any variations in actual assets from the funding target within a defined and reasonable time period.” Because it only targets 90%, the State method does not include a plan to achieve the funding target over any period of time.

Typical public plan amortization methods are designed to increase each year by expected payroll growth. Under the State mandated method, however, the effective amortization payment increases each year by more than the expected growth in payroll. As a result, the State mandated method defers payments on the unfunded actuarial liability further into the future than under typical public plan amortization methods.

Finally, as the remaining period to achieve 90% funding shortens, the State mandated method will also produce more volatile contributions. Instead of a single fixed period, typical public plan amortization methods use layered amortization bases such that new assumption changes and experience gains and losses are amortized over a new period (e.g., 20 years) while the remaining period for the prior amortization layers becomes one year shorter.

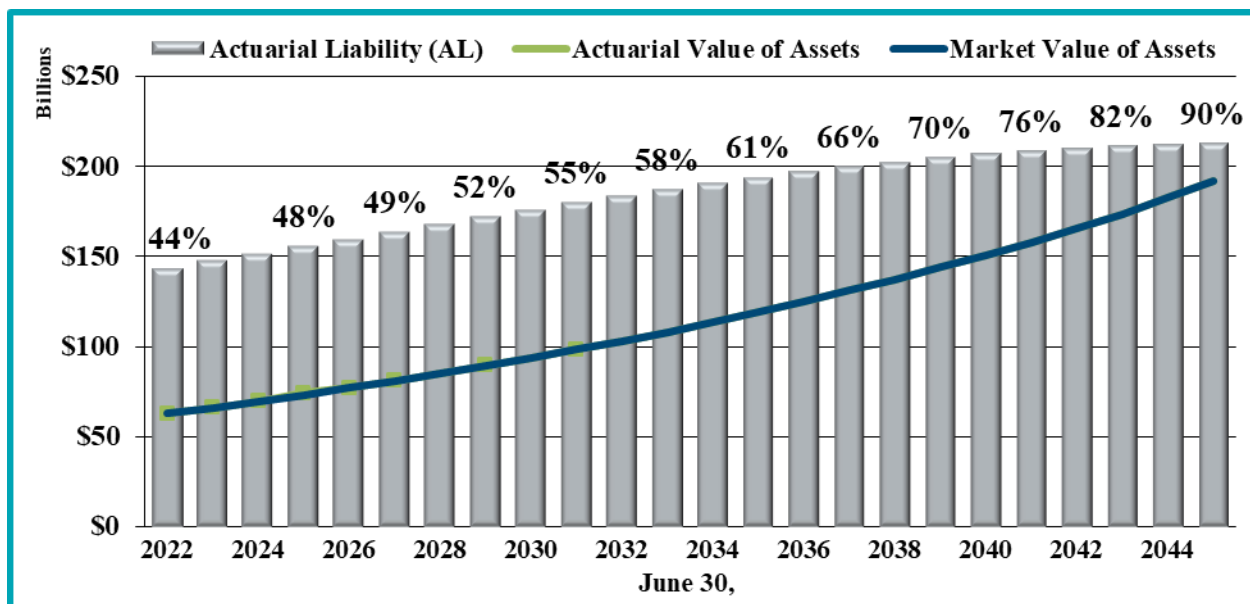
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SECTION IV – PROJECTION ANALYSIS

This section reviews the projections contained in the draft June 30, 2022 Actuarial Valuation of TRS. These projections are fundamental to the development of the required State contribution calculated under the current statutory funding requirement.

The following graphs are independent approximations of the projections performed by the State actuary to verify that the System's funding projections are reasonable. They do not reflect all the precision of the projections applied by the System's actuary, but instead they are intended to verify the reasonableness of the Modeling done by the System's actuary.

The graph below shows our projection of the expected future liabilities and assets in the System through 2045. As seen in the graph on page 16 and the detailed figures in Section 5 of the draft June 30, 2022 Actuarial Valuation, the majority of the funding of the System occurs in the later years of the projection. The **lines show the projected assets** (market value and actuarial value), and the **bars show the projected liabilities** of the System. The funded ratio is shown at the top of the bars. For example, in 2033, the funded ratio is projected to be approximately 58% with assets being approximately \$108 billion and liabilities being approximately \$187 billion.

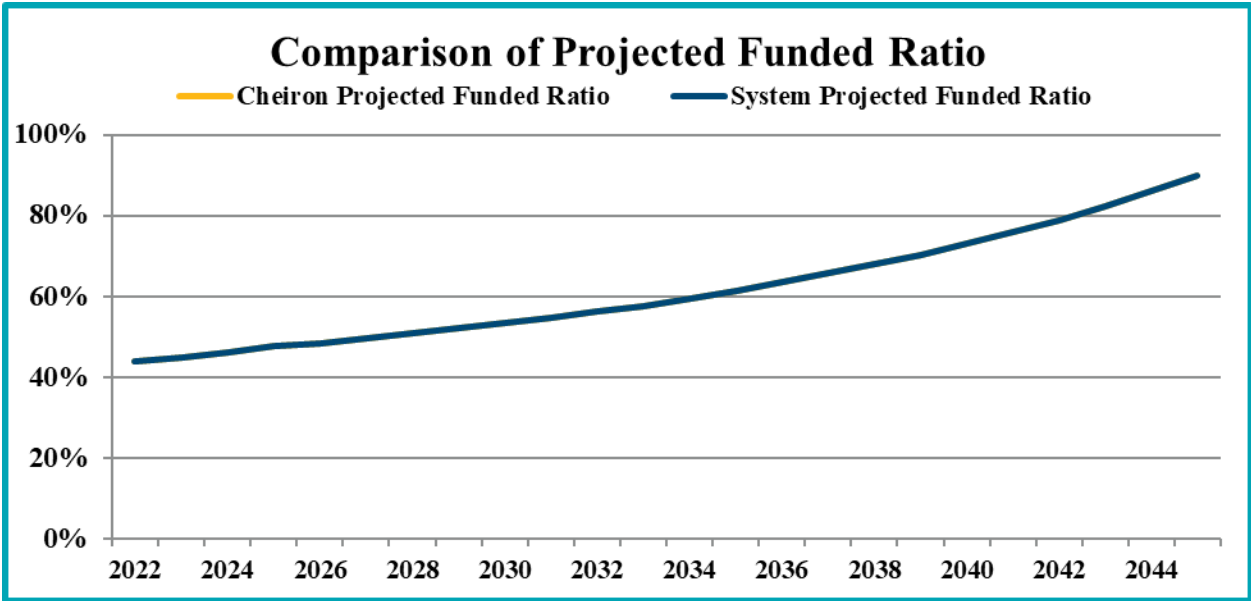


Source: Cheiron projection analysis.

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SECTION IV – PROJECTION ANALYSIS

When we compare our projected funded ratio against the results shown in the draft June 30, 2022 Actuarial Valuation, **we find a close match in expected funded ratio**. This close match of the funded ratio supports that the projections done by the System’s actuary are reasonable and the fact we show slightly different funded ratios is a function of Cheiron’s approximation.

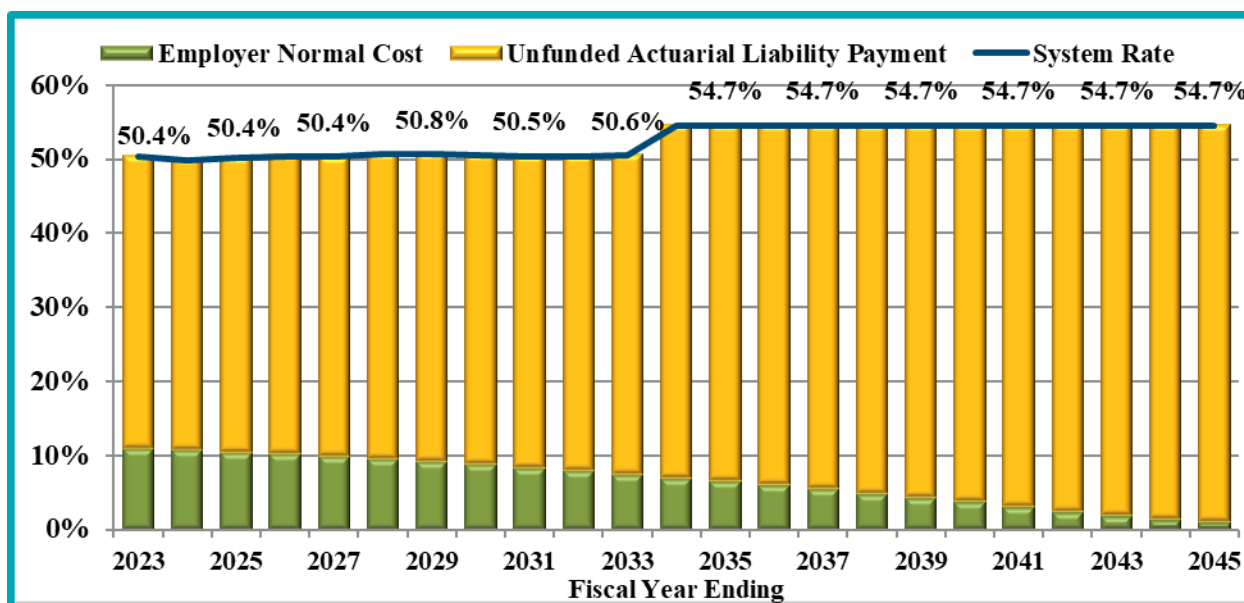


Source: Cheiron projection analysis.

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SECTION IV – PROJECTION ANALYSIS

The following graph shows the expected contributions calculated under the statutory method. The values for the fiscal year ending 2023 were set based on the June 30, 2021 Actuarial Valuation. The current valuation is the basis for setting the rates starting July 1, 2023 (Fiscal Year Ending June 30, 2024). The contribution requirement has two components: 1) the employer normal cost, which is the value of the amount of benefits to be accrued by participants in the upcoming year, less employee contributions, based on the statutory funding method; and 2) an amortization payment on the unfunded liability. The normal cost amounts are shown by the green bars and the amortization payments of the unfunded actuarial liability (UAL) by the yellow bars. The percentages shown are the total contribution rates as a percentage of payroll calculated by Cheiron, which are equal to the sum of the bars. The graph shows that larger percentages of the total contribution are being made toward the UAL payments later in the period. The blue line shows the projected contribution rates as percentages of payroll from the System actuary's draft June 30, 2022 Actuarial Valuation. The difference between Cheiron's approximation and the System's projections is the difference between the top of the bars and the line. In this instance, there is virtually no difference. The contributions are being limited by the maximum contribution described in the General Obligation Bond Act prior to 2033, which is why the rate increases after 2033.



Source: Cheiron projection analysis.

Our conclusion is that **the projections performed by the System's actuary are reasonable.**

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SECTION V – ANALYSIS OF FUNDING ADEQUACY

In this section, we examine the adequacy of the funding for the System, including funded ratio, the sources of changes in the unfunded actuarial liability (UAL), projections of the UAL, and statutory funding requirements compared to contributions needed to pay down the UAL.

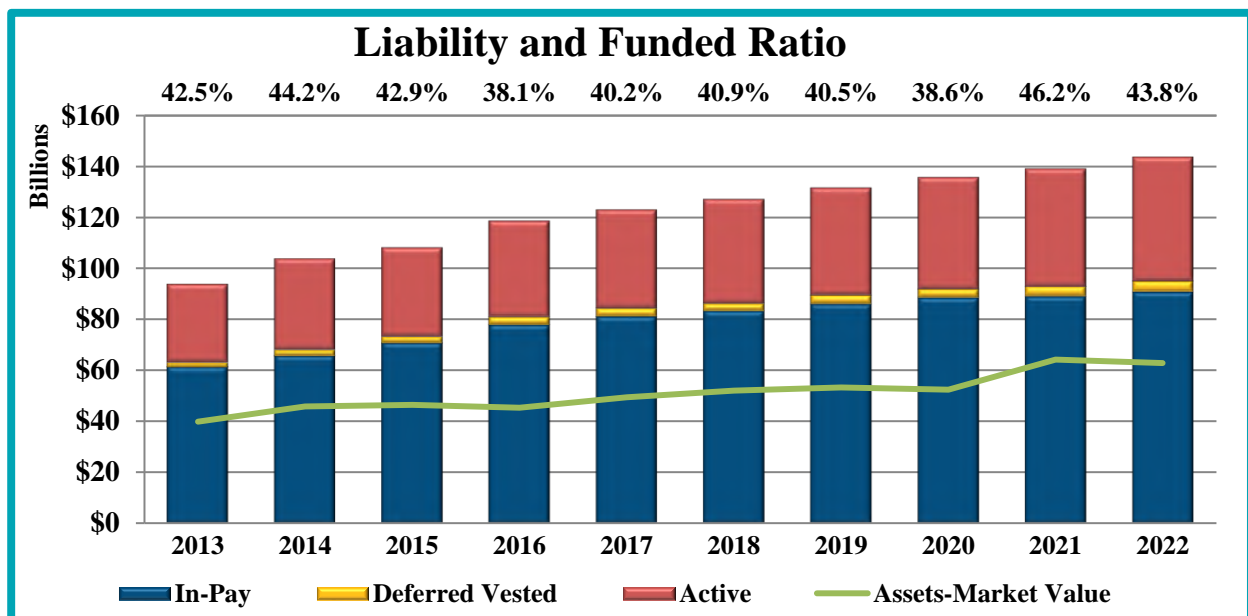
The actuarial valuation report prepared by Segal includes traditional actuarial measurements, that should be enhanced by the additional stress testing and projections that we have suggested. Given the unique and substantial funding challenges faced by the Illinois pension systems, this section on funding adequacy supplements the information from the Segal report to better inform the legislature and other stakeholders about the adequacy of the System's funding.

System Funded Ratio

The first funding adequacy measure is the historical trend of the System's funded ratio for the past ten years. Funded ratio for this purpose is defined as the ratio of the Market Value of Assets to the actuarial liability. The chart below shows that TRS' funded ratio over the last decade has fluctuated between 38.1% and 46.2%. The current funded ratio of 43.8% is slightly above the 2013 level of 42.5%. In addition to showing the funded ratio, this chart also shows the breakdown of the Plan's liabilities by membership status:

- Active liability – the liability (attributable to service already performed) for future payments to members who are currently working in the System,
- Deferred Vested liability – the liability for future payments to members who are no longer working in the System, and
- In-Pay liability – the liability for future payments to retirees and beneficiaries who are currently receiving benefits.

This breakdown shows that today plan assets only cover about 69% of the liabilities for just those members currently receiving benefits.



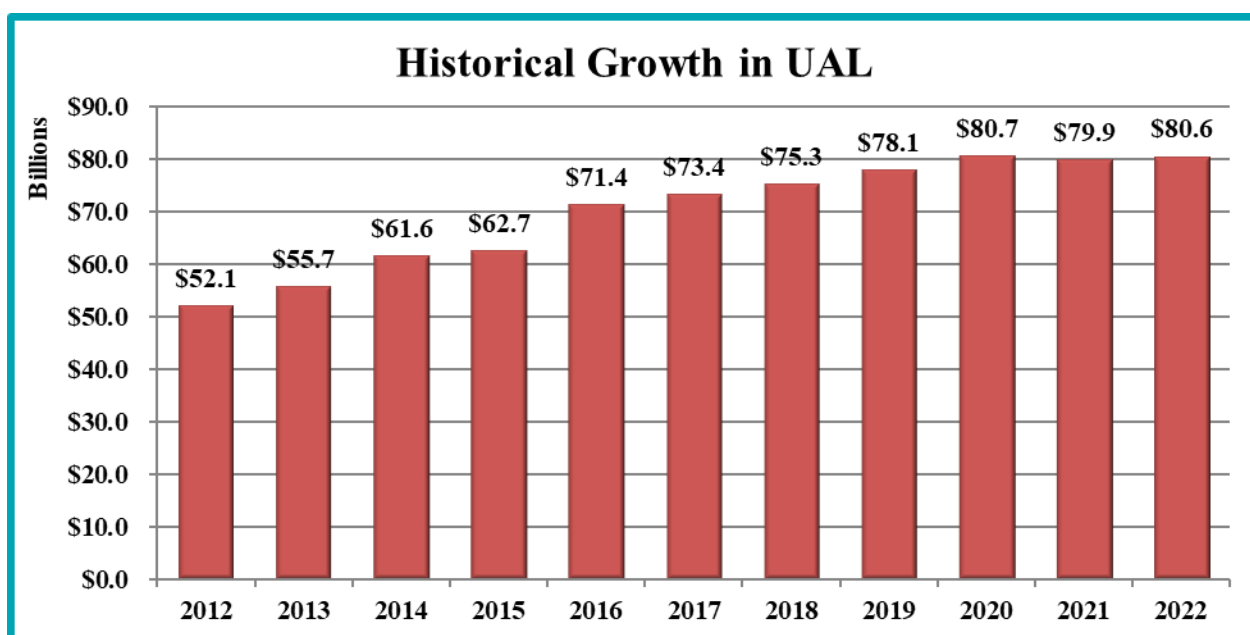
Source: Cheiron analysis of funding adequacy.

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SECTION V – ANALYSIS OF FUNDING ADEQUACY

Sources of Changes in the UAL

As shown in the chart below, TRS' unfunded actuarial liability (UAL) has grown from about \$52.1 billion in 2012 to \$80.6 billion in 2022, an increase of \$28.5 billion. In order to understand how to reverse this trend, it is important to understand the sources contributing to it.



Source: Cheiron analysis of funding adequacy.

The changes to the UAL from June 30, 2012 to June 30, 2022 can be separated into the following components:

- **Contribution Deficiencies** – Contributions that are less than the tread water contribution cause the UAL to increase. The tread water contribution consists of two components: the normal cost, which is the cost of benefits earned in a given year, and the interest on the unfunded actuarial liability. This sum is referred to as the tread water contribution because it is the contribution necessary so that the UAL will remain constant, or “tread water” (absent experience gains or losses). The differences between actual contributions and the tread water contributions increased the UAL by \$16.5 billion over this period.
- **Assumption Changes** – Changes to actuarial assumptions as the System updated expectations, primarily on future investment returns and life expectancy. A positive aspect of the UAL increases due to assumption changes is that they are expected to result in liability measurements that more accurately reflect future expectations. Over this period, assumption changes have increased the UAL by \$11.9 billion.
- **Plan Changes** – Modifications to the design of the Plan. Since most of the changes to the System’s plan affect only future benefits, the impact has been negligible during this period, reducing the liability by \$0.4 billion over this period.

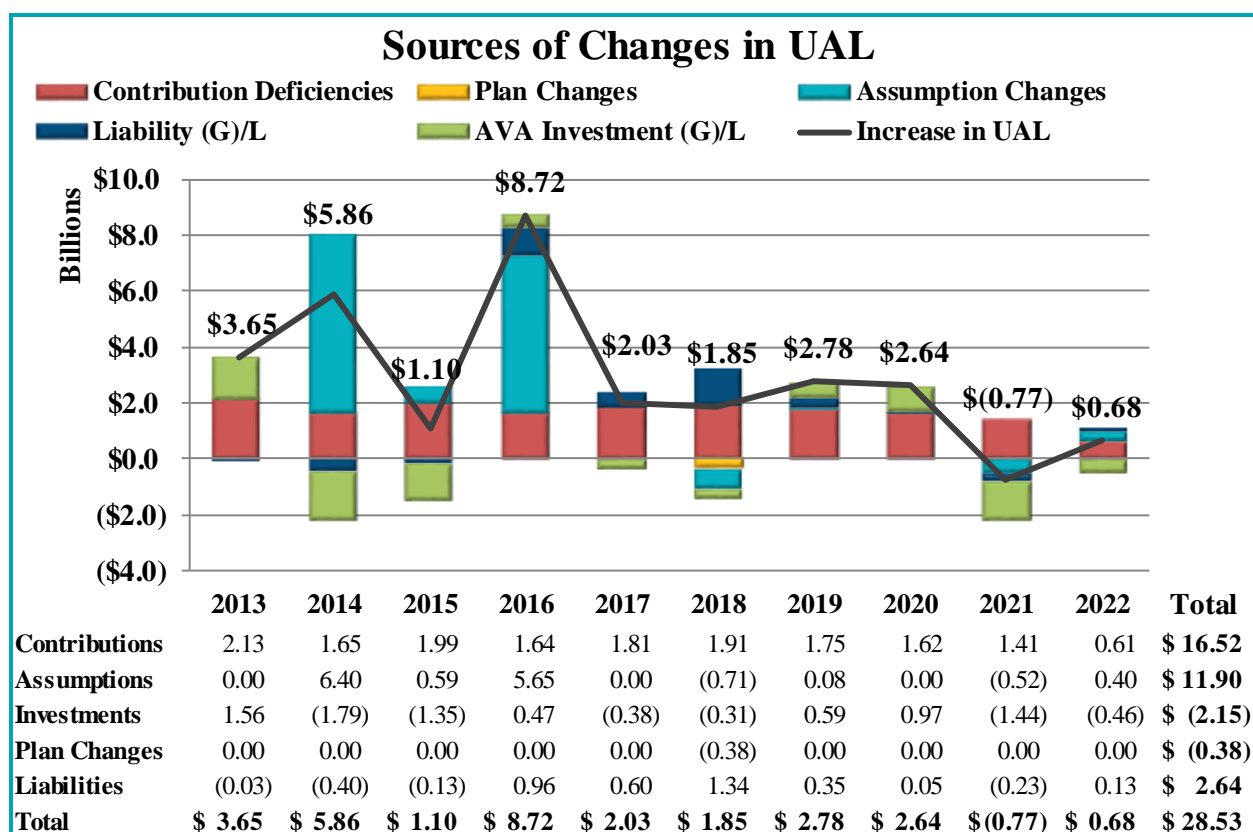
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- **Liability (Gain) or Loss** – Changes in the UAL due to liability experience (i.e., mortality, terminations, salary increases, etc.). These were generally small but increased the UAL by \$2.6 billion over this period.
- **AVA (Actuarial Value of Assets) Investment (Gain) or Loss** – Net investment gains or losses due to assets earning more or less than assumed. These have decreased the UAL over this period by \$2.1 billion.

The chart below shows the changes in UAL each year broken into these five components. The sum of all the components, as the total change in UAL, is shown as the black line. Values of each component as well as total by year are shown in the chart along with the totals for the period.

The UAL has increased in nine of the last ten years. Factors that reduce the UAL have been relatively infrequent and smaller than the factors increasing the UAL. The persistent contribution deficiencies compared to the tread water amount have been the largest contributor to the growth of the UAL in the last 10 years followed by assumption changes (primarily reducing the discount rate



Source: Cheiron analysis of funding adequacy.

We expect that this chart will help stakeholders understand the sources of growth in the UAL over the past decade and inform discussions about the current funding requirements and adequacy.

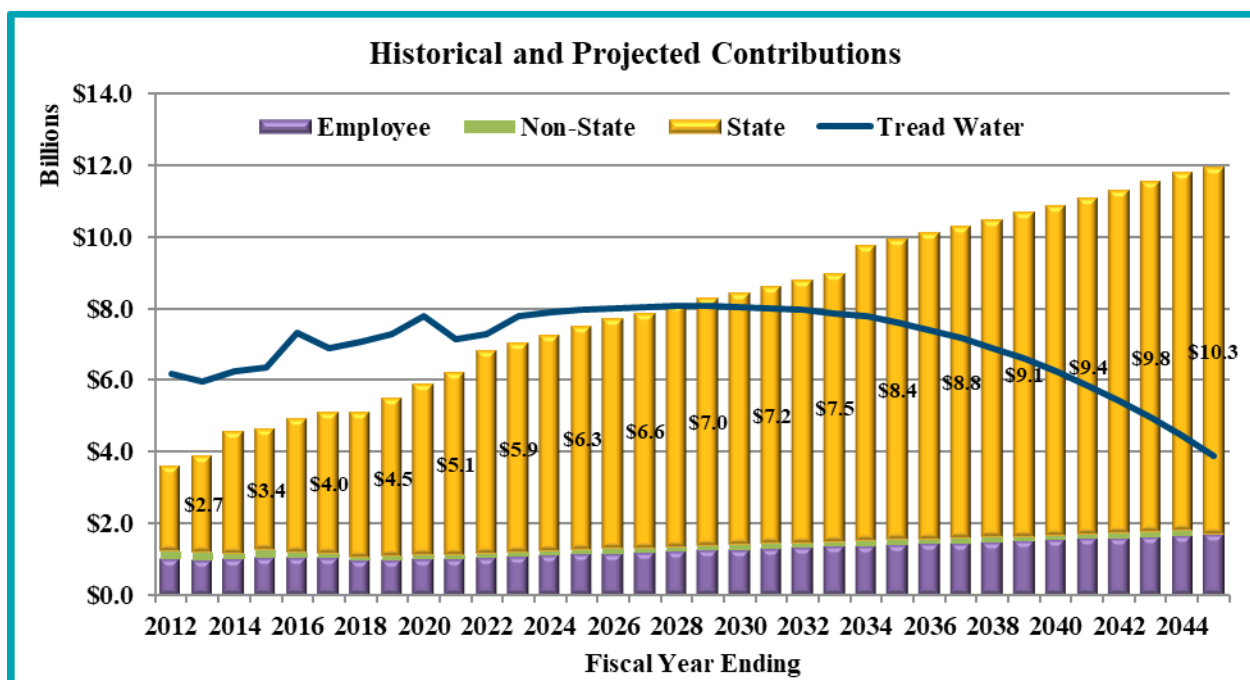
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SECTION V – ANALYSIS OF FUNDING ADEQUACY

Actual Contributions Compared to Tread Water Contribution

One of the persistent sources of the increase in UAL is due to actual contributions to the System being less than the tread water contribution (the amount needed to prevent the UAL from increasing if all assumptions are met). These contribution deficiencies have added between \$0.6 and \$2.1 billion to the UAL each year over the historical period shown.

As the chart below shows, actual contributions have been significantly less than the tread water cost. Each year that total contributions remain below the tread water cost (blue line), the UAL is expected to grow. As shown in the graph below, the contributions from the State will need to increase before the total contribution reaches the tread water contribution and begins to pay down the UAL based on the Market Value of Assets.

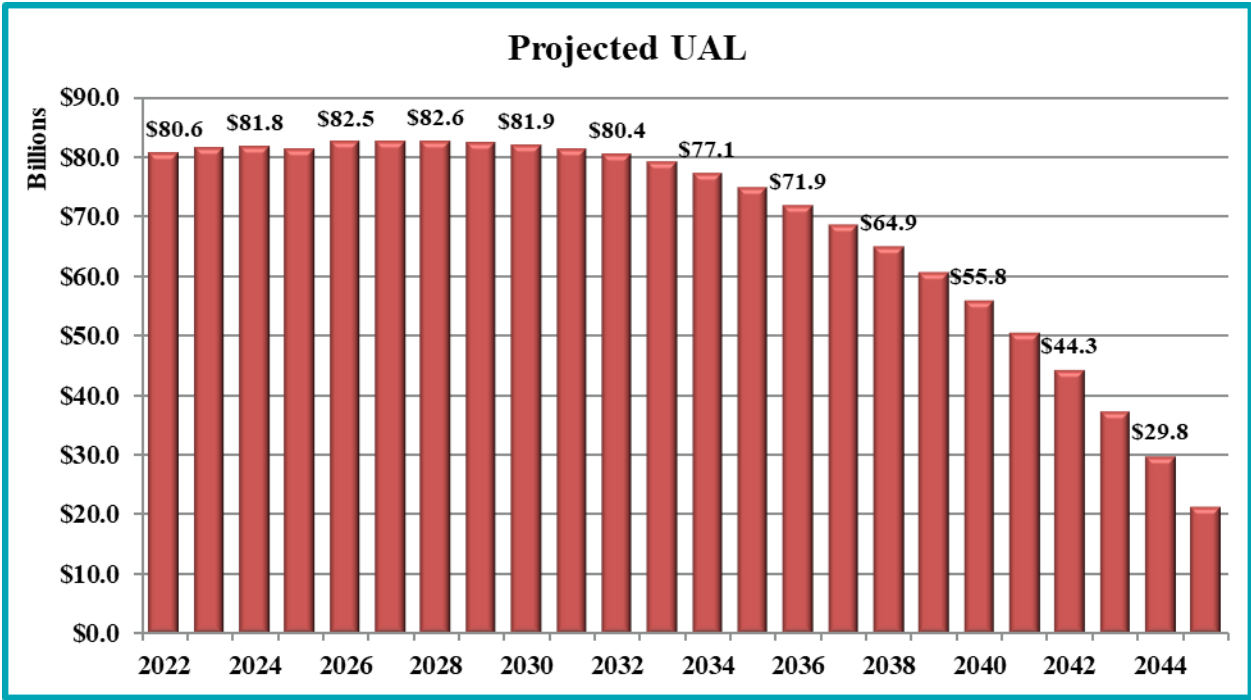


Source: Cheiron analysis of funding adequacy.

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The next chart shows that if the Minimum Required Contributions continue to be made each year and all other assumptions are met, the UAL based on the Actuarial Value of Assets is projected to continue to increase through 2028 before starting to decrease.



Source: Cheiron analysis of funding adequacy

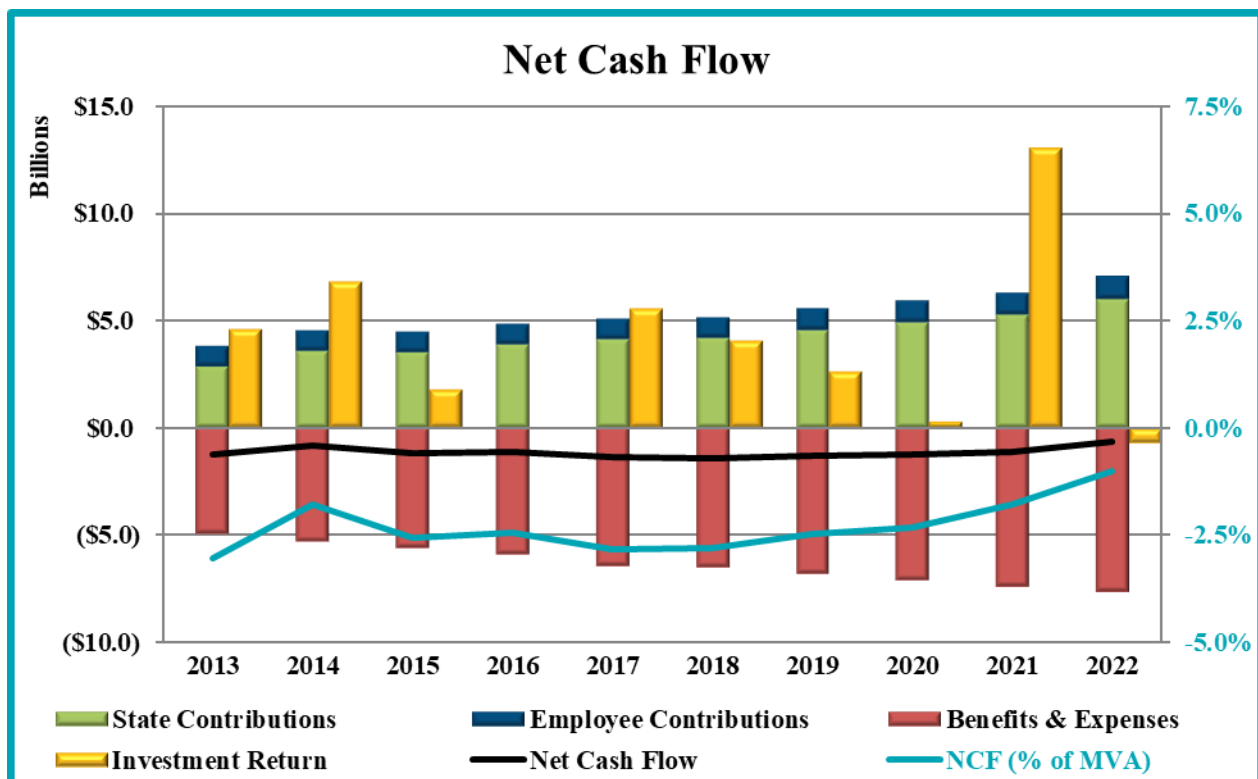
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SECTION V – ANALYSIS OF FUNDING ADEQUACY

Net Cash Flow Analysis

The Plan's net cash flow is defined as State and employee contributions less benefit payments and administrative expenses. The more negative net cash flow is as a percentage of the Plan's assets, the more vulnerable the Plan is to market downturns. This is because when a pension plan has more payouts than contributions and suffers an investment loss, it is left with fewer assets to invest and recapture during a recovery.

As shown in the chart below, TRS has mildly negative net cash flow as a dollar amount (black line) and as a percentage of the Market Value of Assets (teal line, right axis). If contributions increase as quickly as benefit payments, the net cash flow will remain stable. But if contributions do not continue to grow either because the plan has become better funded or because the expected contributions are not made, negative net cash flow may become a more significant issue, therefore it should continue to be monitored.



Source: Cheiron analysis of funding adequacy.

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STATUS OF RECOMMENDATIONS FROM THE 2021 STATE ACTUARY REPORT

Response to Recommendations in 2021

In the State Actuary's Preliminary Report on the Teachers' Retirement System of Illinois dated December 15, 2021, Cheiron made several recommendations. Below we summarize how these recommendations were reflected in either the System's comments last year or in this year's draft June 30, 2022 Actuarial Valuation.

Recommendations to Retirement System from 2021 State Actuary Report	Status	Comments
1. We continue to recommend that the funding method be changed to fully fund plan benefits. We recognize that increasing contributions during the current pandemic may be challenging but continuing the practice of inadequate contributions and targeting a funded percentage less than 100% increases the risk of the System becoming unsustainable. Consequently, we recommend that the funding method require contributions at a level that is expected to reduce the unfunded actuarial liability each year until the plan is ultimately 100% funded. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.	Not Implemented	<p>The System has adopted a funding policy referred to as the <i>Board-Adopted Actuarial Funding Policy</i> that would meet the recommendation; however, the actual funding of the System is based on State statute and a change in the funding method and funding policy would require a statutory change.</p> <p>The <i>Board-Adopted Actuarial Funding Policy</i> targets full funding after 20 years and is considered actuarially sound.</p> <p>Recommendation repeated.</p>
2. Because experience studies are performed every three years, we recommend that the phase-in period for the impact of assumption changes be reduced to three years. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.	Not Implemented	<p>This period is determined by Public Act 100-0023 and would require a statutory change.</p> <p>Recommendation repeated</p>

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STATUS OF RECOMMENDATIONS FROM THE 2021 STATE ACTUARY REPORT

Recommendations to Retirement System from 2021 State Actuary Report	Status	Comments
3. We recommend that Segal include a more detailed explanation of how the new entrant assumption was developed.	Not Implemented	<p>Segal noted that the new entrant assumption is based upon an analysis of historical salary data for recent new entrants. We would assume the breakdown based on age and sex was also based on some level of historical analysis, but the most recent experience study provided no information on the period used or the historical data that served as the basis for the assumption. In addition, the assumption appears to have changed since the last experience study without an explanation or rationale provided.</p> <p>Recommendation Repeated</p>
4. We continue to recommend that Segal provide additional information in the valuation report about the new entrant population used in its projection such as the average age and service of the population each year.	Partially Implemented	<p>Segal provided the average age and service implicit in the new entrant assumption and noted that it remains the same in each future year. However, our intent was to recommend disclosure of the average age and service of the active population in each year of the projections so it would be clear how the new entrant assumption is affecting the demographics of the future active population.</p> <p>Recommendation Modified</p>
5. We recommend the TRS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly, as they did for this valuation. However, we also recommend that Segal take into consideration the TRS' investment consultant's expected returns in developing the investment return assumptions.	Implemented	<p>The economic assumptions were reviewed at the August 2022 Board meeting. Segal supported reducing the investment return but was comfortable with maintaining the current assumption. The Board decided to continue use of a 7.00% rate of return. We note that the asset allocation changed and inflation rate increased from the prior year. Segal has also taken into consideration the TRS' investment consultant's expected returns in developing the investment return assumptions.</p> <p>We will continue to include the recommendation to annually review economic assumptions each year.</p> <p>Recommendation modified.</p>

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STATUS OF RECOMMENDATIONS FROM THE 2021 STATE ACTUARY REPORT

Recommendations to Retirement System from 2021 State Actuary Report	Status	Comments
6. We recommend that future stress testing include the impact to the required State contribution of potential reductions in the discount rate.	Not Implemented	Segal indicated that they would consider an additional stress test for potential reductions in the discount rate, but none were added for the 2022 valuation. Recommendation Repeated
7. We recommend that Segal revise the inactive vested buyout assumption for future valuations so members who have already been offered a buyout and not taken it are not assumed to take a buyout in the future	Implemented	The inactive vested buyout assumption was revised in the 2022 valuation report to 10% of future inactive members. Recommendation Removed
8. We recommend that Segal increase the Full-Time future service accrual rate assumption to 1.0 years of service and consider non-full-time member future service accrual rates that reflect recent experience on an individual basis.	Not Implemented	Segal has indicated that service accrual rates for full-time and non-full-time members will be reviewed separately as part of the next experience study. Recommendation Repeated
9. We recommend that Segal disclose historical values of the maturity measures that are significant to understanding the risks identified along with projections of these measures to the extent they are readily available from current projections.	Implemented	Segal provided the 10-year history of the ratio of full-time actives to annuitants and a chart comparing contributions to benefits and expenses over the last 10 years. Recommendation Removed

Chapter Two

Preliminary Report on the State Universities Retirement System

In accordance with 30 ILCS 5/2-8.1, Cheiron, the State Actuary, submitted a preliminary report to the Board of Trustees of the State Universities Retirement

System (SURS) concerning proposed certifications of required State contributions submitted to Cheiron by the Board. The preliminary report was submitted to SURS on December 1, 2022. The preliminary report was based on Cheiron's review of actuarial assumptions included in SURS' 2022 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the State Universities Retirement System. SURS' written response, provided on December 13, 2022, can be found in Appendix C.

OVERVIEW

STATE UNIVERSITIES RETIREMENT SYSTEM

as of June 30, 2022

Actuarial accrued liability	\$49,869,932,000
Actuarial value of assets	<u>\$22,554,752,340</u>
Unfunded liability	\$27,315,179,660
Funded ratio	45.2%

Employer normal cost	\$476,200,000
State contribution (FY24)	\$2,138,328,000

Active members	73,307
Inactive members	98,551
Current benefit recipients	<u>71,458</u>
Total membership	243,316

Interest rate assumption	6.50%
Inflation assumption	2.25%
Actuarial cost method	Projected Unit Credit
Asset valuation method	5-year Smoothing

Executive Director	Suzanne Mayer
Actuarial Firm	Gabriel, Roeder, Smith & Company

Source: June 30, 2022 SURS actuarial valuation report.

December 15, 2022

Mr. Frank Mautino
Auditor General
740 East Ash Street
Springfield, Illinois 62703

Board of Trustees
State Universities Retirement System of Illinois
1901 Fox Drive
P.O. Box 2710
Champaign, Illinois 61825-2710

Dear Trustees and Auditor General:

In accordance with the Illinois State Auditing Act (30 ILCS 5/2-8.1), Cheiron is submitting this preliminary report concerning the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS), of the required State contribution to the State Universities Retirement System of Illinois (SURS or System) for Fiscal Year 2024.

In summary, we believe that the assumptions and methods used in the June 30, 2022 Actuarial Valuation, which are used to determine the required Fiscal Year 2024 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, were properly calculated in accordance with State law.

Section I of this report describes the review process undertaken by Cheiron. Section II summarizes our findings and recommendations. Section III provides the supporting analysis for those findings and presents more details on our assessment of the actuarial assumptions and methods employed in GRS's Actuarial Certification, as well as our assessment of GRS's determination of the required State contribution for Fiscal Year 2024. Section III also includes comments on other issues impacting the funding of the State Universities Retirement System, including the implications of Article 15 of the Illinois Pension Code, which establishes the statutory minimum funding requirements for the System. **We agree with GRS that the statutory mandated minimum funding requirements have been inadequate. In addition, the past inadequate funding has resulted in current and future contribution levels, measured as a percent of payroll, to be among the highest in the country. Making adequate contributions in the future to fully fund the system will be challenging.** Section IV reviews the projections contained in the June 30, 2022 Actuarial Valuation. Finally, Section V provides an analysis of funding adequacy.

In preparing this report, we relied on information (some oral and some written) supplied by SURS and GRS. This information includes actuarial assumptions and methods adopted by the SURS Board, plan provisions, the June 30, 2022 Actuarial Valuation, the September 2022

Investment Return Assumption Review, the 2021 Experience Review Report, the August 3, 2022 letter on buyout assumptions, the Meketa 2021 Asset-Liability Study, 2022 minutes of the SURS Board of Trustee meetings, and various memos prepared by the System's advisors, staff, and Executive Director. A detailed description of all information provided for this review is contained in Appendix B.

This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys, and our firm does not provide any legal services or advice.

This report was prepared exclusively for the Office of the Auditor General and the State Universities Retirement System of Illinois for the purpose described herein. Other users of this report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to any other user.

Sincerely,
Cheiron

SIGNED ORIGINAL ON FILE

Michael J. Noble, FSA, EA, FCA, MAAA
Principal Consulting Actuary

SIGNED ORIGINAL ON FILE

Jana R. Bowers, FASA
Associate Actuary

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SECTION I – REPORT SCOPE

Illinois Public Act 097-0694 (the Act) amended the Illinois State Auditing Act (30 ILCS 5/2-8.1) and requires Cheiron, as the State Actuary, to review the actuarial assumptions and valuation of the State Universities Retirement System of Illinois (SURS or System), and to issue to the SURS Board this preliminary report on the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contributions for Fiscal Year (FY) 2024. The purpose of this review is to identify any recommended changes to the actuarial assumptions for the SURS Board to consider before finalizing its certification of the required State contribution for FY 2024.

While the Act states that just the actuarial assumptions and valuation are to be reviewed, we have also reviewed the actuarial methodologies (funding and asset smoothing methods) employed in preparing the Actuarial Certification, as these methods can have a material effect on the amount of the State contribution being certified. Finally, we have offered our opinion on the implications of Article 15-155 of the Illinois Pension Code, which impacts the contribution amount certified by GRS.

In conducting this review, Cheiron reviewed the June 30, 2022 Actuarial Valuation prepared by GRS, the 2022 Experience Review Report, the July 15, 2022 letter on buyout assumptions, the Meketa 2022 Asset-Liability Study, 2022 minutes of the SURS Board of Trustees meetings, and various memos prepared by the System's advisors, staff, and Executive Director. The specific materials we reviewed are listed in Appendix B.

In addition to reviewing the actuarial certification of the required State contribution to SURS, the Act requires the State Actuary to conduct a review of the "actuarial practices" of the Board. While the term "actuarial practices" was not defined in the Act, we continue to interpret this language to mean that we review: (1) the use of a qualified actuary (as defined in the Qualification Standards of the American Academy of Actuaries) to prepare the annual actuarial valuation for determining the required State contribution; and (2) the conduct of periodic formal experience studies to justify the assumptions used in the actuarial valuation. In addition, we have included comments on actuarial communication and compliance with Actuarial Standards of Practice (ASOP) reflected in the June 30, 2022 Actuarial Valuation.

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SECTION II – SUMMARY OF RECOMMENDATIONS

This section summarizes recommendations from our review of the actuarial assumptions and methods employed in the June 30, 2022 Actuarial Valuation of SURS as well as the “actuarial practices” of the SURS Board. Section III of this report provides detailed analysis and rationale for these recommendations.

Proposed Certification of the Required State Contribution

Gabriel, Roeder, Smith & Company (GRS) has determined that the FY 2024 required State contribution calculated under the current statutory funding requirements is \$2,138,328,000. We have verified the arithmetic calculations made by GRS to develop this required State contribution and have reviewed the assumptions on which it was based. We have accepted GRS’s annual projections of future payroll, total normal costs, employee contributions, combined benefit payments and expenses, and total contributions.

State Mandated Funding Method

1. We recommend that the funding method be changed to employ a methodology that produces a Reasonable Actuarially Determined Contribution and fully funds plan benefits within a reasonable period. The State Mandated Method is entering a period in which the contribution amount it produces may be reasonable even though the overall methodology is not. This period offers an opportunity to change the methodology to one that is consistent with actuarial standards for a Reasonable Actuarially Determined Contribution (ADC) without significantly affecting the immediate contribution amount. Such a method would set contributions at a level that is expected to prevent the unfunded actuarial liability from growing and remain high enough to reduce the unfunded actuarial liability each year until the plan is ultimately 100% funded within a reasonable period. While the State Mandated Method is inadequate, it will also produce more volatile contribution levels as the remaining period to achieve 90% funding shortens. Consequently, we recommend that the funding method be changed to one that produces more stable contribution requirements while targeting 100% funding within a reasonable period and meets the actuarial standards for a Reasonable ADC. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

Recognition of Changes in Actuarial Assumptions

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modified the State’s funding policy to require that the contribution impact of all assumption changes be phased-in over a five-year period.

1. Because experience studies are performed every three years, we recommend that the phase-in period for the impact of assumption changes be reduced to no longer than three years. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

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Optional Hybrid Plan

P.A. 100-0023 created an Optional Hybrid Plan for current Tier 2 members and future new hires. The Optional Hybrid Plan consists of a reduced defined benefit plan and a defined contribution plan. Employers are required to contribute the normal cost plus an additional 2% of pay for each employee who participates in the Optional Hybrid Plan or Tier 2 in lieu of the Optional Hybrid Plan, for fiscal year 2021 and after. GRS did not reflect provisions related to the Optional Hybrid Plan because SURS will not implement the Plan until clarifying legislation is passed to enable SURS to implement the Plan.

Earnings that Exceed the Governor's Salary

P.A. 100-0023 requires employers to make an additional contribution for participants who have annual earnings that currently exceed, or are projected to exceed, the Governor's current or projected salary. The additional contribution is equal to the employer normal cost rate multiplied by salary in excess of the Governor's current or projected salary.

GRS notes that the estimated additional contribution has been calculated and provided by SURS. This includes a component in which the contribution is adjusted down for members whose employers are already make normal cost adjustments. We have verified that GRS has reflected these additional employer contributions in the development of the net State contribution.

Accelerated Pension Benefit Payments

P.A. 100-0587 created two accelerated pension benefit payment options. Inactive vested members have the option of receiving a lump-sum equal to 60% of the present value of their benefits in lieu of their annuity benefits, and Tier 1 members have the option upon retirement of accepting a reduced automatic annual increase in exchange for a lump-sum equal to 70% of the present value of the reduction in annuity benefits. Eligible members must make an election by June 30, 2026 (extended from June 30, 2024) if they want to receive the accelerated pension benefit payments.

GRS continues to assume that no participant will elect to take an accelerated pension benefit payment option. The analysis of experience through June 30, 2022 showed an immaterial number of eligible members elected buyout options which supports the continued use of this assumption. We believe this approach is reasonable.

Assessment of Actuarial Assumptions Used in the 2022 Valuation

30 ILCS 5/2-8.1 requires the State Actuary to identify recommended changes in actuarial assumptions that the SURS Board must consider before finalizing its certification of the required State contribution. We have reviewed all the actuarial assumptions used in the draft June 30, 2022 Actuarial Valuation and conclude that the recommended assumptions are reasonable in general, based on the evidence provided to us.

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SECTION II – SUMMARY OF RECOMMENDATIONS

Recommended Changes for Future Valuations

2. We recommend that future stress testing include the impact to the required State contribution of potential reductions in the discount rate.
3. Section 3.2 of ASOP 51 requires the actuary to identify risks that “may reasonably be anticipated to **significantly affect** the plan’s future financial condition.” [emphasis added]. The risks currently identified appear to largely duplicate the list of examples in ASOP 51 and could apply to almost any pension plan. In future valuations, we recommend that the actuary explain how each risk identified would reasonably be anticipated to significantly affect the specific plan’s future financial condition.
4. For each risk identified above, Section 3.3 of ASOP 51 requires the actuary to provide an assessment that takes into account “circumstances specific to the plan.” For some of the identified risks, the actuary has provided a quantitative assessment specific to the plan while for other identified risks, the actuary has only provided a generic statement that could apply to any plan. We recommend that for each identified risk the actuary provide an assessment, preferably quantitative, that considers the specific circumstances of this plan.
5. We recommend that the SURS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly, as they did for this valuation.

GASB 67 and 68

The 2022 SURS GASB 67 and 68 information was provided in a separate report. We find that the assumptions and methods used to prepare the 2022 SURS GASB 67 and 68 schedules are reasonable based on the evidence provided to us.

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SECTION III – SUPPORTING ANALYSIS

In this section, we provide detailed analysis and supporting rationale for the recommendations that were presented in Section II of this report.

Proposed Certification of the Required State Contribution

As stated in our summary of recommendations in Section II, we have verified the arithmetic calculations made by GRS to develop the required State contribution, reviewed the assumptions on which it is based, and accepted GRS's annual projections of future payroll, total normal costs, benefits, expenses, and total contributions. However, in accordance with 30 ILCS 5/2-8.1, our review does not include a replication of the actuarial valuation results.

State Mandated Methods

The Illinois Pension Code (40 ILCS 5/15-155) establishes a method that does not adequately fund the System. This law requires the actuary to calculate the employer contribution as the level percentage of projected payroll that would accumulate assets equal to 90% of the Actuarial Accrued Liability in the year 2045 if all assumptions are met. This contribution methodology does not conform to generally accepted actuarial principles and practices. Generally accepted actuarial funding methods target the accumulation of assets equal to 100% of the Actuarial Accrued Liability, not 90%.

We recommend that the funding method be changed to employ a methodology that produces a Reasonable Actuarially Determined Contribution and fully funds plan benefits within a reasonable period of time (Recommendation #1). The State Mandated Method is entering a period in which the contribution amount it produces may be reasonable even though the overall methodology is not. This period offers an opportunity to change the methodology to one that is consistent with actuarial standards for a Reasonable Actuarially Determined Contribution (ADC) without significantly affecting the immediate contribution amount. Such a method would set contributions at a level that is expected to prevent the unfunded actuarial liability from growing and remain high enough to reduce the unfunded actuarial liability each year until the plan is ultimately 100% funded within a reasonable period. While the State Mandated Method is inadequate, it will also produce more volatile contribution levels as the remaining period to achieve 90% funding shortens. Consequently, we recommend that the funding method be changed to one that produces more stable contribution requirements while targeting 100% funding within a reasonable period and meets the actuarial standards for a Reasonable ADC.

The GRS June 30, 2022 Actuarial Valuation includes a recommended funding policy which would contribute the normal cost plus an amortization payment that would seek to fully pay off the total unfunded accrued liability over a closed period by the year 2045. We note that this policy meets the requirements of a Reasonable Actuarially Determined Contribution and will satisfy the requirement effective in 2023 to calculate and disclose a Reasonable Actuarially Determined Contribution (ADC). Under this recommendation, GRS calculated a fiscal year 2024 State contribution amount of \$2,617,120,000 (including Retirement Savings Plan (RSP) and Employer

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contributions). We concur with GRS's recommendation and demonstration of an alternative funding approach. It conforms to a goal of full funding within a reasonable time period and with generally accepted actuarial principles and practices.

Recognition of Changes in Actuarial Assumptions

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modified the State's funding policy to require that the contribution impact of all assumption changes, including changes prior to P.A. 100-0023, be phased-in over a five-year period. As such, the Act delays the funding of the System. Assumption changes are intended to more accurately anticipate the obligations for funding based on the most recent experience analysis and forward-looking changes to future investment returns. However, only one-fifth of the impact of these changes are now recognized from the date of adoption. The remainder of the impact is recognized over four additional years such that the full impact is only recognized at the end of a five-year period beginning at the date of adoption. This phase-in provides time to adjust to a higher level of contributions. However, the Conference of Consulting Actuaries White Paper on Actuarial Funding Policies and Practices for Public Pension Plans recommends that the "phase-in period should be no longer than the time period until the next review of assumptions." **Since experience studies are performed every three years, we recommend the phase-in period for the impact of assumption changes be reduced to no longer than three years** (Recommendation #2).

Optional Hybrid Plan

P.A. 100-0023 created an Optional Hybrid Plan for current Tier 2 members and future new hires. The Optional Hybrid Plan consists of a reduced defined benefit plan and a defined contribution plan. Employers are required to contribute for each employee who participates in the Optional Hybrid Plan or Tier 2 in lieu of the Optional Hybrid Plan, the normal cost plus for fiscal year 2021 and after an additional 2% of pay.

As stated in Section II of this report, GRS reflected the hybrid plan in the June 30, 2017 valuation by anticipating that future participants elect the Optional Hybrid Plan. However, in subsequent valuations, GRS has not reflected the Optional Hybrid Plan because SURS is still not moving forward with the implementation of the Optional Hybrid Plan until additional clarifying legislation is adopted. Based on consultation with SURS staff, GRS has assumed that, when available, 0% of new members will elect the Optional Hybrid Plan. In the 2021 Experience Review Report, GRS studied Plan election and has adopted appropriate assumption for the election of Tier 2 Plan and the Retirement Saving Plan (formerly Self-Managed Plan). The assumption that no members will elect the Optional Hybrid Plan is reasonable based on the Plan design and the expectations of GRS and SURS staff.

Earnings That Exceed the Governor's Salary

P.A. 100- 0023 requires employers to make an additional contribution for participants who have annual earnings that currently exceed, or are projected to exceed, the Governor's current or

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projected salary. The additional contribution is equal to the employer normal cost rate multiplied by salary in excess of the Governor's current or projected salary.

GRS notes that the estimated additional contribution has been calculated and provided by SURS. This includes a component in which the contribution is adjusted down for members whose employers are already make normal cost adjustments. We have verified that GRS has reflected these additional employer contributions in the development of the net State contribution.

Accelerated Pension Benefit Payments

P.A. 100-0587 created two accelerated pension benefit payment options. Inactive vested members have the option of receiving a lump-sum equal to 60% of the present value of their benefits in lieu of their annuity benefits, and Tier 1 members have the option upon retirement of accepting a reduced automatic increase in exchange for a lump-sum equal to 70% of the present value of the reduced annuity benefits. Eligible members must make an election by June 30, 2026 if they want to receive the accelerated pension benefit payments.

While the valuation report identifies experience under this payment option, the number of take-ups of the option remains immaterial relative to the total eligible population (see Actuarial Methods and Assumptions for the supporting information). GRS therefore continues to assume that no participant will elect to take an accelerated pension benefit payment option. We believe this approach is reasonable.

Stress Testing

Based on the June 30, 2022 Actuarial Valuation, the funded ratio, measured as the ratio of the Actuarial Value of Assets to the actuarial liability, is currently at 45.2%. The unfunded actuarial liability is currently about \$27.3 billion and is expected to drop slowly in future years. The required State contribution rate is currently 45.31% of payroll and scheduled to generally decrease to 40.30% of payroll in 2034 and remain level thereafter until 2045. However, if there is a significant market downturn, the unfunded actuarial liability and the required State contribution rate would increase, putting the sustainability of the system further into question. Stress testing was performed and included in the 2022 final Actuarial Valuation report in Appendix J to allow the users and public better understand these risks and the potential advantages of additional contributions in the near term to maintain the sustainability of the system.

Actuarial Standard of Practice 51

Actuarial Standard of Practice (ASOP) 51 provides guidance to actuaries on the assessment and disclosure of risks to help readers of the actuarial valuation report “*understand the effects of future experience differing from the assumptions used*” and “*the potential volatility of future measurements resulting from such differences.*”

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ASOP 51's first requirement is to *"identify risks that, in the actuary's professional judgment, may reasonably be anticipated to significantly affect the Plan's future financial condition."* GRS identified six sources of risk to SURS: investment risk, asset/liability mismatch risk, contribution risk, salary and payroll risk, longevity risk and other demographic risks.

ASOP 51 requires the actuary to assess each of the risks identified. While the assessment does not have to be quantitative, it does have to take into account the specifics of the individual plan. ASOP 51 also describes several quantitative methods that may be used to assess risk.

- Investment Risk. GRS included additional stress testing in this year's final actuarial valuation report that adequately assessed the investment risk with various investment return scenarios.
- Asset/Liability Mismatch Risk. GRS does not appear to provide an assessment of asset/liability mismatch risk other than to indicate that asset value changes that do not match liability changes will either increase or decrease costs. If GRS continues to identify this as a key risk, ASOP 51 requires that they also provide an assessment that takes into account "circumstances specific to the plan."
- Contribution Risk. GRS discusses several issues with the statutorily required contribution amounts in the risk section as well as in other parts of the valuation report. The stress testing included in last year's final actuarial valuation report adequately assessed the impact of a declining contribution base (i.e., payroll).
- Salary and Payroll Risk. The stress testing included in this year's final actuarial valuation report adequately assessed the salary and payroll risk with alternative projected decreases in the active population.
- Longevity Risk. GRS does not appear to provide an assessment of longevity risk. The valuation report simply states that experience that differs from the assumptions will either increase or decrease costs. If GRS continues to identify this as a key risk, ASOP 51 requires that they also provide an assessment that takes into account "circumstances specific to the plan."
- Other Demographic Risk. GRS provides an explanation of demographic risks. The stress testing included in this year's final actuarial valuation report adequately assessed the impact of participants selecting the RSP. However, there does not appear to provide an assessment of other demographic risk. If GRS continues to identify this as a key risk, ASOP 51 requires that they also provide an assessment that takes into account "circumstances specific to the plan."

ASOP 51 requires the actuary to recommend a more detailed assessment of risks if it *"would be significantly beneficial."* GRS adequately identified the primary drivers of these risks, provided background information and assessments about these identified risks, but did not in our opinion

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adequately communicate the significance of all of these risks to this Plan. The stress testing included in this year's final actuarial valuation report provided a quantitative assessment of the investment risk, contribution risk, and salary and payroll risk. However, the other risks were only assessed with a generic statement that could apply to any pension plan.

Section 3.2 of ASOP 51 requires the actuary to identify risks that “may reasonably be anticipated to significantly affect the plan's future financial condition.” The risks currently identified appear to largely duplicate the list of examples in ASOP 51 and could apply to almost any pension plan. **In future valuations, we recommend that the actuary explain how each risk identified would reasonably be anticipated to significantly affect the specific plan's future financial condition (Recommendation #4).**

For each risk identified above, Section 3.3 of ASOP 51 requires the actuary to provide an assessment that takes into account “circumstances specific to the plan.” For investment, salary and payroll, and plan selection risks, the actuary has provided a quantitative assessment specific to the plan while for other asset/liability mismatch, longevity, and other demographic risks, the actuary has only provided a generic statement that could apply to any plan. **We recommend that for each identified risk the actuary provide an assessment, preferably quantitative, that considers the specific circumstances of this plan (Recommendation #5).**

Changes to Actuarial Standard of Practice 4

Actuarial Standard of Practice No. 4 (ASOP 4) was amended and the changes will become effective for SURS' actuarial valuations starting June 30, 2023. There are three primary changes that will affect the SURS actuarial valuation:

1. The requirement to calculate and disclose a Reasonable Actuarially Determined Contribution as defined in ASOP 4,
2. The requirement to assess the implications of the funding policy, including four specific assessments, and
3. The requirement to calculate, disclose, and explain a Low-Default-Risk Obligation Measure (LDROM).

The requirement to calculate and disclose a Reasonable ADC is already incorporated in the SURS actuarial valuation and has been discussed in our analysis above. This section will discuss the remaining two requirements that will become effective for the June 30, 2023 actuarial valuation.

Implications of the Funding Policy

Effective with the 2023 actuarial valuation, changes to ASOP No. 4 will require GRS to make four specific assessments of the State Mandated Funding Policy:

1. A qualitative assessment of the implications of the funding policy on expected future contributions and funded status,
2. An estimate of how long until contributions under the funding policy will exceed normal cost plus interest on the unfunded actuarial liability,

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3. An estimate of how long until the unfunded actuarial liability is expected to be paid off, and
4. An assessment of whether the funding policy is significantly inconsistent with accumulating assets adequate to make benefit payments, and, if applicable, an estimate of the approximate time until assets are depleted.

GRS already provides the qualitative assessment required and discusses the principal issues but will need to add the specific estimates in future valuation reports.

Calculation and Disclosure of LDROM

The LDROM is calculated using a discount rate derived from low-default-risk fixed income securities whose cash flows are reasonably consistent with the plan's projected benefit payments. Consequently, the discount rate is likely to be significantly lower than the funding discount rate and the LDROM significantly higher than the actuarial liability.

The actuary has a few choices in the calculation of the LDROM, and those choices may depend on how the actuary wants to explain the significance of the LDROM as required by ASOP 4 "with respect to the funded status of the plan, plan contributions, and the security of participant benefits."

Public plan actuaries may explain the LDROM in terms of the expected taxpayer savings from investing in a diversified portfolio or the cost to eliminate investment risk. Using this framework for the explanation, actuaries would likely elect to use the same actuarial cost method as is used for funding and to derive the discount rate from yields on high quality corporate bonds. However, multiple other options are also possible.

Our review of this new disclosure will focus on the consistency between the explanation of LDROM's significance and the selected cost method and basis for discount rate.

Assessment of Actuarial Assumptions Used in the 2022 Valuation

A. Economic Assumptions

1. The Interest Rate

The interest rate assumption (also called the investment return or discount rate) is the most impactful assumption affecting the required State contribution amount. This assumption, which is used to value liabilities for funding purposes, was maintained at 6.50% for the June 30, 2022 Actuarial Valuation.

After reviewing all the materials (see Appendix B of the report) that were made available, Cheiron concludes that the use of 6.50% for this valuation is reasonable. Because it is reasonable to anticipate future reductions in the discount rate, we

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recommend that future stress testing include the impact to the required State contribution of potential reductions in the discount rate (Recommendation #3).

We recommend that the SURS Board continue to annually review the economic assumptions (interest rate and inflation), as was done for this valuation, prior to commencing the valuation work and adjust assumptions accordingly (Recommendation #6).

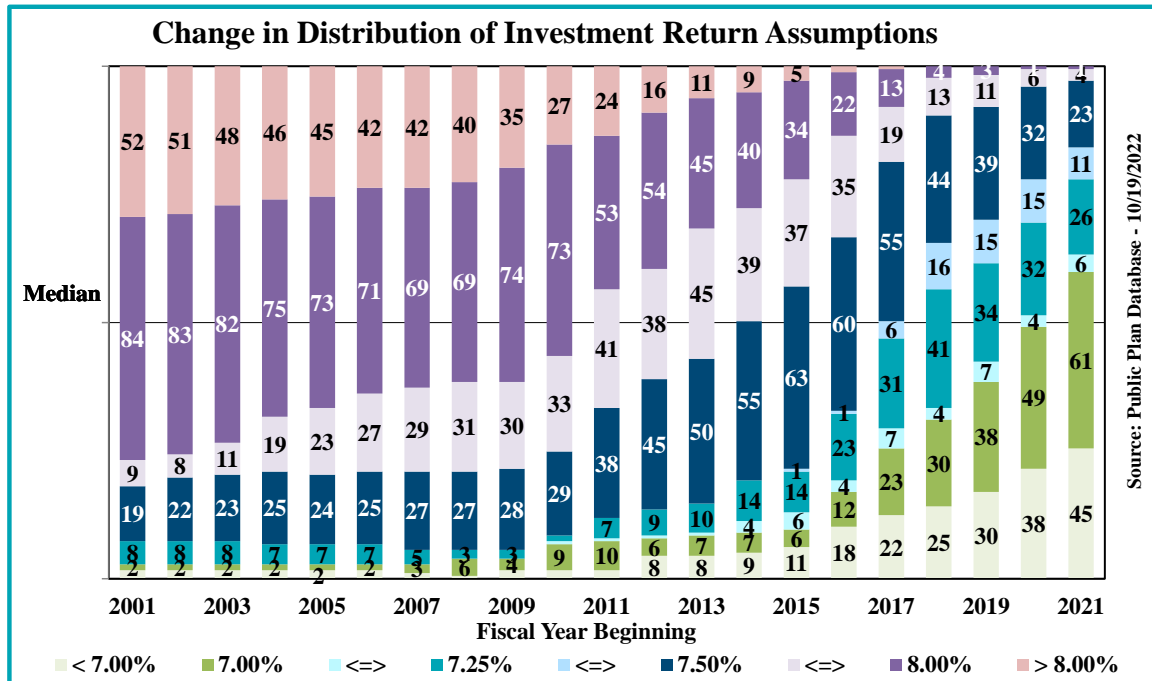
Our rationale for these recommendations:

- A review of the interest and inflation rates does not involve the collection of significant data and can be updated annually. In addition, it keeps the Board focused more closely on these very important assumptions.
- GRS's September 2022 Investment Return Assumption Review presented the expectations for the SURS portfolios based on their 2021 Capital Market Assumption Modeler (CMAM). This modeler uses the forward-looking expectations from 12 independent investment consultants. The CMAM produces expected returns for the portfolios on both a 10-year and 20-year plus basis. As GRS notes it is appropriate to give considerable weight to the 10-year expectations a large portion of the liabilities are expected to be paid out in the next 10 years. The expectations were presented based on two asset portfolios by Meketa, the first with the asset distribution as of January 1, 2022 and the second with the long term proposed portfolio. Based on these portfolios, the expected 10-year geometric average return would be 5.60% using the January 1, 2022 portfolio and 6.00% using the long term proposed portfolio. The probability of meeting or exceeding the 6.50% assumption over a 10-year time horizon is only 38% with January 1, 2022 portfolio and 41% with the long term portfolio. This is why we find it is reasonable to anticipate a future reduction in the discount rate and recommend additional stress testing of a possible discount rate change in future valuations.
- Adjusting for volatility the average expected geometric return for the SURS portfolio using the 10-year assumption for a 20-year period is 6.50% using the January 1, 2022 portfolio and 6.90% using the long term portfolio. This analysis estimated SURS has a 51% chance of meeting or exceeding the 6.50% assumption over a 20-year time horizon using January 1, 2022 portfolio and a 55% chance of meeting or exceeding the 6.50% assumption using the long term portfolio.
- While the discount rate assumption should be based on the future expected investment returns for the System's investment portfolio, survey information can provide an important context for evaluating the assumption. The Public Plans Database is maintained by a partnership between the Center for State and Local Government Excellence (SLGE) and the Center for Retirement Research at Boston College with support from the National Association of State Retirement Administrators (NASRA). This database contains historical information on large public pension plans, including

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key assumptions used in their actuarial valuations. The following chart shows the distribution of investment return assumptions for the 177 plans in the Public Plans Database with consistent information from 2001 through 2021 as of October 19, 2022.



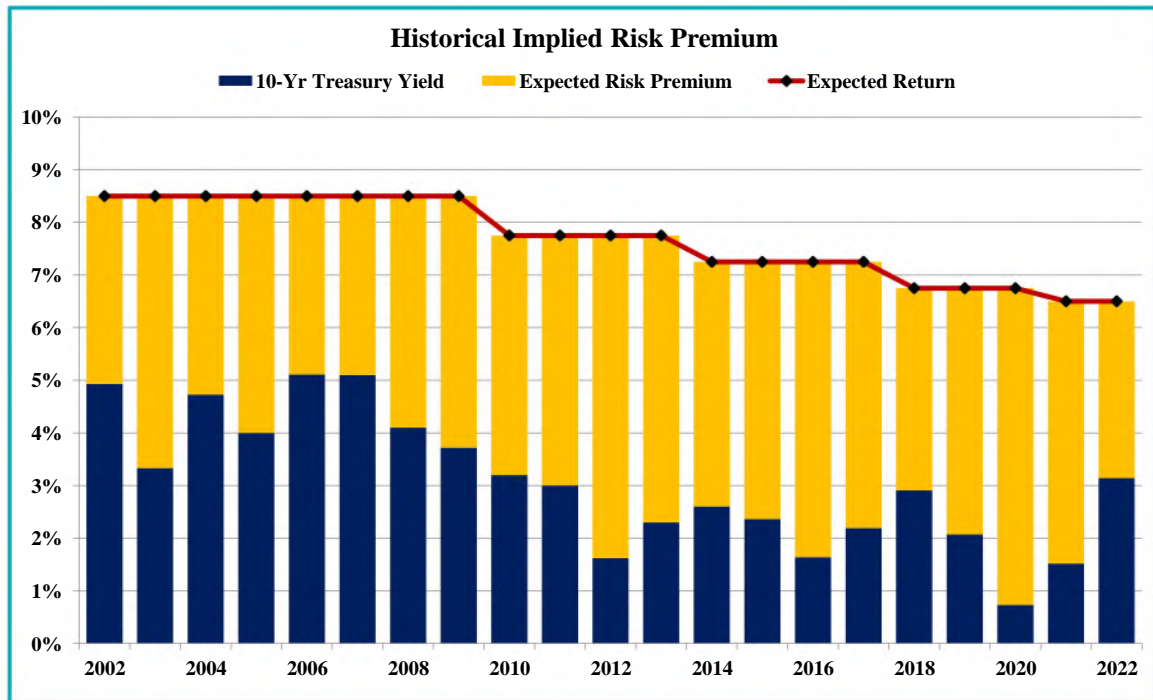
Over the period shown, there continues to be a pattern of reducing discount rates partially reflecting long-term changes in capital markets, interest rates and underlying inflation. Of the 177 plans shown, 113 have reduced their discount rate assumption since 2017. For these 113 plans, the average reduction is 0.44%.

- Over the last two decades, declining interest rates have forced pension plans to either reduce their discount rates, increase their exposure to investment risk, or some combination of the two. For example, as shown in the following chart, in June 2002, the yield on 10-year Treasury bonds (a proxy for a risk-free investments) was 4.9%. To achieve SURS' then assumed return of 8.50%, the System's investments had to outperform the yield on the 10-year Treasury by 3.6%. In June 2020, the yield on the 10-year Treasury had dropped to 0.7%, and to achieve SURS' assumed return of 7.00%, the System's investments need to exceed the 10-year Treasury yield by 6.3%. Even though SURS had reduced its return assumption by 150 basis points over the period, it still had to take more investment risk in 2020 to meet its assumption than it did in 2002. Since 2020, yields on 10-year Treasury bonds have increased, reducing the expected risk premium needed to achieve the System's assumed return. With recent action by the Federal Reserve, 10-year Treasury bond yields have increased rapidly from 1.5% in December 2021 to 3.1% in June 2022 and 4.0% in October 2022. If these higher Treasury bond yields persist, plans may be able to achieve the expected return with less

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exposure to investment risk. However, if these higher Treasury bond yields prove temporary, plans could quickly find the pressure returning to further reduce discount rates or increase their exposure to investment risk.



2. Inflation Assumption

SURS maintained its inflation assumption at 2.25% in the draft June 30, 2022 valuation.

We find the 2.25% inflation assumption to be reasonable.

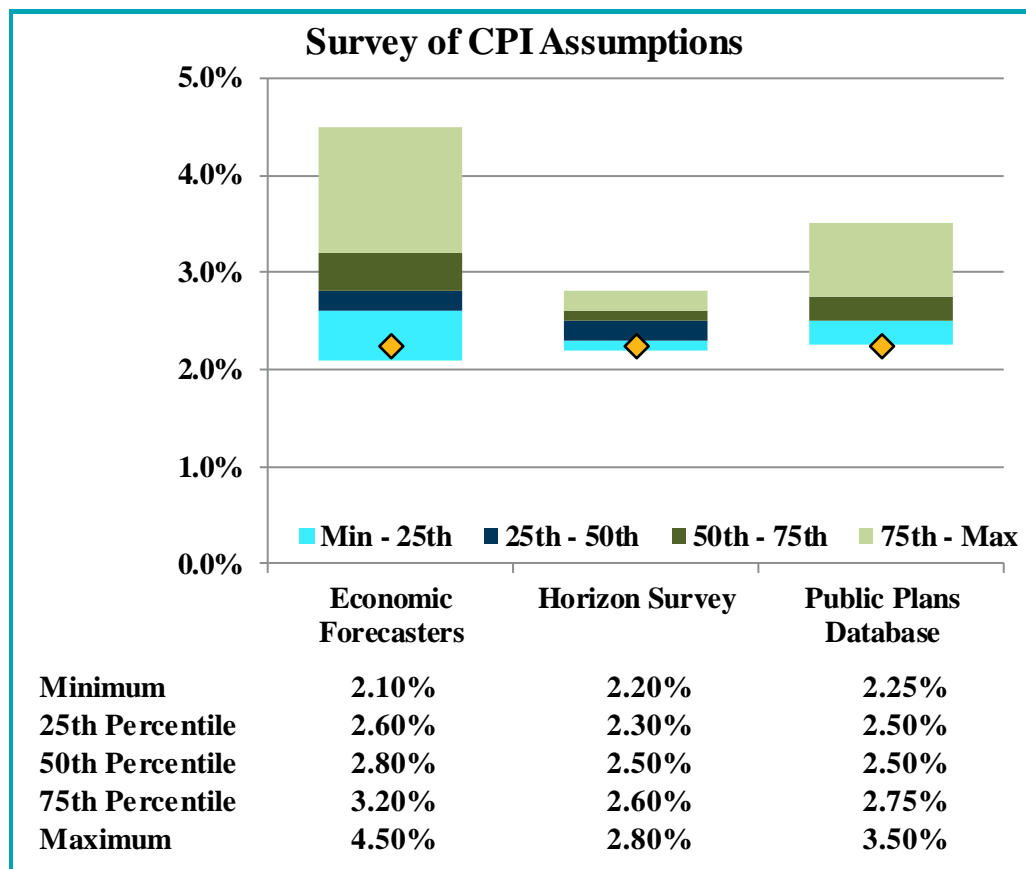
Our rationale for concurring with the 2.25% assumption:

- The June 2022 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (next 75 years), inflation will average between 1.8% and 3.0% (<http://www.ssa.gov/oact/tr/2022/tr2022.pdf>). Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.4%.

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- In the 2022 Review of the Inflation Assumption and Inflation Sensitivity Projections, GRS provides significant data on inflation forecasts that primarily indicate expectations for lower than the current assumption. While some data presented point to slightly higher inflation than the current assumption, the current assumption remains within the reasonable range and GRS concludes they should maintain the current 2.25% assumption
- The following chart shows the distribution of inflation expectations for the Third Quarter 2022 survey of professional economic forecasters published by the Philadelphia Federal Reserve, the 2022 Horizon survey of investment consultant capital market assumptions (20-year), and the 2021 inflation assumptions used by plans in the Public Plans Database compared to the SURS assumption (indicated by the gold diamonds). The assumption of 2.25% is in the lower quartile of the range projected by professional economic forecasters and investment consultants and is on the low end of the range used by other public pension plans.



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3. *Salary (Annual Compensation) Increase Assumption*

Salary Increases were maintained for the 2022 valuation and are shown below.

Illustrative rates of increase per individual employee per annum, compounded annually:

Service Year	Total Increase	
	Under Age 50	50 and Older
0	12.75%	12.00%
1	12.75%	12.00%
2	9.00%	8.25%
3	7.75%	7.00%
4	6.75%	6.00%
5	6.25%	5.50%
6	6.00%	5.25%
7	5.50%	4.75%
8-10	5.00%	4.25%
11-14	4.50%	3.75%
15-18	4.25%	3.50%
19	4.00%	3.25%
20-33	3.75%	3.25%
34+	3.50%	3.00%

The assumed rate of total payroll growth is 3.00%.

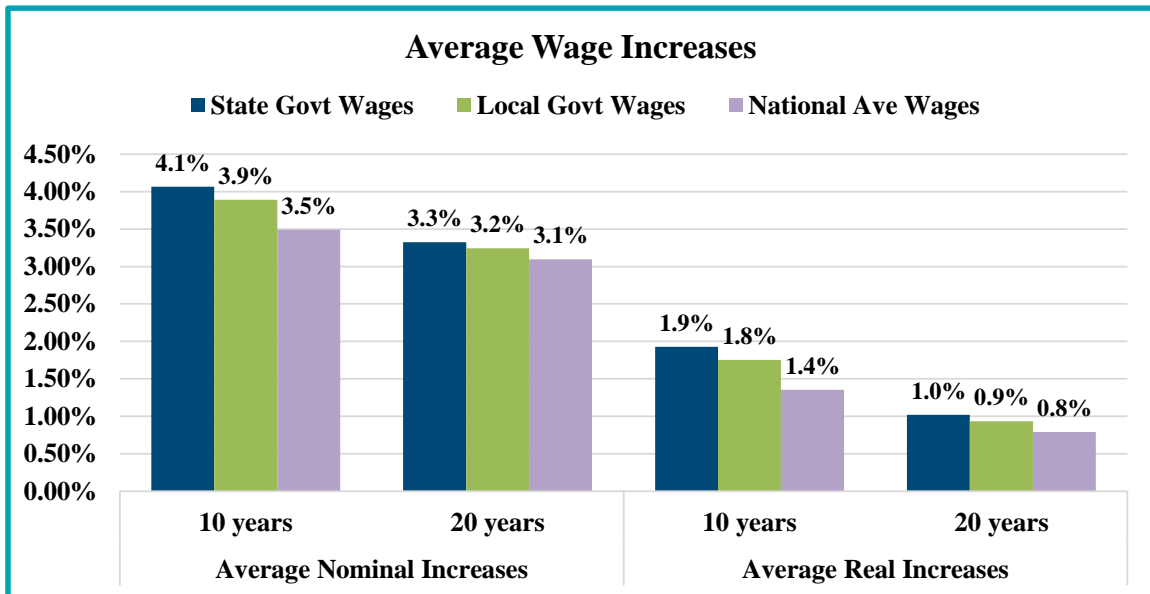
We find the assumption to keep real wage growth at 0.75% and the basis for setting it as reasonable and consistent with the inflation assumption.

Our rationale for concurring with GRS's recommended salary increase assumption:

- The following chart shows the average nominal and real increases in wages over the last 10 and 20 years for State governments, local governments, and National Average Wages. State and local government data is from the Quarterly Census of Employment and Wages as published by the Bureau of Labor Statistics. National Average Wages is published by the Social Security Administration.

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- The June 2022 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (next 75 years), real wage differential will average somewhere between 0.53% and 1.77%. Under the intermediate cost projection, the Social Security Administration uses an assumption of 1.15%.
- During the year ending June 30, 2022, there was an experience gain from this assumption (i.e., salary increases were less than assumed) as shown on page 32 of the June 30, 2022 Actuarial Valuation. The table on page 33 shows that there had been gains due to salary increases in three out of the four prior years.

4. Cost-of-Living Adjustment Assumption

Benefits are increased annually as described on page 60 of the June 30, 2022 Actuarial Valuation. Annual increases are 3.0% for those hired prior to January 1, 2011 and based upon ½ of the Consumer Price Index for those hired on or after January 1, 2011, which is 1.125% based on the inflation assumption of 2.25%.

We find the assumption and the basis for setting it reasonable.

5. Capped Pay Assumption

Benefits for members hired after January 1, 2011 are calculated using pay that is capped under 40 ILCS 5/1-160. The pay cap is shown on page 72 of the June 30, 2022 Actuarial Valuation to be \$119,892.41 for 2023. The Optional Hybrid Plan pay cap is equal to the Social Security Wage Base, which is \$160,200 for 2023.

We find the assumption and the basis for setting it reasonable.

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6. Effective Rate of Interest

The Effective Rate of Interest (“ERI”) is the interest rate that is applied to member contribution balances. The ERI, for the purpose of determining the money purchase benefit, is established by the State Comptroller annually. The ERI for other purposes such as the calculation of purchases of service credit, refunds for excess contributions, portable plan refunds, and lump-sum portable retirements is determined by the SURS Board annually and certified to the Governor. For purposes of the actuarial valuation, the assumed ERI is 6.50%.

While we find this assumption and the basis for setting it as reasonable, we would like to point out that crediting member accounts with an annual rate of 6.50% is generous given today’s interest rate environment.

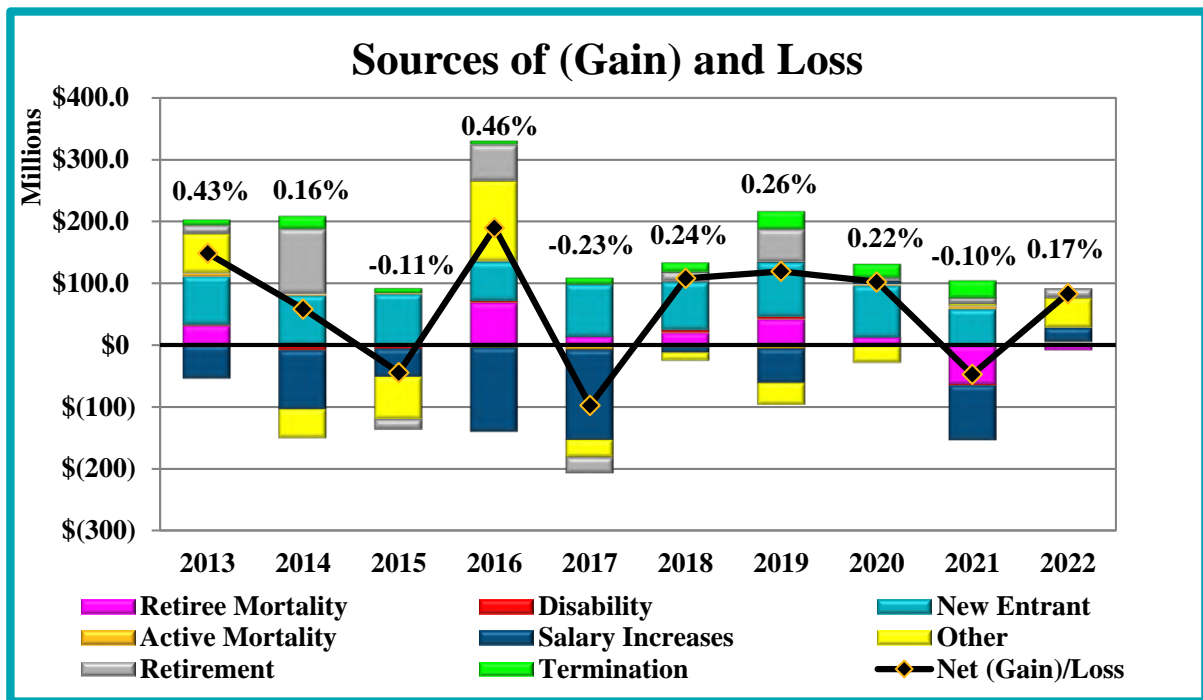
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B. Demographic Assumptions

In its annual actuarial valuation reports, GRS regularly reports sources of liability gains and losses. In the June 30, 2022 Actuarial Valuation, these are shown on page 33. In the chart below, we have collected similar data from GRS's past valuation reports dating back to 2013 and presented a historical review of past demographic and salary increase experience gains and losses.

The chart below shows the pattern of annual gains and losses attributable to eight different sources as shown in the legend. When the colored bar slices appear above zero on the Y-axis, it represents an experience loss with the value representing the increase in liabilities over what was expected. When the bar is below zero, it represents an experience gain for that year with liabilities less than expected. This net liability (gain)/loss is shown by the black line. This net (gain)/loss as a percent of liability is shown above the bars.



The percentages shown above the bars refer to net (gain)/loss as a percentage of liability.

Key observations from this chart are as follows:

1. In every year, there have been experience losses attributable to new entrants joining SURS. New entrant losses are expected because participants are hired and accrue service between valuations. GRS did not report the loss from new entrants in the June 30, 2022 draft valuation report separately and is included in the “other” category for 2022. However, there is also an offsetting asset gain to this loss due to contributions made on behalf of these new entrants.

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2. A trend of salary gains had appeared in most years. However, the salary increase assumption was changed in 2021 and this year a small loss was reported.
3. Termination from employment experience has consistently shown losses, but they have been relatively small. This assumption was reexamined in the recent GRS 2021 Experience Review and was slightly modified to produce fewer expected number of terminations. The gain/loss from this source is not evident in the current valuation.
4. Disability and active mortality experience are too small to be noticed on the chart, given their insignificant size relative to other experience items. Since there have been both gains and losses in each of these areas during the period shown, they are not an immediate area of concern.
5. The net liability (gain)/loss is shown by the black line on the graph above. This net (gain)/loss as a percent of liability is shown above the bars. The percent is generally quite small and there is not a consistent pattern of either gains or losses.

Below we summarize the demographic assumptions that we have reviewed, and we have concluded all are reasonable and meet the requirements of ASOP No. 35, Section 3.3.4.

1. Mortality

The mortality assumptions are as follows:

Employee Type of Academic:

Base Table with 2010 Base Year	Male Multiplier	Female Multiplier
Pub-2010 Employee Mortality Table (for Teachers) (pre-retirement)	101%	97%
Pub-2010 Healthy Retiree Mortality Table (for Teachers) (non-disabled post-retirement)	99%	105%
Pub-2010 Disabled Retiree Mortality Table (for Non-Safety Employees) (disabled post-retirement)	112%	110%

Employee Type of Non-Academic:

Base Table with 2010 Base Year	Male Multiplier	Female Multiplier
Pub-2010 Employee Mortality Table (for General Employees) (pre-retirement)	114%	105%
Pub-2010 Healthy Retiree Mortality Table (for General Employees) (non-disabled post-retirement)	99%	107%
Pub-2010 Disabled Retiree Mortality Table (for Non-Safety Employees) (disabled post-retirement)	112%	110%

The provision for future mortality improvement is based on the generational application of the MP-2020 improvement scales.

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Sample Mortality Rates								
Future Life Expectancy (years) in 2022					Future Life Expectancy (years) in 2035			
Age	<u>Academic</u>		<u>Non-Academic</u>		<u>Academic</u>		<u>Non-Academic</u>	
	Male	Female	Male	Female	Male	Female	Male	Female
35	53.50	55.24	51.10	53.42	54.48	56.13	52.30	54.46
40	48.25	49.98	45.83	48.12	49.23	50.88	47.03	49.17
45	43.02	44.74	40.59	42.84	43.99	45.64	41.77	43.88
50	37.81	39.51	35.48	37.67	38.78	40.41	36.63	38.70
55	32.69	34.38	30.59	32.72	33.65	35.27	31.70	33.72
60	27.72	29.44	25.87	27.89	28.65	30.29	26.92	28.84
65	22.96	24.63	21.37	23.20	23.82	25.42	22.32	24.07
70	18.43	19.96	17.12	18.71	19.19	20.67	17.93	19.48
75	14.23	15.54	13.19	14.51	14.87	16.17	13.87	15.17

2. Marriage Assumption

Members are assumed to be married in the following proportions:

Age	Males	Females
20-24	10%	25%
25-29	35	45
30-34	60	65
35-39	70	70
40-44	75	75
45-59	80	75
60-89	80	70

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3. Termination Rates

The termination rates are based on the most recent experience study period. The assumption is a table of turnover rates for each classification by years of service.

A sample of these rates follows:

Years of Service	Academic	Non-Academic
0	15.00%	15.00%
1	15.00	15.00
2	12.00	15.00
3	11.00	14.00
4	10.00	12.00
5	9.00	10.00
6	8.00	9.00
7	7.00	8.00
8	6.00	7.00
9	5.00	6.00
10	4.00	5.00
11	4.00	5.00
12	3.00	3.50
13	3.00	3.50
14	3.00	3.50
15	2.50	3.00
16	2.50	3.00
17	2.50	3.00
18	2.50	3.00
19	2.50	3.00
20	2.00	2.00
21	2.00	2.00
22	2.00	2.00
23	2.00	2.00
24	2.00	2.00
25	1.50	1.50
26	1.50	1.50
27	1.50	1.50
28	1.50	1.50
29	1.50	1.50

A termination rate of 100 percent is assumed at three years of service for members classified as part time for valuation purposes.

Members that terminate with at least five years of service (10 years of service for Tier 2 members) are assumed to elect the most valuable option on a present value basis, either refund of contributions or a deferred benefit.

Termination rate for 29 years of service used for Tier 2 members until retirement eligibility is met.

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4. Retirement Rates

Upon eligibility, active members are assumed to retire as follows:

<u>Members Hired before January 1, 2011 and Eligible for</u>						
<u>Academic</u>				<u>Non-Academic</u>		
Age	Normal Retirement		Early Retirement	Normal Retirement		Early Retirement
	Under 40 Years	40+ Years		Under 40 Years	40+ Years	
Under 50	55.0%	-	-	55.0%	-	-
50	55.0%	-	-	40.0%	-	-
51	40.0%	-	-	30.0%	-	-
52	40.0%	-	-	30.0%	-	-
53	30.0%	-	-	30.0%	-	-
54	30.0%	-	-	30.0%	-	-
55	20.0%	30.0%	7.0%	25.0%	37.5%	4.0%
56	20.0%	30.0%	5.5%	25.0%	37.5%	4.0%
57	20.0%	30.0%	4.0%	25.0%	37.5%	4.0%
58	20.0%	30.0%	5.0%	25.0%	37.5%	4.0%
59	20.0%	30.0%	5.5%	25.0%	37.5%	4.0%
60	13.0%	19.5%	-	20.0%	30.0%	-
61	13.0%	19.5%	-	15.0%	22.5%	-
62	13.0%	19.5%	-	15.0%	22.5%	-
63	13.0%	19.5%	-	15.0%	22.5%	-
64	13.0%	19.5%	-	15.0%	22.5%	-
65	17.0%	25.5%	-	25.0%	37.5%	-
66	17.0%	25.5%	-	25.0%	37.5%	-
67	17.0%	25.5%	-	25.0%	37.5%	-
68	17.0%	25.5%	-	25.0%	37.5%	-
69	17.0%	25.5%	-	25.0%	37.5%	-
70	17.0%	25.5%	-	20.0%	30.0%	-
71-79	15.0%	22.5%	-	20.0%	30.0%	-
80+	100.0%	100.0%	-	100.0%	100.0%	-

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<u>Members Hired on or After January 1, 2011 and Eligible for</u>					
Age	<u>Academic</u>		<u>Non-Academic</u>		<u>Police</u>
	Normal Retirement	Early Retirement	Normal Retirement	Early Retirement	Normal Retirement
60	-	-	-	-	60.0%
61	-	-	-	-	25.0%
62	-	25.0%	-	35.0%	25.0%
63	-	10.0%	-	15.0%	25.0%
64	-	10.0%	-	15.0%	25.0%
65	-	10.0%	-	15.0%	15.0%
66	-	10.0%	-	15.0%	15.0%
67	35.0%	-	35.0%	-	15.0%
68	17.0%	-	25.0%	-	25.0%
69	17.0%	-	25.0%	-	25.0%
70	17.0%	-	20.0%	-	20.0%
71-79	15.0%	-	20.0%	-	20.0%
80+	100.0%	-	100.0%	-	100.0%

A rate equal to 1.5 times the Tier 2 rate shown is used if a member has 40 or more years of service and is less than 80 years old. The rates shown above are for members with less than 40 years of service.

Members that retire are assumed to elect the most valuable option on a present value basis, either refund of contributions (or portable lump-sum retirement, if applicable) or a retirement annuity.

For purposes of the projections in the actuarial valuation, members of the Retirement Savings Plan are assumed to retire in accordance with the Tier 1 and Tier 2 retirement rates (based on hire date).

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5. Disability Rates

A table of disability incidence with sample rates follows:

Academic			Non-Academic		
Age	Males	Females	Age	Males	Females
20	0.00741%	0.01640%	20	0.02717%	0.037720%
21	0.00759%	0.01735%	21	0.02783%	0.039905%
22	0.00777%	0.01830%	22	0.02849%	0.042090%
23	0.00795%	0.01925%	23	0.02915%	0.044275%
24	0.00813%	0.02020%	24	0.02981%	0.046460%
25	0.00831%	0.02115%	25	0.03047%	0.048645%
26	0.00849%	0.02210%	26	0.03113%	0.050830%
27	0.00867%	0.02305%	27	0.03179%	0.053015%
28	0.00885%	0.02405%	28	0.03245%	0.055315%
29	0.00900%	0.02500%	29	0.03300%	0.057500%
30	0.00945%	0.02705%	30	0.03465%	0.062215%
31	0.00990%	0.02910%	31	0.03630%	0.066930%
32	0.01035%	0.03115%	32	0.03795%	0.071645%
33	0.01077%	0.03320%	33	0.03949%	0.076360%
34	0.01122%	0.03525%	34	0.04114%	0.081075%
35	0.01185%	0.03725%	35	0.04345%	0.085675%
36	0.01245%	0.03930%	36	0.04565%	0.090390%
37	0.01308%	0.04135%	37	0.04796%	0.095105%
38	0.01371%	0.04340%	38	0.05027%	0.099820%
39	0.01431%	0.04545%	39	0.05247%	0.104535%
40	0.01608%	0.04750%	40	0.05896%	0.109250%
41	0.01785%	0.04955%	41	0.06545%	0.113965%
42	0.01962%	0.05160%	42	0.07194%	0.118680%
43	0.02139%	0.05365%	43	0.07843%	0.123395%
44	0.02316%	0.05570%	44	0.08492%	0.128110%
45	0.02535%	0.05775%	45	0.09295%	0.132825%
46	0.02757%	0.05980%	46	0.10109%	0.137540%
47	0.02979%	0.06185%	47	0.10923%	0.142255%
48	0.03198%	0.06390%	48	0.11726%	0.146970%
49	0.03420%	0.06595%	49	0.12540%	0.151685%
50	0.03642%	0.06800%	50	0.13354%	0.156400%
51	0.03861%	0.07005%	51	0.14157%	0.161115%
52	0.04083%	0.07210%	52	0.14971%	0.165830%
53	0.04305%	0.07415%	53	0.15785%	0.170545%
54	0.04524%	0.07620%	54	0.16588%	0.175260%
55 and older	0.04656%	0.07825%	55 and older	0.17072%	0.179975%

Disability rates apply during the retirement eligibility period.

Members are assumed to first receive disability benefits and then receive disability retirement annuity benefits.

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6. Operational Expenses

The amount of operational expenses for administration incurred in the latest fiscal year are supplied by SURS staff and incorporated in the normal cost. Estimated administrative expenses for FY 2024 and after are assumed to increase by 3.00%.

7. Spouse's Age

The female spouse is assumed to be three years younger than the male spouse.

8. Missing Data

Members with an unknown gender are assumed to be female. Active and inactive members with an unknown date of birth are assumed to be 37 years old at the valuation date. An assumed spouse date of birth is calculated for current service retirees in the traditional plan for purposes of calculating future survivor benefits. The female spouse is assumed to be three years younger than the male spouse. Seventy percent of current total male retirees and 80% of current total female retirees in the traditional plan that have not elected a survivor refund are assumed to have a spouse at the valuation date.

9. Benefit Commencement Age

Inactive members eligible for a deferred benefit are assumed to commence benefits at their earliest normal retirement age. For Tier 1 members, this is age 62 with at least five years of service, age 60 with at least eight years of service, or immediately with at least 30 years of service. For Tier 2 members, this is age 67 with 10 or more years of service.

10. Load on Final Average Salary

No load is assumed to account for higher than assumed pay increases in final years of employment before retirement.

11. Load on Liabilities for Service Retirees with Non-finalized Benefits

A load of 10% on liabilities for service retirees whose benefits have not been finalized as of the valuation date is assumed to account for finalized benefits that on average are 10% higher than 100% of the preliminary estimated benefit. A load of 5% is used if a “best formula” benefit was provided in the data by Staff.

12. Valuation of Inactives

An annuity benefit is estimated based on information provided by staff for Tier 1 inactive members with five or more years of service and Tier 2 members with 10 or more years of service.

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13. Reciprocal Service

Reciprocal service is included for current inactive members for purposes of determining vesting eligibility and eligibility age to commence benefits.

The recently updated actuarial assumptions (including retirement and termination rates) were based on SURS service only. Therefore, reciprocal service was not included for current active members.

14. Projection Assumptions

The number of total active members throughout the projection period will remain the same as the total number of active members in the defined benefit plans and the RSP in the current valuation.

Future new hires are assumed to elect to participate in the offered plans as follows:

- Academic
 - 45% are assumed to elect to participate in the Retirement Saving Plan.
 - 55% are assumed to elect to participate in the Tier 2 Plan
- Non-Academic
 - 25% are assumed to elect to participate in the Self-Managed Plan.
 - 75% are assumed to elect to participate in the Tier 2 Plan

New entrants have an average age of 38.0 and average capped pay of \$48,903 and average uncapped pay of \$50,949 (2022 dollars). These values are based on the average age and average pay of current members. The range profile is based on the age at hire and assumed pay at hire (using the actuarial assumptions, inflated to 2022 dollars) of current active members with hire dates between July 1, 2018 and July 1, 2021.

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Summary of New Entrants - Academic									
Age	Number Males	Average Pay		Number Females	Average Pay		Total Number	Average Pay	
		Capped Male	Uncapped Male		Capped Female	Uncapped Female		Capped Total	Uncapped Total
<20	0	\$0	\$0	0	\$0	\$0	0	\$0	\$0
20 - 24	47	32,155	32,155	49	30,508	30,508	96	31,314	31,314
25 - 29	234	43,834	44,728	305	42,792	43,265	539	43,244	43,900
30 - 34	440	66,976	73,388	613	54,723	57,981	1,053	59,843	64,419
35 - 39	465	61,015	67,456	511	55,080	58,194	976	57,907	62,607
40 - 44	309	57,691	65,611	354	49,211	52,250	663	53,289	58,477
45 - 49	227	49,920	56,773	263	45,480	49,575	490	47,537	52,909
50 - 54	138	52,182	57,487	180	42,862	44,825	318	46,907	50,320
55 - 59	135	52,585	62,936	132	43,288	50,437	267	47,988	56,757
60 - 64	95	38,475	49,256	81	36,951	40,719	176	37,773	45,327
65 - 69	13	36,770	43,819	6	55,062	79,530	19	42,546	55,096
Total	2,103	\$55,770	\$62,042	2,494	\$49,067	\$52,128	4,597	\$52,133	\$56,663

Summary of New Entrants – Non - Academic									
Age	Number Males	Average Pay		Number Females	Average Pay		Total Number	Average Pay	
		Capped Male	Uncapped Male		Capped Female	Uncapped Female		Capped Total	Uncapped Total
<20	14	\$22,837	\$22,837	21	\$19,503	\$19,503	35	\$20,837	\$20,837
20 - 24	453	35,466	35,466	705	34,135	34,135	1,158	34,656	34,656
25 - 29	1,040	44,798	44,841	1,633	44,284	44,287	2,673	44,484	44,503
30 - 34	967	51,711	53,506	1,382	48,857	49,474	2,349	50,032	51,134
35 - 39	633	56,172	58,066	1,091	48,926	49,439	1,724	51,587	52,608
40 - 44	460	57,646	59,793	856	49,876	51,073	1,316	52,592	54,121
45 - 49	413	55,503	58,590	725	47,944	49,205	1,138	50,687	52,611
50 - 54	357	54,799	58,706	585	46,671	47,962	942	49,751	52,034
55 - 59	282	57,611	63,494	457	44,192	45,475	739	49,313	52,351
60 - 64	147	51,804	58,131	202	44,118	48,430	349	47,356	52,516
65 - 69	7	52,283	52,283	9	38,367	40,377	16	44,455	45,586
Total	4,773	\$50,653	\$52,586	7,666	\$45,904	\$46,632	12,439	\$47,726	\$48,917

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE
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SECTION III – SUPPORTING ANALYSIS

15. Retirement Savings Plan (RSP) Contribution Assumptions

The projected RSP contributions are equal to 7.6% of RSP payroll, plus estimated RSP expenses minus RSP employer forfeitures. Estimated RSP expenses for FY 2023 are \$1,122,835 and actual FY 2022 RSP employer forfeitures used to reduce the certified contributions for FY 2024 are \$8,393,643. Estimated RSP expenses for FY 2024 and after are assumed to increase by 3.00%. Estimated RSP employer forfeitures used to reduce the certified contributions for FY 2025 and after are assumed to be 7.5% of the gross RSP employer contribution.

16. Pensionable Earnings Greater than 6%

The participant's employer is required to pay the present value of the increase in benefits resulting from the portion of the increase in excess of 6.00% for earnings used in the calculation of the final average salary. The projections include a component paid for by employers for earnings increases greater than 6.00% in the calculation of the final average salary.

17. Governor's Pay

The Governor's pay is \$184,800 as of June 30, 2022, and budgeted as of \$190,700 as of June 30, 2023, and is expected to increase each year by the assumed rate of Tier 2 capped payroll growth of 1.125%.

18. Buyout Election Assumption.

Zero percent of eligible Tier 1 active members are assumed to elect to receive a reduced and delayed AAI benefit at retirement and an accelerated pension benefit option in accordance with Public Act 100-0587, 101-0010, and 102-718. Zero percent of eligible inactive members are assumed to elect to receive an accelerated pension benefit option in lieu of an annuity at retirement in accordance with Public Act 100-0587 and 101-0010.

Comment: Again, this year GRS studied buyout option elections for the two options available in the Plan:

- i) The vested inactive member buyout (VIB) which provides vested inactive members a payment equal to 60% of the present value of their pension benefit in lieu of any future payments, and
- ii) The automatic annual increase buyout which provides Tier 1 members a payment equal to 70% of the difference between the present value of their current AAI provisions and the revised provision available to Tier 2 members

Their analysis showed that very few members have been approved for buyouts through 6/30/2022. We find this assumption and the basis for setting it as reasonable.

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SECTION III – SUPPORTING ANALYSIS

19. Treatment of Benefits in Excess of the Internal Revenue Code Section 415 Limits.

The benefit amounts in excess of the IRC Section 415 limits for current retirees are paid through the Excess Benefit Arrangement (EBA) and are not reported in the actuarial valuation data. Therefore, the liabilities and the required contributions for these EBA benefits are not reflected in the actuarial valuation results. The amount of the estimated EBA payments for the upcoming fiscal year are provided by SURS Staff and included in the statutory contribution requirement.

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SECTION III – SUPPORTING ANALYSIS

C. Funding Methods

Actuarial funding methods consist of three components: (1) the actuarial cost method, which is the attribution of total costs to past, current, and future years; (2) the asset valuation method (i.e., asset smoothing); and (3) the amortization method.

1. Actuarial Cost Method

The System uses the projected unit credit cost method (PUC) to assign costs to years of service, as required under the Pension Code (40 ILCS 5/15). **We have no objections with respect to using the PUC method, although we would prefer the Entry Age Normal (EAN) cost method as it is more consistent with the requirement in 40 ILCS 5/15 -155 requirement for level percentage of pay funding.**

Under the PUC method, which is used by some public sector pension funds, the benefits of active participants are calculated based on their compensation projected with assumed annual increases to ages at which they are assumed to leave the active workforce by any of these causes: retirement, disability, turnover, or death. Only past service (through the valuation date but not beyond) is taken into account in calculating these benefits. The present value of these benefits based on past service and future compensation is the actuarial liability for a given active participant. Under the PUC cost method, the value of an active participant's benefits tends to increase more sharply over his or her later years of service than over his or her earlier ones. While the PUC method is not an unreasonable method, as a result of this pattern of benefit values increasing, more plans use the EAN cost method to mitigate this effect. It should also be noted that the EAN cost method is the required method to calculate liability for GASB Nos 67 and 68.

2. Asset Valuation Method

The Actuarial Value of Assets for the System is a smoothed market value. Unanticipated changes in market value are recognized over five years in the Actuarial Value of Assets. The primary purpose for smoothing out gains and losses over multiple years is so fluctuations in the contributions will be less volatile over time than if based on the Market Value of Assets.

The 2021 Public Retirement Systems Study by the National Conference on Public Employee Retirement Systems (NCPERS) survey of 156 public retirement funds found that the majority of plans responding to the survey have a five-year smoothing period.

Smoothing the market gains and losses over a period of five years to determine the Actuarial Value of Assets is a generally accepted approach in determining actuarial cost, and we concur with its use.

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3. Amortization Method

The mandated State contribution is based on a determination of the level percentage of payroll that is expected to achieve a 90% funded ratio in 2045. While not a traditional amortization method, this methodology effectively amortizes a portion of the unfunded actuarial liability over the remaining period until 2045, which is currently 23 years.

One of the principles of funding public plans identified by the American Academy of Actuaries is that there should be “a plan to make up for any variations in actual assets from the funding target within a defined and reasonable time period.” Because it only targets 90%, the State method does not include a plan to achieve the funding target over any period of time.

Typical public plan amortization methods are designed to increase each year by expected payroll growth. Under the State mandated method, however, the effective amortization payment increases each year by more than the expected growth in payroll. As a result, the State mandated method defers payments on the unfunded actuarial liability further into the future than under typical public plan amortization methods.

Finally, as the remaining period to achieve 90% funding shortens, the State mandated method will also produce more volatile contributions. Instead of a single fixed period, typical public plan amortization methods use layered amortization bases such that new assumption changes and experience gains and losses are amortized over a new period (e.g., 20 years) while the remaining period for the prior amortization layers becomes one year shorter.

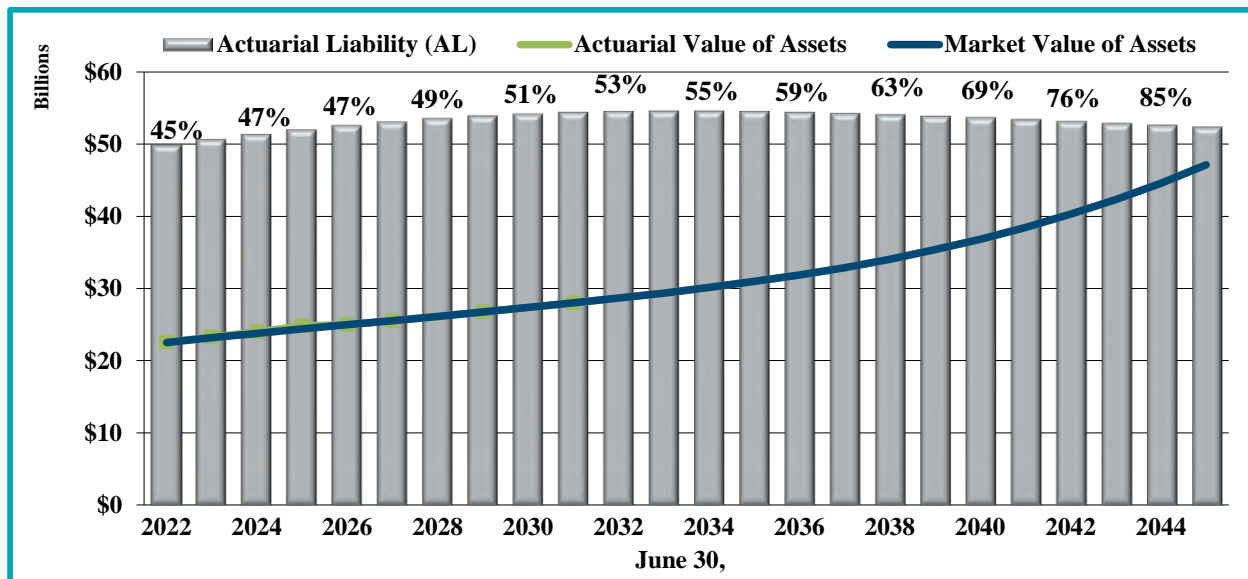
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SECTION IV– PROJECTION ANALYSIS

This section reviews the projections contained in the June 30, 2022 Actuarial Valuation of SURS. These projections are fundamental to the development of the required State contribution calculated under the current statutory funding requirement.

The following graphs are independent approximations of the projections performed by the State actuary to verify that the System's funding projections are reasonable. They do not reflect all the precision of the projections applied by the System's actuary, but instead they are intended to verify the reasonableness of the modeling done by the System's actuary.

The graph below shows our projection of the expected future liabilities and assets in the System through 2045. As pointed out on page 9 of the June 30, 2022 Actuarial Valuation, the majority of the funding of the System occurs in the later years of the projections. **The lines show the projected assets** (market value and actuarial value), and the **bars show the projected liabilities** of the System. The funded ratio for every other year is shown at the top of the bars. For example, in 2034, the funded ratio is projected to be approximately 55%, with assets being approximately \$30 billion and liabilities being approximately \$55 billion.

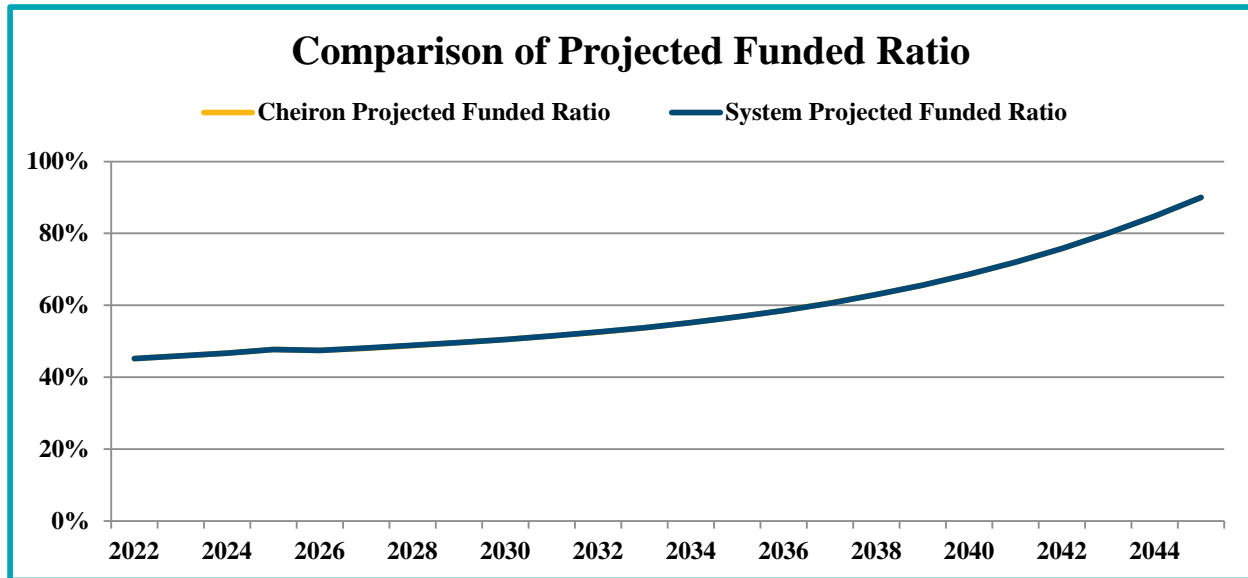


Source: Cheiron projection analysis.

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SECTION IV– PROJECTION ANALYSIS

When we compare our projected funded ratio against the results shown in the June 30, 2022 Actuarial Valuation, **we find a very close match in expected funded ratio**. This close match of the funded ratio indicates that the projections done by the System's actuary are reasonable and the fact we show slightly different funded ratios is a function of Cheiron's approximation.

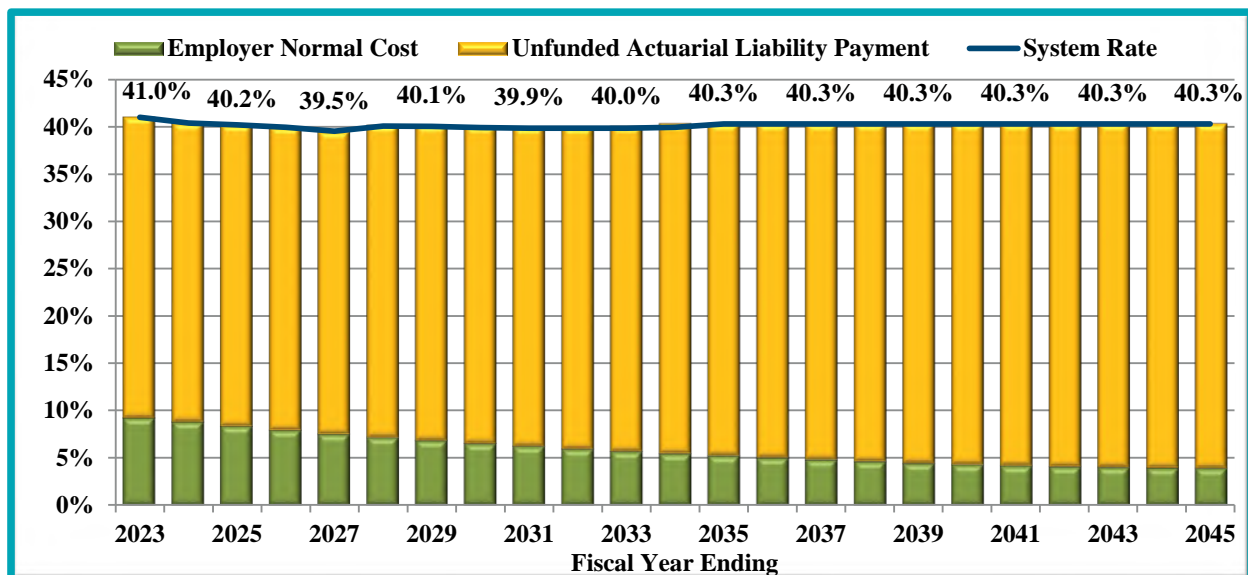


Source: Cheiron projection analysis.

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SECTION IV– PROJECTION ANALYSIS

The following graph shows the expected contributions calculated under the statutory method. The contribution as a percentage of payroll is shown above each bar. The value shown for the fiscal year ending 2023 was set based on the June 30, 2021 Actuarial Valuation. The current valuation is the basis for setting the rates starting July 1, 2023 (Fiscal Year Ending June 30, 2024). The contribution requirement has two components: 1) the employer normal cost, which is the approximate value of the amount of benefits accrued by participants not covered by employee contributions based on the statutory funding method; and 2) an amortization of the unfunded liability. The normal cost amounts are shown by the green bars and the amortization of the unfunded actuarial liability (UAL) amounts by the yellow bars. The percentages shown are the total contribution rates calculated by Cheiron which are equal to the sum of the bars. The graph shows that a larger percentage of the total contribution is being made toward the UAL payment later in the period. The blue line shows the projected contribution rates as a percentage of payroll from the June 30, 2022 Actuarial Valuation. The difference between Cheiron's approximation and the System's projections is the difference between the top of the bars and the line.



Source: Cheiron projection analysis.

Our conclusion is that **the projections performed by the System's actuary are reasonable.**

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SECTION V– ANALYSIS OF FUNDING ADEQUACY

In this section, we examine the adequacy of the funding for the System, including funded ratio, the sources of changes in the unfunded actuarial liability (UAL), and projections of the UAL and statutory funding requirements compared to contributions needed to pay down the UAL.

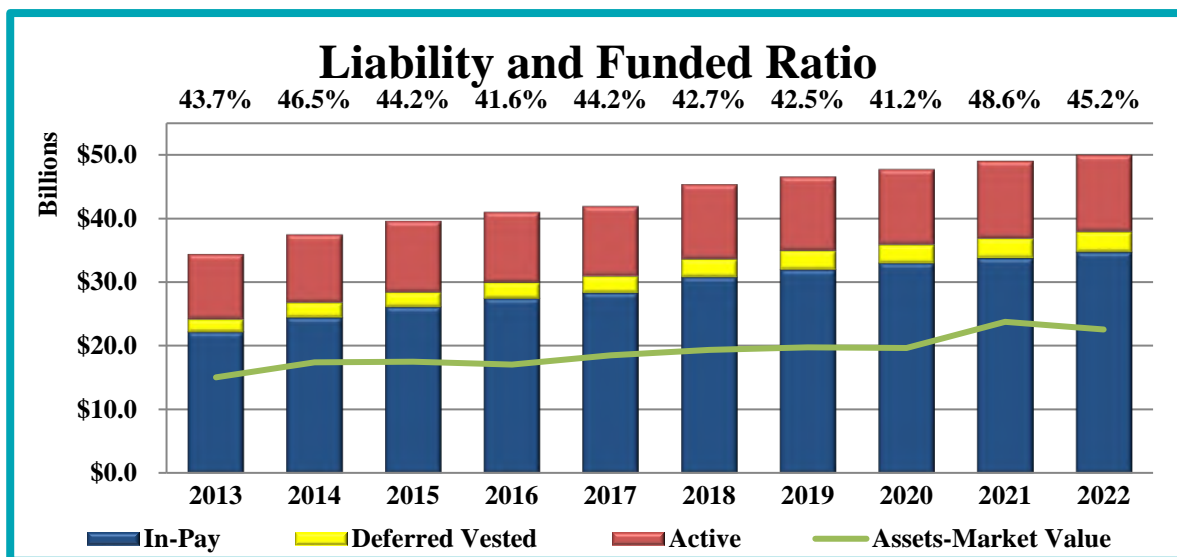
The actuarial valuation report prepared by GRS includes both traditional actuarial measurements, as well as additional risk measurements that are shown on pages 15, 16, and 17 in their 2022 valuation report. Given the unique and substantial funding challenges faced by the Illinois pension systems, this additional information is quite important and supplements the information we present here on funding adequacy to better inform the legislature and other stakeholders about the adequacy of the System's funding.

System Funded Ratio

The first funding adequacy measure we present is a historical funded ratio trend for the past ten years. Funded ratio for this measure is defined as the ratio of the Market Value of Assets to the actuarial liability. The chart below shows SURS' funded ratio since 2013 has gone from 43.7% funded to 45.2% funded in 2022, an increase in funded ratio of 1.5%. In addition to showing the funded ratio, this chart also shows the breakdown of the plan's liabilities by membership status:

- Active liability – the liability (attributable to service already performed) for future payments to members who are currently working in the System,
- Deferred Vested liability – the liability for future payments to members who are no longer working in the system, and
- In-Pay liability – the liability for future payments to retirees and beneficiaries who are currently receiving benefits.

This breakdown shows that today plan assets only cover about 65% of the liabilities for just those members currently in-pay status.



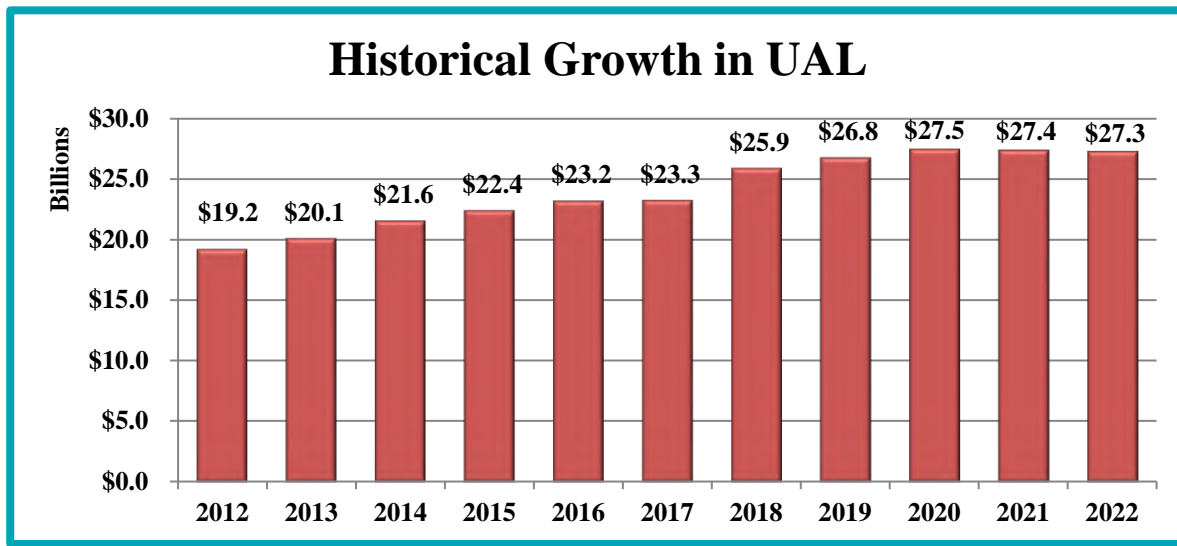
Source: Cheiron analysis of funding adequacy.

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SECTION V– ANALYSIS OF FUNDING ADEQUACY

Sources of Changes in the UAL

As shown in the chart below, SURS' unfunded actuarial liability (UAL) has grown from about \$19.2 billion in 2012 to \$27.3 billion in 2022, an increase of \$8.1 billion. In order to understand how to reverse this trend, it is important to understand the sources contributing to it.



Source: Cheiron analysis of funding adequacy.

The changes to the UAL from June 30, 2012 to June 30, 2022 can be separated into the following components:

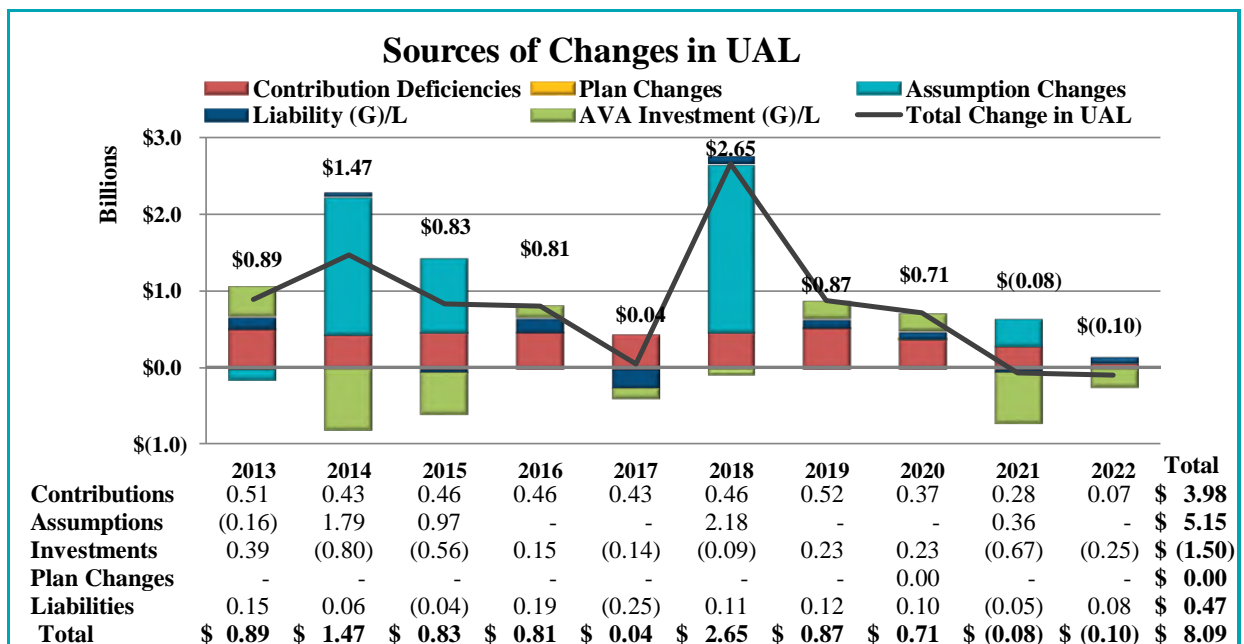
- **Contribution Deficiencies** – Contributions that are less than the tread water contribution causes the UAL to increase. The tread water contribution consists of two components: the normal cost, which is the cost of benefits earned in a given year, and the interest on the unfunded actuarial liability. This sum is referred to as the tread water contribution because it is the contribution necessary so that the UAL will remain constant, or “tread water” (absent experience gains or losses). The difference between actual contributions and the tread water contributions have increased the UAL by \$3.98 billion over this period.
- **Assumption Changes** are changes to actuarial assumptions as the System updated expectations on future investment returns and life expectancy. A positive aspect of the UAL increases due to assumption changes is that they will result in liability measurements that more accurately reflect future expectations. Over this period assumption changes have increased the UAL by \$5.15 billion
- **Plan Changes** are any modifications of the design of the Plan, which have affected benefits already accrued. Since most of the changes to the System’s plan affect only future benefits the impact has been negligible during this period.

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SECTION V– ANALYSIS OF FUNDING ADEQUACY

- **Liability (Gain) or Loss** are the changes in the UAL due to liability experience (i.e., mortality, terminations, salary increases, etc.). These were generally small and had a net effect of increasing the UAL by \$0.47 billion during this period.
- **AVA (Actuarial Value of Assets) Investment (Gain) or Loss** is the net investment gain or loss due to assets earning more or less than assumed. These have decreased the UAL over this period by \$1.50 billion.

The chart below shows the changes in UAL each year broken into these five components. The sum of all the components (total change in UAL) is shown as the black line.



Source: Cheiron analysis of funding adequacy.

We expect that this chart will help stakeholders understand the sources of growth in the UAL over the past decade and inform discussions about the current funding requirements and adequacy.

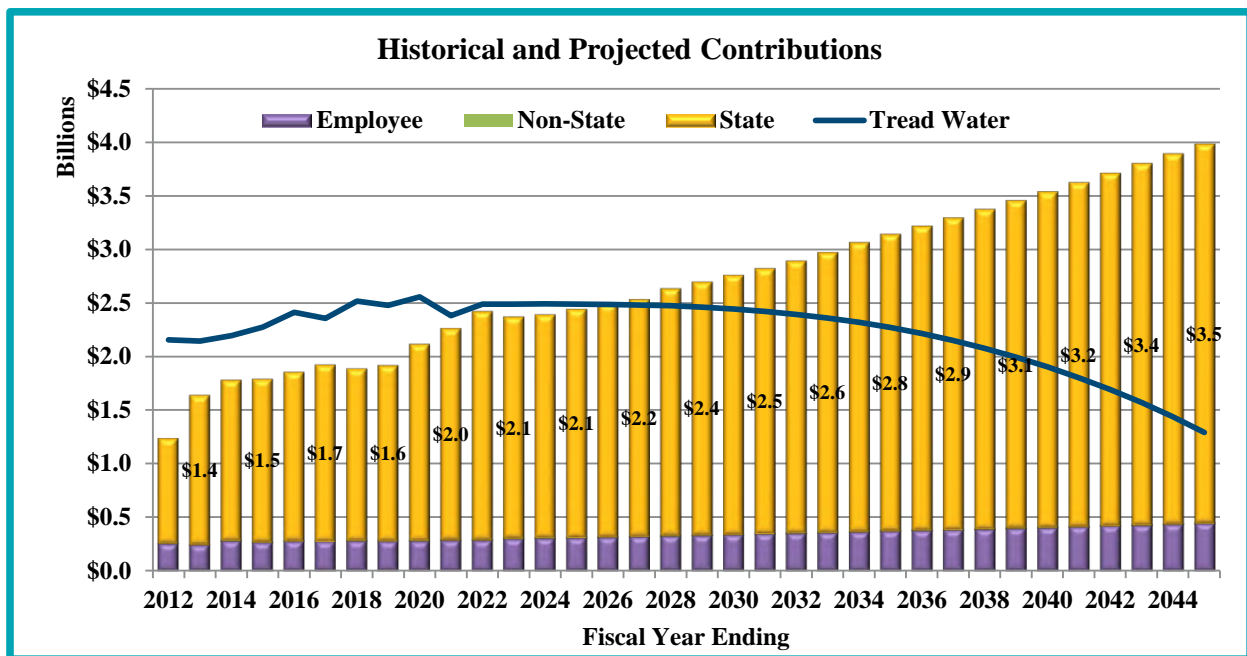
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SECTION V– ANALYSIS OF FUNDING ADEQUACY

Actual Contributions Compared to Tread Water Contribution

One of the persistent sources of the increase in UAL is due to actual contributions to the System being less than the tread water contribution (the amount needed to prevent the UAL from increasing if all assumptions are met). These contribution deficiencies have added between \$70 to \$510 million to the UAL each year over the historical period shown.

As the chart below shows, actual contributions have been significantly less than the tread water cost. Each year that total contributions remain below the tread water cost (blue line), the UAL is expected to grow. As shown in the graph below the contributions from the State will need to increase before the total contribution reaches the tread water contribution (expected in FYE 2026) and begins to pay down the UAL based on the Market Value of Assets.



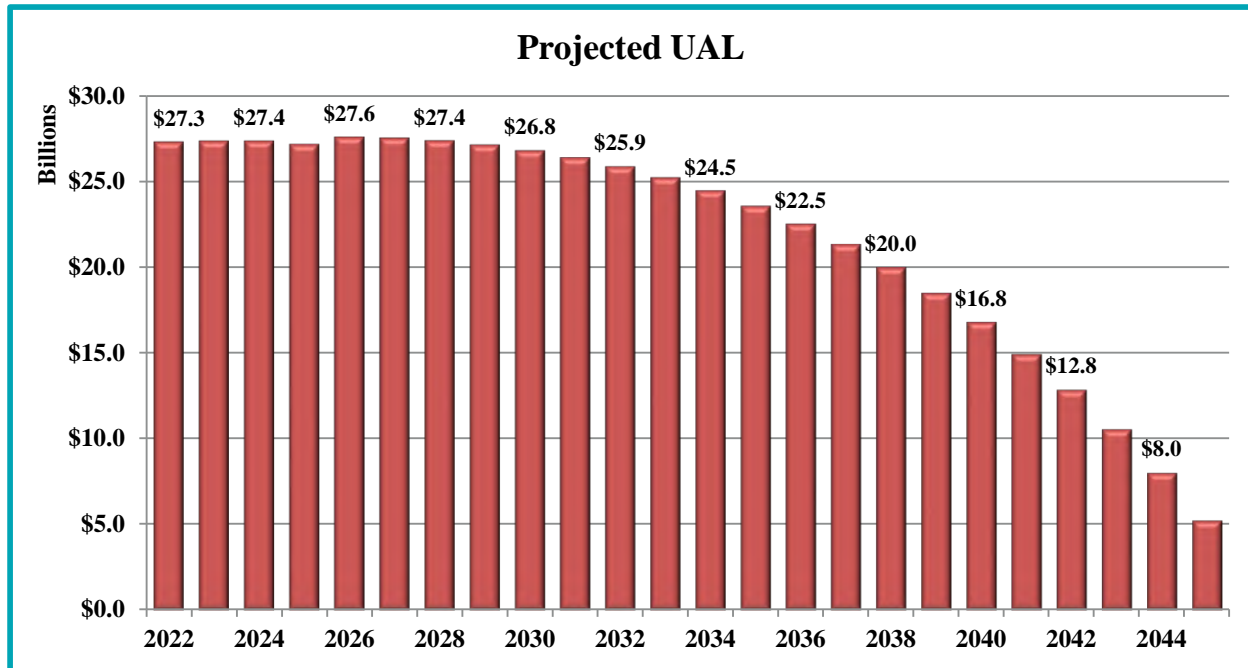
Source: Cheiron analysis of funding adequacy.

The System’s actuary commented that “the statutory funding method generates a contribution requirement that is less than a reasonable actuarially determined contribution”. Because a “reasonable actuarially determined contribution” has never been defined in actuarial standards, it isn’t clear what standard the System’s actuary is using to make this determination. However, a revision to ASOP 4 has defined a “Reasonable Actuarial Determination Contribution” and that definition will be first effective for next year’s valuation. The actuary will need to consider the new ASOP 4 definition when evaluating this statement next year.

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SECTION V– ANALYSIS OF FUNDING ADEQUACY

The next chart shows that if the Minimum Required Contributions continue to be made each year and all other assumptions are met, the UAL based on the Actuarial Value of Assets is projected to decline from \$27 billion in 2022 to \$5 billion in 2045. The slight growth over the next few years is due to a combination of contributions and recognition of offsetting investment gains and losses in the asset smoothing method.



Source: Cheiron analysis of funding adequacy

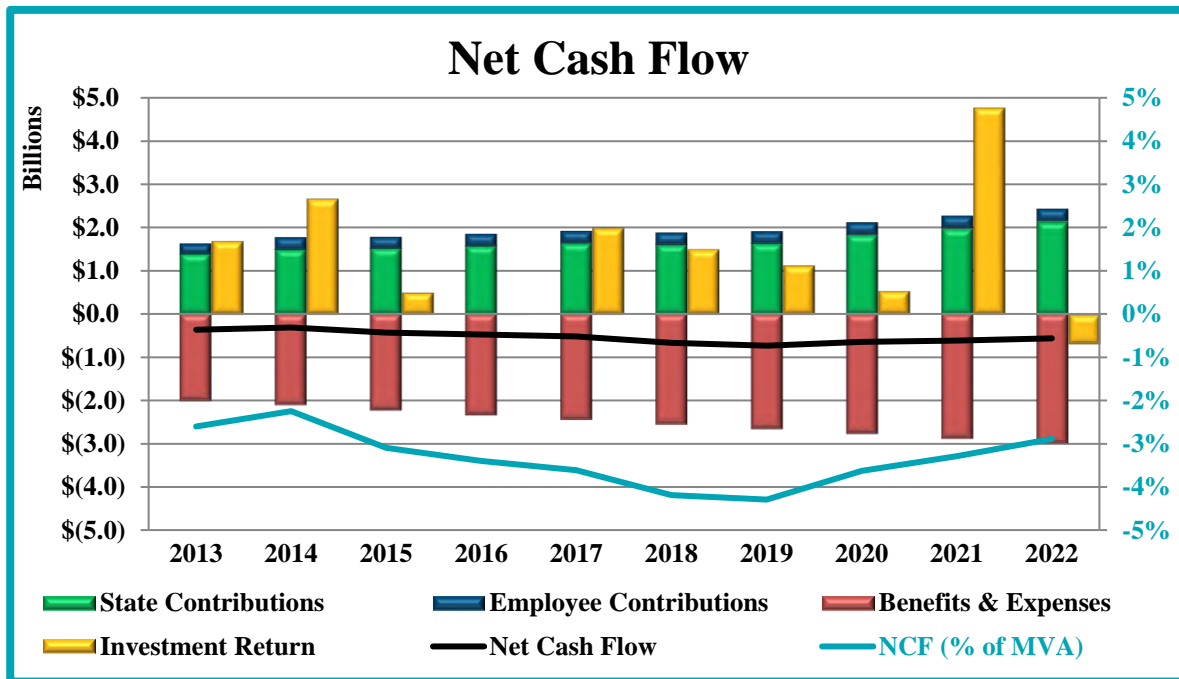
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SECTION V– ANALYSIS OF FUNDING ADEQUACY

Net Cash Flow Analysis

The plan's net cash flow is defined as State and member contributions less benefit payments and administrative expenses. The more negative net cash flow is as a percentage of the plan's assets, the more vulnerable the Plan is to market downturns. When a pension plan has more payouts than contributions and suffers an investment loss, it is left with fewer assets to invest and recapture during a recovery.

Looking at the chart below, SURS has slightly negative net cash flow (black line). If contributions increase as quickly as benefit payments, the net cash flow will remain stable. But if contributions do not continue to grow either because the Plan has become better funded or because the expected contributions are not made, negative net cash flow may become a more significant issue, therefore it should continue to be monitored. The teal line shows net cash flow as a percent of Market Value of Assets on the right-side axis. The greater the negative cash flows are relative to plan assets the more vulnerable a plan is to market downturns. This is because once there is a market downturn, the plan assets lose both on the return and the negative cash flow, leaving it with a lower asset base from which to recover from the loss.



Source: Cheiron analysis of funding adequacy.

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STATUS OF RECOMMENDATIONS FROM THE 2021 STATE ACTUARY REPORT

Response to Recommendations in 2021

In the State Actuary's Preliminary Report on the State Universities Retirement System of Illinois presented December 15, 2021, Cheiron made several recommendations. Below we summarize how these recommendations were reflected in either the System's comments last year or in this year's June 30, 2022 Actuarial Valuation.

Recommendations to Retirement System from 2021 State Actuary Report	Status	Comments
1. We continue to recommend that the funding method be changed to fully fund plan benefits. Continuing the practice of inadequate contributions and targeting a funded percentage less than 100% increases the risk of the System becoming unsustainable. Consequently, we recommend that the funding method maintain contributions at a level that is expected to reduce the unfunded actuarial liability each year until the Plan is ultimately 100% funded. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.	Partially Implemented	<p>The System has adopted a funding policy that would meet recommendation; however, the actual funding of the System is based on State statute and a change in the funding method and funding policy would require a statutory change.</p> <p>GRS continues to include strong language throughout their report recommending the use of an actuarially sound method and stating clearly that the statutory method is not actuarially sound. We find these statements to be appropriate and support their continuation.</p> <p>Recommendation repeated.</p>
2. Because experience studies are performed every three years, we recommend the phase-in period of the impact of assumption changes be reduced to three years. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.	Not Implemented	<p>This period is determined by Public Act 100-0023 and would require a statutory change.</p> <p>Recommendation repeated.</p>
3. We recommend that future stress testing include the impact to the required State contribution of potential reductions in the discount rate.	Not Implemented	<p>The stress testing included in the 2021 Actuarial Valuation did not include testing the impact of potential reduction in the discount rate.</p> <p>Recommendation repeated.</p>

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STATUS OF RECOMMENDATIONS FROM THE 2021 STATE ACTUARY REPORT

Recommendations to Retirement System from 2021 State Actuary Report	Status	Comments
4. We recommend that the actuary explain how each risk identified would reasonably be anticipated to significantly affect the specific plan's future financial condition.	Not Implemented	The risks currently identified appear to largely duplicate the list of examples in ASOP 51 and could apply to almost any pension plan. Recommendation repeated.
5. We recommend that for each identified risk the actuary provide an assessment, preferably quantitative, that considers the specific circumstances of this plan.	Not Implemented	ASOP 51 requires the actuary to provide an assessment that takes into account "circumstances specific to the plan." For asset/liability mismatch, longevity, and other demographic risks, the actuary has only provided a generic statement that could apply to any plan and has not provided the assessment required by ASOP 51. Recommendation repeated.
6. We recommend that the SURS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly, as they did for this valuation.	Implemented	This review has been performed, evidenced and recommendation made by Meketa, the investment consultant to the fund in the June 2021 Experience Review Report and presentation. We will continue to include this recommendation each year. Recommendation continued.

Chapter Three

Preliminary Report on the State Employees' Retirement System

In accordance with 30 ILCS 5/2-8.1, Cheiron, the State Actuary, submitted a preliminary report to the Board of Trustees of the State Employees' Retirement

System (SERS) concerning proposed certifications of required State contributions submitted to Cheiron by the Board. The preliminary report was submitted to SERS on December 1, 2022. The preliminary report was based on Cheiron's review of actuarial assumptions included in SERS' 2022 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the State Employees' Retirement System. SERS' written response, provided on December 9, 2022, can be found in Appendix C.

OVERVIEW

STATE EMPLOYEES' RETIREMENT SYSTEM

as of June 30, 2022

Actuarial accrued liability	\$52,049,731,940
Actuarial value of assets	\$22,892,722,736
Unfunded liability	\$29,157,009,204
Funded ratio	44.0%

Employer normal cost	\$584,425,119
State contribution (FY24)	\$2,472,697,000

Active members	61,056
Inactive members	30,644
Current benefit recipients	76,918
Eligible for deferred benefits	152
Total membership	168,770

Interest rate assumption	6.75%
Inflation assumption	2.25%
Actuarial cost method	Projected Unit Credit
Asset valuation method	5-year Smoothing

Executive Director	Tim Blair
Actuarial Firm	Gabriel, Roeder, Smith & Company

Source: June 30, 2022 SERS actuarial valuation report.

December 15, 2022

Mr. Frank Mautino
Auditor General
740 East Ash Street
Springfield, Illinois 62703

Board of Trustees
State Employees' Retirement System of Illinois
2101 South Veterans Parkway
P.O. Box 19255
Springfield, Illinois 62794-9255

Dear Trustees and Auditor General:

In accordance with the Illinois State Auditing Act (30 ILCS 5/2-8.1), Cheiron is submitting this preliminary report concerning the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contribution to the State Employees' Retirement System of Illinois (SERS or System) for Fiscal Year 2024.

In summary, we believe that the assumptions and methods used in the draft June 30, 2022 Actuarial Valuation, which are used to determine the required Fiscal Year 2024 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, were properly calculated in accordance with State law.

Section I of this report describes the review process undertaken by Cheiron. Section II summarizes our findings and recommendations. Section III provides the supporting analysis for those findings and presents more details on our assessment of the actuarial assumptions and methods employed in GRS's Actuarial Certification, as well as our assessment of GRS's determination of the required State contribution for Fiscal Year 2024. Section III also includes comments on other issues impacting the funding of SERS, including the implications of Article 14 of the Illinois Pension Code, which establishes the statutory minimum funding requirements for the System. **We agree with GRS that the statutory mandated minimum funding requirements have been and continue to be inadequate. In addition, the past inadequate funding has resulted in current and future contribution levels, measured as a percent of payroll, to be among the highest in the country. Making adequate contributions in the future to fully fund the system will be challenging.** Section IV reviews the projections contained in the draft June 30, 2022 Actuarial Valuation. Finally, Section V provides an analysis of funding adequacy.

In preparing this report, we relied on information (some oral and some written) supplied by SERS and GRS. This information includes actuarial assumptions and methods adopted by the SERS Board, System provisions, the draft June 30, 2022 Actuarial Valuation, the draft 2022 GASB 67/68 Report, the 2022 Valuation Results presentation, the 2021 Actuarial Experience Study, the 2022 Economic Assumption Update Review, the actuarial audit of the June 30, 2020 Actuarial Valuation, and minutes of the 2022 plan year SERS Board of Trustee meetings. A detailed description of all information provided for this review is contained in Appendix B.

This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys, and our firm does not provide any legal services or advice.

This report was prepared exclusively for the Office of the Auditor General and the State Employees' Retirement System of Illinois for the purpose described herein. Other users of this report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to any other user.

Sincerely,
Cheiron

SIGNED ORIGINAL ON FILE

Christian Benjaminson, FSA, EA, MAAA
Principal Consulting Actuary

SIGNED ORIGINAL ON FILE

Heath Merlak, FSA, EA, MAAA, FCA
Principal Consulting Actuary

**THE STATE ACTUARY’S PRELIMINARY REPORT ON THE
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SECTION I – REPORT SCOPE

Illinois Public Act 097-0694 (the Act) amended the Illinois State Auditing Act (30 ILCS 5/2-8.1) and requires Cheiron, as the State Actuary, to review the actuarial assumptions and valuation of the State Employees’ Retirement System of Illinois (SERS or System) and to issue to the SERS Board this preliminary report on the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contributions for Fiscal Year (FY) 2024. The purpose of this review is to identify any recommended changes to the actuarial assumptions for the SERS Board to consider before finalizing its certification of the required State contributions for FY 2024.

While the Act states that just the actuarial assumptions and valuation are to be reviewed, we have also reviewed the actuarial methodologies (funding and asset smoothing methods) employed in preparing the Actuarial Certification, as these methods can have a material effect on the amount of the State contribution being certified. Finally, we have offered our opinion on the implications of Article 14-131 of the Illinois Pension Code, which impacts the contribution amount certified by GRS.

In conducting this review, Cheiron reviewed the draft June 30, 2022 Actuarial Valuation, the draft 2022 GASB 67/68 Report, the 2022 Actuarial Results presentation, the 2021 Actuarial Experience Study, the 2022 Economic Assumption Update Review, the actuarial audit of the June 30, 2020 Actuarial Valuation, and minutes of the plan year 2022 SERS Board of Trustees meetings. The materials we reviewed are listed in Appendix B.

In addition to reviewing the Actuarial Certification of the required State contribution to SERS, the Act requires the State Actuary to conduct a review of the “actuarial practices” of the Board. While the term “actuarial practices” was not defined in the Act, we continue to interpret this language to mean that we review: (1) the use of a qualified actuary (as defined by the Qualification Standards of the American Academy of Actuaries) to prepare the annual actuarial valuation for determining the required State contribution; and (2) the conduct of periodic formal experience studies to justify the assumptions used in the actuarial valuation. In addition, we have included comments on actuarial communication and compliance with Actuarial Standards of Practice (ASOP) reflected in the draft June 30, 2022 Actuarial Valuation.

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SECTION II – SUMMARY OF RECOMMENDATIONS

This section summarizes recommendations from our review of the actuarial assumptions and methods employed in the draft June 30, 2022 Actuarial Valuation of SERS as well as the “actuarial practices” of the SERS Board. Section III of this report contains detailed analysis and rationale for these recommendations.

Proposed Certification of the Required State Contribution

Gabriel, Roeder, Smith & Company (GRS) has determined that the FY 2024 required State contribution calculated under the current statutory funding requirements is \$2,472,697,000. We have verified the arithmetic calculations made by GRS to develop this required State contribution and have reviewed the assumptions on which it was based. We have accepted GRS’s annual projections of future payroll, total normal costs, employee contributions, combined benefit payments and expenses, and total contributions.

State Mandated Funding Method

1. We recommend that the funding method be changed to employ a methodology that produces a Reasonable Actuarially Determined Contribution and fully funds plan benefits within a reasonable period. The State Mandated Method is entering a period in which the contribution amount it produces may be reasonable even though the overall methodology is not. This period offers an opportunity to change the methodology to one that is consistent with actuarial standards for a Reasonable Actuarially Determined Contribution (ADC) without significantly affecting the immediate contribution amount. Such a method would set contributions at a level that is expected to prevent the unfunded actuarial liability from growing and remain high enough to reduce the unfunded actuarial liability each year until the plan is ultimately 100% funded within a reasonable period. While the State Mandated Method is inadequate, it will also produce more volatile contribution levels as the remaining period to achieve 90% funding shortens. Consequently, we recommend that the funding method be changed to one that produces more stable contribution requirements while targeting 100% funding within a reasonable period and meets the actuarial standards for a Reasonable ADC. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

Recognition of Changes in Actuarial Assumptions

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modified the State’s funding policy to require that the contribution impact of all assumption changes be phased-in over a five-year period.

2. Because experience studies are performed every three years, we recommend that the phase-in period for the impact of assumption changes be reduced to no longer than three years. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

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Optional Hybrid Plan

P.A. 100-0023 created an Optional Hybrid Plan for current Tier 2 members and future new hires. The Optional Hybrid Plan consists of a reduced defined benefit plan and a defined contribution plan. Employers are required to contribute the normal cost plus an additional 2% of pay for each employee who participates in the Optional Hybrid Plan or Tier 2 in lieu of the Optional Hybrid Plan for fiscal year 2021 and after.

GRS identified in the draft June 30, 2022 report that, given the uncertainty of the election behavior and the small population eligible for the Optional Hybrid Plan, they have assumed all members will remain in Tier 2. In the assumptions used for projections, they have also assumed that future members will elect to remain in Tier 2.

Accelerated Pension Benefit Payments

P.A. 100-0587 created two accelerated pension benefit payment options. Inactive vested members have the option of receiving a lump-sum equal to 60% of the present value of their benefits in lieu of their annuity benefits, and Tier 1 members have the option upon retirement of accepting a reduced automatic annual increase in exchange for a lump-sum equal to 70% of the present value of the reduction in annuity benefits. Eligible members must make an election by June 30, 2026, if they want to receive the accelerated pension benefit payments.

Assessment of Actuarial Assumptions Used in the 2022 Valuation

30 ILCS 5/2-8.1 requires the State Actuary to identify recommended changes in actuarial assumptions that the SERS Board must consider before finalizing its certification of the required State contribution. We have reviewed all the actuarial assumptions used in the draft June 30, 2022 Actuarial Valuation and conclude that the assumptions are reasonable in general, based on the evidence provided to us.

Recommended Additional Disclosures for the 2022 Valuation

3. For 9 of the last 10 years, there have been actuarial liability losses attributable to the retirement decrement assumption. We recommend that GRS provide an explanation of the causes for consistent losses for this assumption.
4. For the actuarial liability (gain)/loss for 2022, there was \$119 million gain noted as “Other” on page 26 of the actuarial report. We recommend that GRS explain the cause of this gain.

Recommended Changes for Future Valuations

5. Section 3.2 of ASOP 51 requires the actuary to identify risks that “may reasonably be anticipated to **significantly affect** the plan’s future financial condition.” [emphasis added].

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The risks currently identified appear to largely duplicate the list of examples in ASOP 51 and could apply to almost any pension plan. In future valuations, we recommend that the actuary explain how each risk identified would reasonably be anticipated to significantly affect the specific plan's future financial condition.

6. For each risk identified above, Section 3.3 of ASOP 51 requires the actuary to provide an assessment that takes into account "circumstances specific to the plan." For some of the identified risks, the actuary has provided a quantitative assessment specific to the plan while for other identified risks, the actuary has only provided a generic statement that could apply to any plan. We recommend that for each identified risk the actuary provide an assessment, preferably quantitative, that considers the specific circumstances of this plan.
7. We recommend GRS provide explanation and justification for selecting the Below-Median Income subset for the base mortality table assumptions used in the valuation for retirees and provide justification for selecting the headcount weighted instead of a salary weighted for pre-retirement.
8. We recommend the SERS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly, as they did for this valuation.

GASB 67 and 68

The 2022 SERS GASB Nos. 67 and 68 information was provided in a separate report. We find that the assumptions and methods used to prepare the 2022 SERS GASB Nos. 67 and 68 schedules are reasonable based on the materials provided to us.

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In this section, we provide detailed analysis and supporting rationale for the recommendations that were presented in Section II of this report.

Proposed Certification of the Required State Contribution

As stated in our summary of recommendations in Section II, we have verified the arithmetic calculations made by GRS to develop the required State contribution, reviewed the assumptions on which it is based, and accepted GRS's annual projections of future payroll, total normal costs, benefits, expenses, and total contributions. However, in accordance with 30 ILCS 5/2-8.1, our review does not include a replication of the actuarial valuation results.

As previously recommended, SERS Board retained an independent actuary, Foster & Foster, to complete a replication audit. Foster & Foster independently replicated the June 30, 2020 Actuarial Valuation and found no significant differences in the calculation of liabilities, assets, and contributions for SERS.

State Mandated Methods

The Illinois Pension Code (40 ILCS 5/2-124) establishes a method that does not adequately fund the System. This law requires the actuary to calculate the employer contribution as the level percentage of projected payroll that would accumulate assets equal to 90% of the Actuarial Accrued Liability in the year 2045 if all assumptions are met. This contribution methodology does not conform to generally accepted actuarial principles and practices. Generally accepted actuarial funding methods target the accumulation of assets equal to 100% of the Actuarial Accrued Liability, not 90%.

We recommend that the funding method be changed to employ a methodology that produces a Reasonable Actuarially Determined Contribution and fully funds plan benefits within a reasonable period of time (Recommendation #1). The State Mandated Method is entering a period in which the contribution amount it produces may be reasonable even though the overall methodology is not. This period offers an opportunity to change the methodology to one that is consistent with actuarial standards for a Reasonable Actuarially Determined Contribution (ADC) without significantly affecting the immediate contribution amount. Such a method would set contributions at a level that is expected to prevent the unfunded actuarial liability from growing and remain high enough to reduce the unfunded actuarial liability each year until the plan is ultimately 100% funded within a reasonable period. While the State Mandated Method is inadequate, it will also produce more volatile contribution levels as the remaining period to achieve 90% funding shortens. Consequently, we recommend that the funding method be changed to one that produces more stable contribution requirements while targeting 100% funding within a reasonable period and meets the actuarial standards for a Reasonable ADC.

The GRS June 30, 2022 Actuarial Valuation includes a recommended funding policy which would contribute the normal cost plus an amortization payment that would seek to fully pay off the total unfunded actuarial liability over a closed period by the year 2045. In the same report on pages 12 through 15, GRS also demonstrates the implications of the statutory funding amounts on the

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growth of the unfunded actuarial liability. The SERS Board of Trustees has agreed with this recommendation and adopted a separate funding policy to calculate an *Actuarially Determined Contribution (ADC)*. We note that this policy meets the requirements of a Reasonable Actuarially Determined Contribution and will satisfy the new ASOP 4 requirement effective in 2023 to calculate and disclose a Reasonable Actuarially Determined Contribution (ADC). According to this methodology, the State's contribution amount would be \$2,994,893,916 for FY 2024 compared to the statutory contribution amount of \$2,472,697,000. It is important though to recognize that the ADC does not affect the actual funding of the System.

We have reviewed the adopted policy. We agree that the policy is a reasonable method that conforms to the Actuarial Standards of Practice, and we agree with its use in the GASB report as an ADC. The funding policy calls for a funding amount equal to the normal cost plus a closed 25-year amortization as a level percentage of uncapped payroll of the unfunded actuarial liability. As of June 30, 2022, the remaining amortization period is 18 years. This policy defines a method that would ultimately fully fund the Plan and falls within generally accepted actuarial funding methods currently in use for public plans.

Recognition of Changes in Actuarial Assumptions

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modified the State's funding policy to require that the contribution impact of all assumption changes, including changes prior to P.A. 100-0023, be phased-in over a five-year period. As such, the Act delays the recognition of the impact of assumption changes when calculating the contribution requirement of the System. Assumption changes are intended to more accurately anticipate the obligations for funding based on the most recent experience analysis and forward-looking changes to future investment returns. However, only one-fifth of the impact of these changes are now recognized from the date of adoption. The remainder of the impact is recognized over four additional years such that the full impact is only recognized at the end of a five-year period beginning at the date of adoption. This phase-in provides time to adjust to a new level of contributions. However, the Conference of Consulting Actuaries White Paper on Actuarial Funding Policies and Practices for Public Pension Plans recommends that the "phase-in period should be no longer than the time period until the next review of assumptions." **Since experience studies are performed every three years, we recommend the phase-in period for the impact of assumption changes be reduced to no longer than three years (Recommendation #2).**

Optional Hybrid Plan

P.A. 100-0023 created an Optional Hybrid Plan for current Tier 2 members and future new hires. The Optional Hybrid Plan consists of a reduced defined benefit plan and a defined contribution plan. Employers are required to contribute the normal cost plus an additional 2% of pay for each employee who participates in the Optional Hybrid Plan or Tier 2 in lieu of the Optional Hybrid Plan for fiscal year 2021 and after.

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As stated in Section II of this report, GRS anticipates that 0% of current and future participants elect the Optional Hybrid Plan. While the valuation notes that Tier 3 is expected to be available beginning in fiscal year 2020, we understand that SERS will not implement the Optional Hybrid Plan until clarifying legislation is passed. Given the need for additional legislation, we believe it is reasonable not to reflect the Optional Hybrid Plan in the current valuation.

Accelerated Pension Benefit Payments

P.A. 100-0587 created two accelerated pension benefit payment options. Inactive vested members have the option of receiving a lump-sum equal to 60% of the present value of their benefits in lieu of their annuity benefits, the “Total Buyout”. This program is available until June 30, 2024. The “COLA Buyout” program provides Tier 1 members the option upon retirement of accepting the reduced Tier 2 automatic annual increase (AAI) provision instead of their current 3% automatic annual increases. In exchange for electing the reduced AAI, members will receive a lump-sum equal to 70% of the present value of the reduction in annuity benefits. The State finances the program by issuing bonds up to certain limits. Lump-sum payments will be made directly from the bond proceeds. This program expires June 30, 2024, or earlier if funds are no longer available.

For the draft June 30, 2022 report, GRS has assumed that 2% of inactive participants will elect the “Total Buyout” of their pension benefit. Further, GRS has assumed that 20% of eligible Regular formula members, 42% of eligible Alternative Formula members not covered by Social Security, and 38% of Alternative Formula members covered by Social Security, will elect the “COLA Buyout” at retirement. The election percentages are assumed to apply until the end of the Buyout Programs. GRS notes these “COLA Buyout” assumptions are based upon experience through June 2022 provided by the System and this year they provided support for the assumption on page 44.

Stress Testing

We anticipate GRS will continue including stress testing of the System within the valuation report and include an explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower salary growth, assumption changes) can have on future State costs. The tests illustrate the potential stresses on the System and its contributing sponsors so that an assessment of sustainability can be made.

We note that GRS has included stress testing in the final report for the past two years, but the stress testing section has not been completed in this year’s draft report. Last year, a separate letter dated December 20, 2021 was subsequently provided that contained the stress testing that was ultimately included in the final report. We anticipate that similar stress testing will be included in the final June 30, 2022 Actuarial Valuation.

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Actuarial Standard of Practice 51

Actuarial Standard of Practice (ASOP) 51 provides guidance to actuaries on the assessment and disclosure of risks to help readers of the actuarial valuation report “*understand the effects of future experience differing from the assumptions used*” and “*the potential volatility of future measurements resulting from such differences.*”

ASOP 51's first requirement is to “*identify risks that, in the actuary's professional judgment, may reasonably be anticipated to significantly affect the Plan's future financial condition.*” GRS identified six sources of risk to SERS: investment risk, asset/liability mismatch risk, contribution risk, salary and payroll risk, longevity risk, and other demographic risks. With the exception of the contribution risk due to the statutorily required amount of contributions, the risks SERS identified are relatively generic and would apply to most pension plans.

ASOP 51 requires the actuary to assess each of the risks identified. While the assessment does not have to be quantitative, it does have to take into account the specifics of the individual plan. ASOP 51 also describes several quantitative methods that may be used to assess risk.

- Investment Risk. GRS included additional stress testing in the last year's final actuarial valuation report that adequately assessed the investment risk with various investment return scenarios.
- Asset/Liability Mismatch Risk. GRS does not appear to provide an assessment of asset/liability mismatch risk other than to indicate that asset value changes that do not match liability changes will either increase or decrease costs. If GRS continues to identify this as a key risk, ASOP 51 requires that they also provide an assessment that takes into account “circumstances specific to the plan.”
- Contribution Risk. GRS discusses several issues with the statutorily required contribution amounts in the risk section as well as in other parts of the valuation report. The stress testing included in last year's final actuarial valuation report adequately assessed the impact of a declining contribution base (i.e. payroll).
- Salary and Payroll Risk. The stress testing included in last year's final actuarial valuation report adequately assessed the salary and payroll risk with alternative projected decreases in the active population.
- Longevity Risk. GRS does not appear to provide an assessment of longevity risk. The valuation report simply states that experience that differs from the assumptions will either increase or decrease costs. If GRS continues to identify this as a key risk, ASOP 51 requires that they also provide an assessment that takes into account “circumstances specific to the plan.”

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- Other Demographic Risk. GRS provides an explanation of demographic risks but does not appear to provide any assessment of these risks. If GRS continues to identify this as a key risk, ASOP 51 requires that they also provide an assessment that takes into account “circumstances specific to the plan.”

ASOP 51 requires the actuary to recommend a more detailed assessment of risks if it “*would be significantly beneficial.*” GRS adequately identified the primary drivers of these risks, provided background information and assessments about these identified risks, but did not in our opinion adequately communicate the significance of all of these risks to this Plan. The stress testing included in last year’s final actuarial valuation report provided a quantitative assessment of the investment risk, contribution risk, and salary and payroll risk and we anticipate similar stress testing will be included in this year’s valuation actuarial valuation report. However, the other risks were only assessed with a generic statement that could apply to any pension plan.

Section 3.2 of ASOP 51 requires the actuary to identify risks that “may reasonably be anticipated to significantly affect the plan’s future financial condition.” The risks currently identified appear to largely duplicate the list of examples in ASOP 51 and could apply to almost any pension plan. **In future valuations, we recommend that the actuary explain how each risk identified would reasonably be anticipated to significantly affect the specific plan’s future financial condition (Recommendation #5).**

For each risk identified above, Section 3.3 of ASOP 51 requires the actuary to provide an assessment that takes into account “circumstances specific to the plan.” For some of the identified risks, the actuary has provided a quantitative assessment specific to the plan while for other identified risks, the actuary has only provided a generic statement that could apply to any plan. **We recommend that for each identified risk the actuary provide an assessment, preferably quantitative, that considers the specific circumstances of this plan (Recommendation #6).**

Changes to Actuarial Standard of Practice 4

Actuarial Standard of Practice No. 4 (ASOP 4) was amended and the changes will become effective for SERS’ actuarial valuations starting June 30, 2023. There are three primary changes that will affect the SERS actuarial valuation:

1. The requirement to calculate and disclose a Reasonable Actuarially Determined Contribution as defined in ASOP 4,
2. The requirement to assess the implications of the funding policy, including four specific assessments, and
3. The requirement to calculate, disclose, and explain a Low-Default-Risk Obligation Measure (LDROM).

The requirement to calculate and disclose a Reasonable ADC is already incorporated in the SERS actuarial valuation and has been discussed in our analysis above. This section will discuss the remaining two requirements that will become effective for the June 30, 2023 actuarial valuation.

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Implications of the Funding Policy

Effective with the 2023 actuarial valuation, changes to ASOP No. 4 will require GRS to make four specific assessments of the State Mandated Funding Policy:

1. A qualitative assessment of the implications of the funding policy on expected future contributions and funded status,
2. An estimate of how long until contributions under the funding policy will exceed normal cost plus interest on the unfunded actuarial liability,
3. An estimate of how long until the unfunded actuarial liability is expected to be paid off, and
4. An assessment of whether the funding policy is significantly inconsistent with accumulating assets adequate to make benefit payments, and, if applicable, an estimate of the approximate time until assets are depleted.

GRS already provides the qualitative assessment required and discusses the principal issues but will need to add the specific estimates in future valuation reports.

Calculation and Disclosure of LDROM

The LDROM is calculated using a discount rate derived from low-default-risk fixed income securities whose cash flows are reasonably consistent with the plan's projected benefit payments. Consequently, the discount rate is likely to be significantly lower than the funding discount rate and the LDROM significantly higher than the actuarial liability.

The actuary has a few choices in the calculation of the LDROM, and those choices may depend on how the actuary wants to explain the significance of the LDROM as required by ASOP 4 "with respect to the funded status of the plan, plan contributions, and the security of participant benefits."

Public plan actuaries may explain the LDROM in terms of the expected taxpayer savings from investing in a diversified portfolio or the cost to eliminate investment risk. Using this framework for the explanation, actuaries would likely elect to use the same actuarial cost method as is used for funding and to derive the discount rate from yields on high quality corporate bonds. However, multiple other options are also possible.

Our review of this new disclosure will focus on the consistency between the explanation of LDROM's significance and the selected cost method and basis for discount rate.

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Assessment of Actuarial Assumptions Used in the 2022 Valuation

A. Economic Assumptions

1. Interest Rate

The interest rate assumption (also called the investment return or discount rate) is the most impactful assumption affecting the required State contribution amount. This assumption, which is used to value liabilities for funding purposes, remained at 6.75% for the draft June 30, 2022 Actuarial Valuation.

After reviewing all the materials (see Appendix B of this report) that were made available, Cheiron concludes that the interest rate of 6.75% for this valuation is reasonable.

We recommend that the SERS Board continue to annually review the economic assumptions (interest rate and inflation), as was done for this valuation, prior to commencing the valuation work and adjust assumptions accordingly (Recommendation #8).

The items we considered and our rationale for this recommendation are as follows:

- A review of the interest and inflation rates does not involve the collection of significant data and can be updated annually. In addition, it keeps the Board focused more closely on these Critical assumptions.
- In GRS's July 15, 2022 Actuarial Experience Study, they presented the expectations for the SERS portfolio of the Illinois State Board of Investment's investment consultant Meketa Investment Group. Meketa's expected 20-year geometric average return of the SERS portfolio is 6.51% (See page C-9 GRS's July 15, 2022 Actuarial Experience Study). Based on the capital market assumptions provided by Meketa, SERS has a 46.55% chance of meeting or exceeding the assumption of 6.75%. Given that SERS is only 42.79% funded on a market asset value, an expectation of achieving the investment return only 47% of the time could result in cost increases following years that the returns are below the assumption.
- GRS's July 15, 2022 review of economic assumptions also presented the expectations for the SERS portfolio based on capital market assumptions for a 10-year or shorter time horizon of twelve independent investment consultants and concluded that, adjusting for GRS's assumed rate of inflation, the average expected geometric return for the SERS portfolio is 5.59% (See page C-9 of GRS's July 15, 2022 Actuarial Experience Study). This analysis estimated SERS has a 37.95% chance of meeting or exceeding the 6.75% assumption over a 10-year time horizon. In the future, we suggest

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that GRS disclose more information about these capital market assumptions, including a list of the investment consulting firms included and the dates of the capital market assumptions.

- GRS also presented the expectations for the SERS portfolio based on capital market assumptions for a 20-year or longer time horizon of five independent investment consultants. Based on these longer-term assumptions, the average 20-year geometric mean for the SERS portfolio was 6.66% and SERS is estimated to have a 48.61% chance of meeting or exceeding the 6.75% assumption (See page C-9 of GRS's July 15, 2022 Actuarial Experience Study). In the future, we suggest that GRS disclose more information about these capital market assumptions, including a list of the investment consulting firms included and the dates of the capital market assumptions.

Distribution of 20-year Average Geometric Net Nominal Return

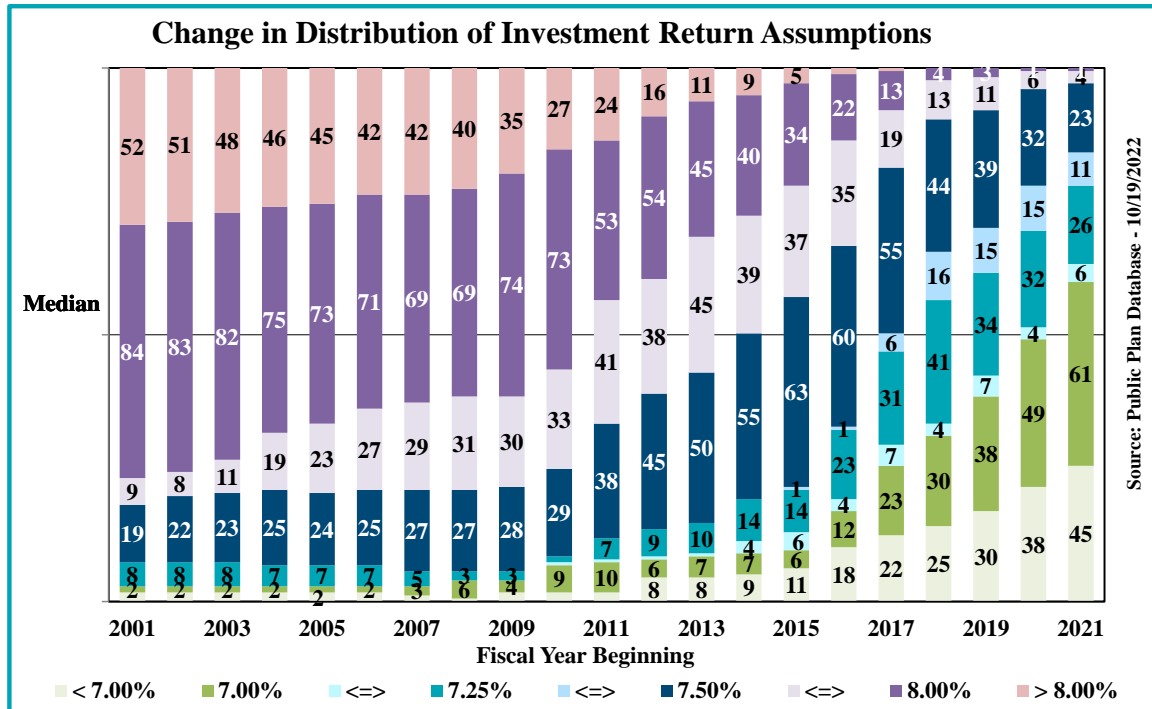
Investment Consultant	Distribution of 20-Year Average Geometric Net Nominal Return			Probability of exceeding 6.75 %
	40 th	50 th	60 th	
(1)	(2)	(3)	(4)	(5)
1	5.71%	6.39%	7.07%	44.62%
2	6.73%	7.46%	8.20%	59.73%
3	6.19%	6.88%	7.57%	51.86%
4	5.35%	6.04%	6.73%	39.77%
5	5.90%	6.56%	7.22%	47.07%
Average	5.98%	6.66%	7.36%	48.61%

- The combination of the expectations from the Illinois State Board of Investment's investment consultant and the expectations from a variety of independent investment consultants supports the reasonableness of assuming a 6.75% interest rate for the current year.
- SERS is projected to have negative cash flow (contribution income less benefit and expense payouts) in Fiscal Year Ending 2023. The cash flow is expected to grow increasingly negative over time to about \$1.5 billion dollars by 2033 as shown in the graph on page 14 and table 4d on pages 33 and 34 of the draft 2022 Actuarial Valuation Report. When short-term returns are expected to be lower than the long-term expectations, which is the current case with SERS, a plan with negative cash flows will tend to have dollar-weighted returns that are less than their "time-weighted" returns.
- While the discount rate assumption should be based on the future expected investment returns for the System's investment portfolio, survey information can provide an important context for evaluating the assumption. The Public Plans Database is maintained by a partnership between the Center for State and Local Government

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Excellence (SLGE) and the Center for Retirement Research at Boston College with support from the National Association of State Retirement Administrators (NASRA). This database contains historical information on large public pension plans, including key assumptions used in their actuarial valuations. The following chart shows the distribution of investment return assumptions for the 177 plans in the Public Plans Database with consistent information from 2001 through 2022 as of October 19, 2022.



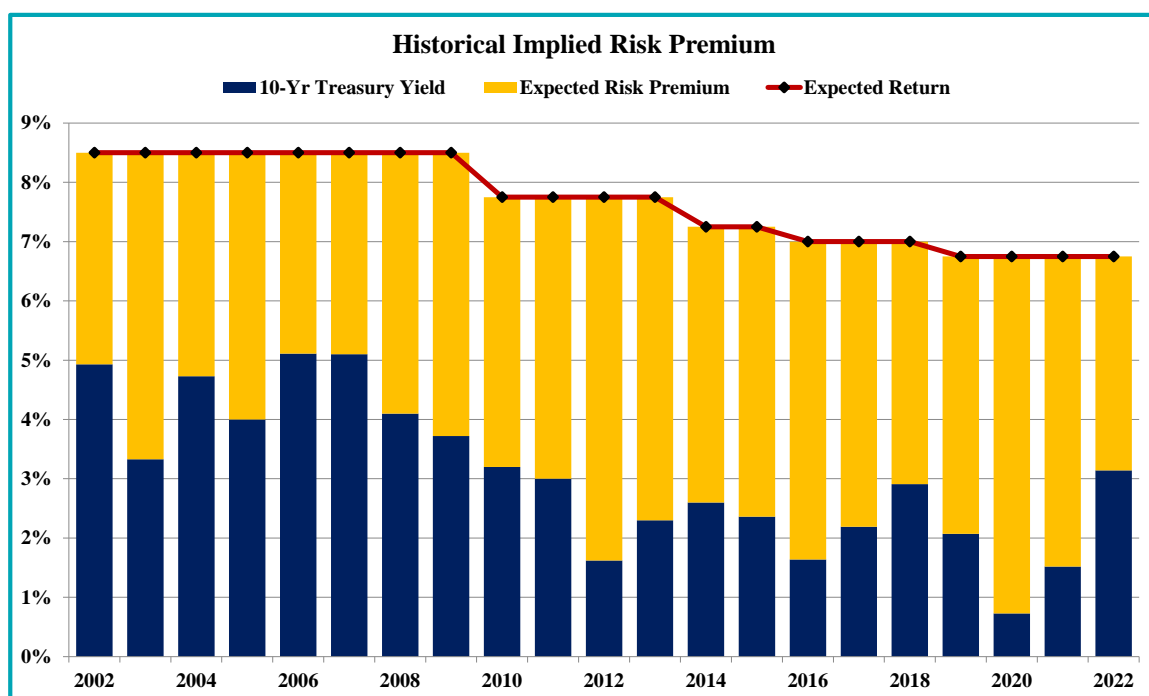
Over the period shown, there continues to be a pattern of reducing discount rates partially reflecting long-term changes in capital markets, interest rates and underlying inflation. Of the 177 plans shown, 113 have reduced their discount rate assumption since 2017. For these 113 plans, the average reduction is 0.44%.

- Over the last two decades, declining interest rates have forced pension plans to either reduce their discount rates, increase their exposure to investment risk, or some combination of the two. For example, as shown in the chart below, in June 2002, the yield on 10-year Treasury bonds (a proxy for a risk-free investments) was 4.9%. To achieve SERS' then assumed return of 8.50%, the System's investments had to outperform the yield on the 10-year Treasury by 3.6%. In June 2020, the yield on the 10-year Treasury had dropped to 0.7%, and to achieve SERS' assumed return of 6.75%, the System's investments need to exceed the 10-year Treasury yield by 6.05%. Even though SERS had reduced its return assumption by 175 basis points over the period, it still had to take more investment risk in 2020 to meet its assumption than it did in 2002. Since 2020, yields on 10-year Treasury bonds have increased, reducing the expected

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risk premium needed to achieve the System's assumed return. With recent action by the Federal Reserve, 10-year Treasury bond yields have increased rapidly from 1.5% in December 2021 to 3.1% in June 2022 and 4.0% in October 2022. If these higher Treasury bond yields persist, plans may be able to achieve the expected return with less exposure to investment risk. However, if these higher Treasury bond yields prove temporary, plans could quickly find the pressure returning to further reduce discount rates or increase their exposure to investment risk.



2. Inflation Assumption

As recommended in GRS's July 15, 2022 review of economic assumptions, the inflation assumption remained at 2.25% in the draft June 30, 2022 Actuarial Valuation.

We find the 2.25% inflation assumption to be reasonable.

The items we considered and our rationale for concurring with the 2.25% assumption are as follows:

- GRS's July 15, 2022 review of economic assumptions included a survey of the inflation assumptions of independent investment consultants. The 5 investment consulting firms with longer time horizons (20+ years) reported an average of 2.22% and ranged from 2.11% to 2.31%. The 12 firms with a shorter time horizon reported an average of 2.19% and ranged from 1.92% to 3.10%. In the future, we suggest that GRS disclose more

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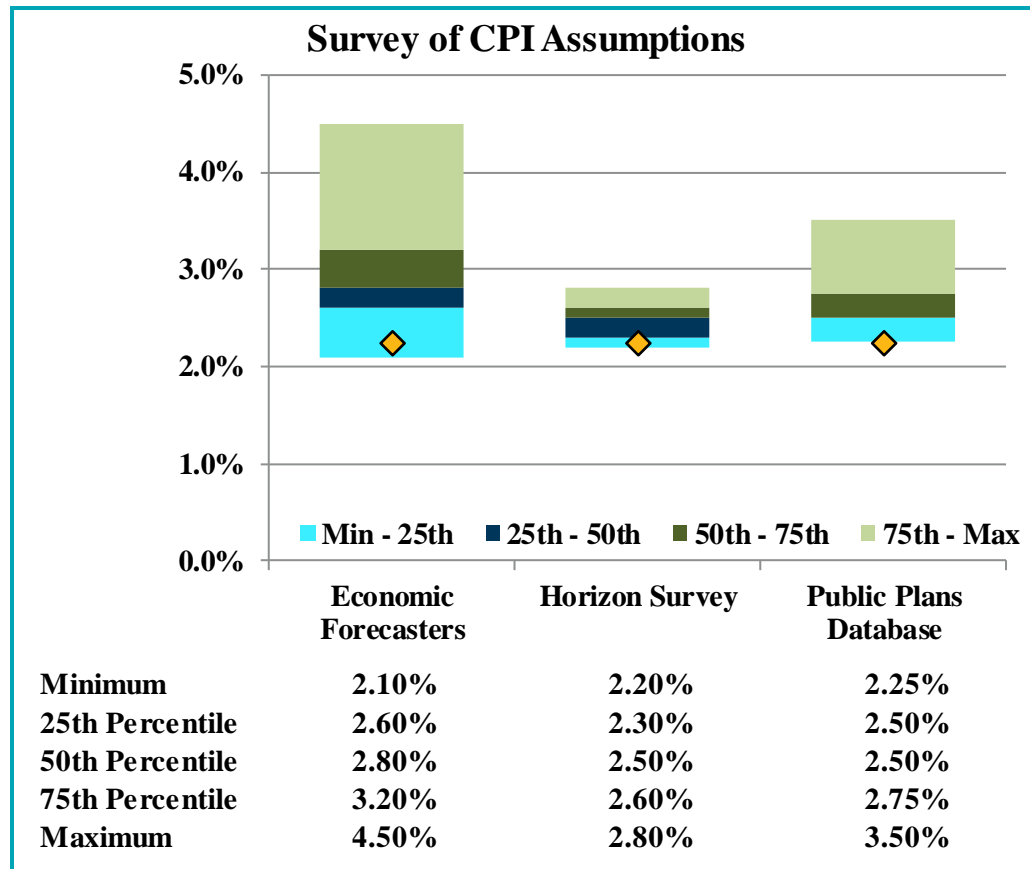
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information about this survey, including a list of the investment consulting firms included and the dates of the inflation assumptions.

- GRS's July 15, 2022 review of economic assumptions also included the forward-looking inflation forecasts from the Federal Reserve Bank of Cleveland as of December 1, 2021. This forecast shows inflation over the next 10 years of 1.76% increasing to 2.09% over 30 years.
- The June 2022 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (next 75 years), inflation will average between 1.8% and 3.0% (<http://www.ssa.gov/oact/tr/2022/tr2022.pdf>). Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.4%.
- GRS's July 15, 2022 review of economic assumptions included forward-looking price inflation forecasts from numerous sources where inflation forecasts ranged from 2.27% to 2.90% (please see page C-4 of GRS's 2018-2021 Actuarial Experience Study report).
- The following chart shows the distribution of inflation expectations for the Third Quarter 2022 survey of professional economic forecasters published by the Philadelphia Federal Reserve, the 2022 Horizon survey of investment consultant capital market assumptions (20-year), and the 2021 inflation assumptions used by plans in the Public Plans Database compared to the SERS assumption (indicated by the gold diamonds). The assumption of 2.25% is in the lower quartile of the range projected by professional economic forecasters and investment consultants and is on the low end of the range used by other public pension plans.

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3. *Salary (Annual Compensation) Increase Assumption*

The salary increase assumption consists of inflation (2.25%), real wage growth (0.50%) and merit or longevity increases that vary by age. Illustrative rates of increase per individual employee per annum, compounded annually are shown in the table below:

Age	Annual Increase
25	7.41%
30	6.29%
35	5.19%
40	4.36%
45	3.79%
50	3.38%
55	3.08%
60	2.84%
65	2.60%
70	2.50%
80+	2.25%

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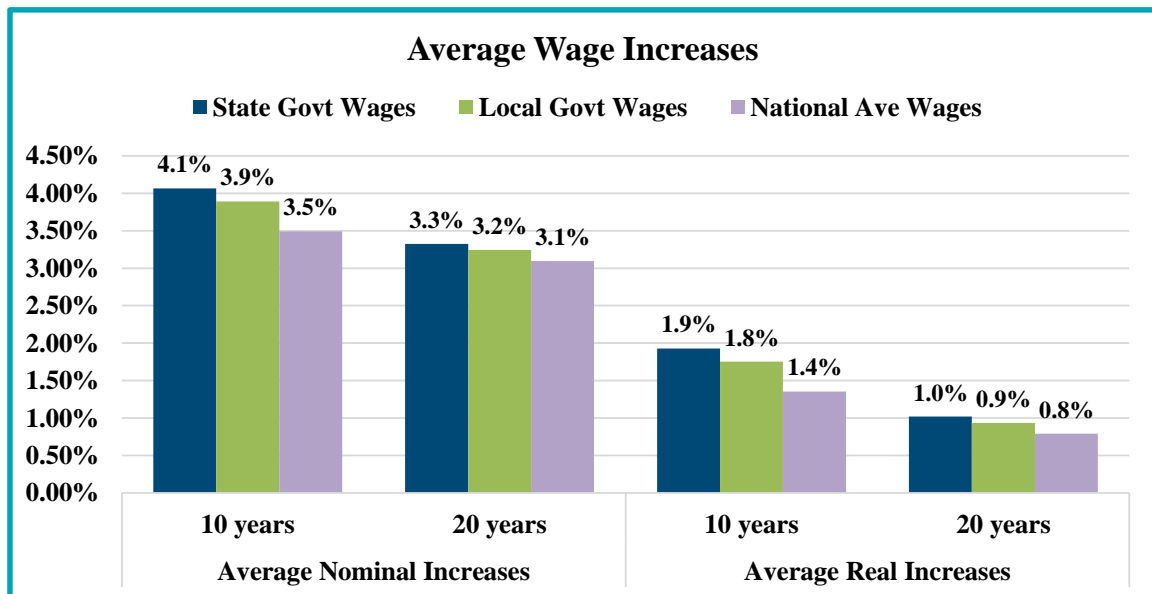
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These increases include the wage inflation assumption of 2.75% comprised of an inflation assumption of 2.25% per annum and 0.50% per annum productivity or real wage growth assumption.

We find the assumption of 0.50% real wage growth and 2.75% wage inflation and the basis for setting them as reasonable and consistent with the inflation assumption. We accept the rationale in the 2021 experience study for maintaining the age-based merit/longevity component of the assumption until the next experience study.

The items we considered and our rationale for concurring with GRS's recommendation of 0.50% real wage growth and 2.75% wage inflation are:

- The following chart shows the average nominal and real increases in wages over the last 10 and 20 years for State governments, local governments, and National Average Wages. State and local government data is from the Quarterly Census of Employment and Wages as published by the Bureau of Labor Statistics. National Average Wages is published by the Social Security Administration.



- The June 2022 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (next 75 years), real wage differential will average somewhere between 0.53% and 1.77%. Under the intermediate cost projection, the Social Security Administration uses an assumption of 1.15%.
- In our own experience with our public sector pension plans (about 60 large plans), we have witnessed a continued trend of lower salary increases for public sector employees. Given the recent experience in SERS and the continued budget pressures in Illinois, we believe the 2.75% wage inflation assumption is reasonable.

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4. Cost of Living Adjustment Assumption

Benefits are increased annually as described on pages 58 through 65 of the draft June 30, 2022 Actuarial Valuation. Annual increases are 3% for those hired prior to January 1, 2011 and the lesser of 3% or ½ of the Consumer Price Index for those hired on or after January 1, 2011, which is 1.125% based on the inflation assumption of 2.25%.

We find the assumption and the basis for setting it reasonable.

5. Expenses

As estimated and advised by SERS staff, assumed plan expenses are based on current expenses and are expected to increase in proportion to the projected capped payroll.

We find the assumption reasonable; however, more information on the expected expenses as a function of capped payroll would be a valuable additional disclosure.

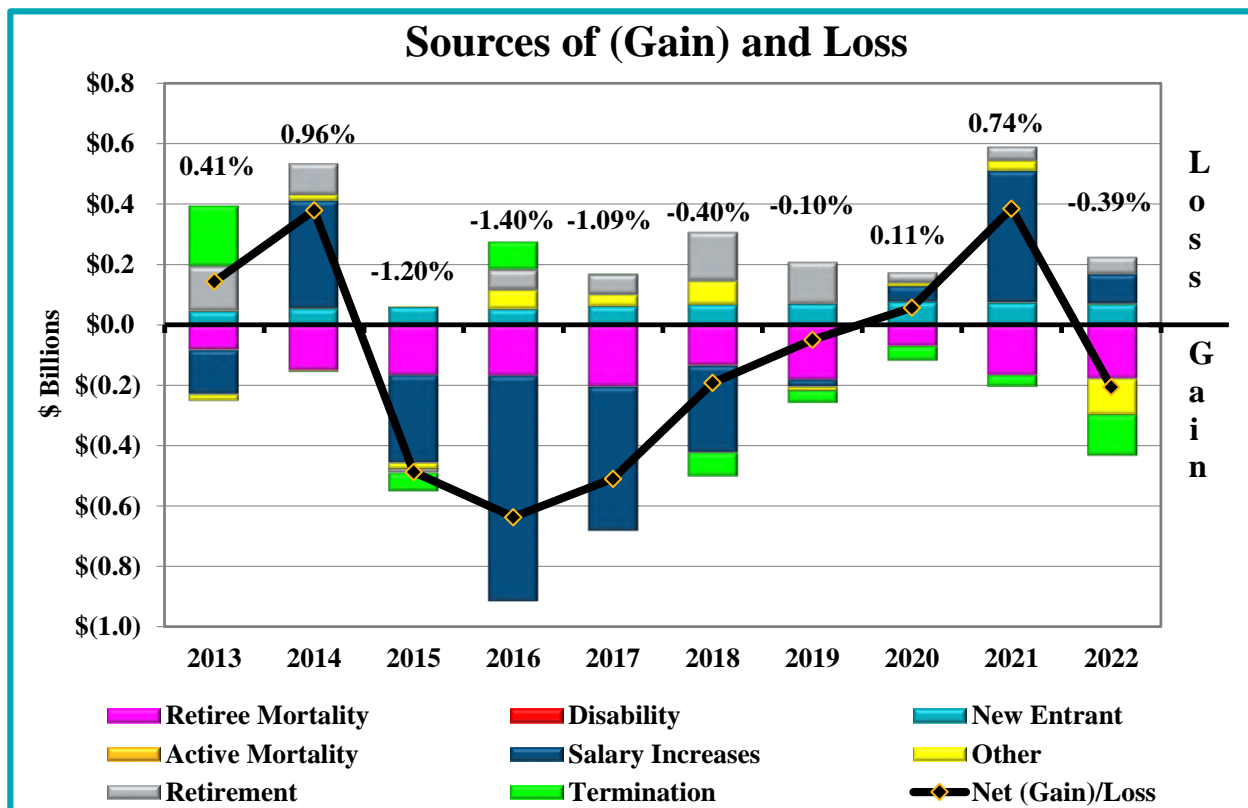
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B. Demographic Assumptions

In its annual actuarial valuation reports, GRS regularly reports sources of liability gains and losses. In the draft June 30, 2022 Actuarial Valuation, these are shown on page 26. In the chart below, we have collected similar data from GRS's past valuation reports dating back to 2013 and use these to present a historical review of past demographic and salary increase experience gains and losses.

The following chart shows the pattern of annual gains and losses attributable to eight different sources as shown in the legend. When the colored bar slices appear above zero on the Y-axis, they represent experience losses with the values representing the increases in liabilities over what was expected. When the bar slices are below zero, they represent experience gains with the values representing the reductions in the liabilities for that year versus what was expected. The net liability (gain)/loss is shown by the black line. This net (gain)/loss as a percent of liability for each year is shown as the percentage above the bars.



The percentages shown above the bars refer to net (gain)/loss as a percentage of liability.

Key observations from this chart are as follows:

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1. SERS has experienced a gain after two consecutive years of net losses. The 2022 net gain is primarily due to more retiree deaths (purple area) and more active terminations than expected (green area).
2. Over the last ten years, retirement experience has resulted in a loss in 9 years. **We recommend that GRS provide an explanation of the causes for this consistent actuarial loss** (recommendation #3). The losses from retirements should continue to be monitored and the assumption may need to be revised if it continues to result in losses.
3. There have also been consistent gains due to retiree mortality reflecting additional conservatism in the expected longevity of retirees and the impact of COVID.
4. In every year, there have been small experience losses attributable to new entrants joining SERS. This continuing source of losses due to new entrants is expected for most pension plans. This is because members who are hired after the valuation date may earn a partial year of service credit that does not show up until the following valuation, at which point the extra liabilities for their initial partial year are treated as a liability loss. These losses could be anticipated in future assumptions through a load developed in anticipation that new entrants will begin on average with some past service credits.
5. In the actuarial liability gain loss review, there is a category labeled as “Other”. In most valuations the Other category represents a small portion of the overall net gain loss. On page 26 of the 2022 actuarial report, there is a gain of \$119 million that is listed as “Other” and is the third largest component to net gain loss. **We recommend that GRS explain the cause of this gain** (recommendation #4).

The demographic assumptions are summarized below. We reviewed the development of these assumptions based on a full experience study for the three-year period ending June 30, 2021, and we have concluded all are reasonable and meet the requirements of ASOP No. 35, Section 3.3.4.

1. Mortality

Post-Retirement Mortality

The mortality basis was updated with the June 30, 2022 Actuarial Valuation and uses different tables for general retirees covered under the Regular Benefit Formula and Public Safety retirees covered under the Alternative Benefit Formula.

The mortality assumption for general retirees is based on the Pub-2010 Below-Median Income General Healthy Retiree Mortality tables, sex distinct multiplied by 91% for males and 115% for females. Generational mortality improvement is applied using the MP-2021 two-dimensional mortality improvement scales.

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In the 2021 Experience Study, the analysis of mortality by GRS begins with the mortality tables from the Pub-2010 Public Retirement Plans Mortality Tables Report published by the Society of Actuaries and the Retirement Plans Experience Committee. For General Healthy Retirees, GRS selects the Pub-2010 Below-Median Income General Healthy Retiree Mortality Table to use as a baseline table. There is no explanation or justification for why the Below-Median Income subset is selected based on the Plan's actual experience and level of credibility. We recommend GRS provide an explanation and justification for selecting the Below-Median Income for use as a baseline table.

The mortality assumption for Public Safety retirees is based on the Pub-2010 Below-Median Income Public Safety Healthy Retiree Mortality tables, sex distinct, multiplied by 97% for males and 103% for females. Generational mortality improvement is applied using the MP-2021 two-dimensional mortality improvement scales. The base table is based on an appropriate published mortality table, with scaling factors developed reflecting the Plan's experience and credibility. Mortality improvement is projected on a generational basis using the most recent mortality improvement scale published by the Society of Actuaries. Similar to General Healthy Retirees, we recommend GRS provide an explanation and justification for selecting the Below-Median Income for use as a baseline table.

Pre-Retirement Mortality, including terminated vested members prior to attaining age 50

The mortality basis was updated with the June 30, 2022 Actuarial Valuation and uses different tables for general employees covered under the Regular Benefit Formula and Public Safety employees covered under the Alternative Benefit Formula.

The mortality assumption for general active members is based on the Pub-2010 General Employee Mortality headcount-weighted tables, sex distinct, and multiplied by 84% for males and 92% for females. Generational mortality improvement is applied using the MP-2021 two-dimensional mortality improvement scales. The base table is a published mortality table, and scaling factors were developed reflecting the Plan's experience and credibility. It is not clear why the published mortality table GRS selected is headcount-weighted as opposed to salary-weighted. An explanation should be provided.

The mortality assumption for Public Safety employees is based on the Pub-2010 Public Safety Healthy Employee Mortality headcount-weighted tables, sex distinct, multiplied by 90% for males and 100% for females. Generational mortality improvement is applied using the MP-2021 two-dimensional mortality improvement scales. The base table is a published mortality table, and scaling factors were developed reflecting the Plan's experience and credibility. It is not clear why the published mortality table GRS selected is headcount-weighted as opposed to salary-weighted. An explanation should be provided. In our opinion, the mortality assumption for Public Safety employees is reasonable.

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We recommend GRS provide additional explanation and justification for the methods used to develop the mortality assumptions used in the valuation (Recommendation #7).

Specifically, an explanation and justification should be provided for:

1. Selection of the Below-Median Income table for use as a baseline table to develop the scaling factor for the proposed mortality table is needed.
2. Selecting a headcount-weighted as opposed to salary-weighted published mortality table for the pre-retirement mortality analysis.

2. Termination

Assumed rates of withdrawal from the System for Tier 1 members are as follows:

Service (Beginning of Year)	Service Based Withdrawal			
	Regular Formula Employees		Alternate Formula Employees	
	Males	Females	Males	Females
0	0.2400	0.2200	0.0300	0.0700
1	0.0900	0.0900	0.0300	0.0700
2	0.0700	0.0550	0.0300	0.0650
3	0.0600	0.0550	0.0300	0.0600
4	0.0600	0.0450	0.0300	0.0600
5	0.0410	0.0400	0.0300	0.0500
6	0.0450	0.0350	0.0300	0.0400
7	0.0400	0.0350	0.0300	0.0300
8	0.0300	0.0350	0.0200	0.0200
9	0.0300	0.0350	0.0200	0.0200
10	0.0300	0.0300	0.0150	0.0200
11	0.0250	0.0300	0.0150	0.0175
12	0.0250	0.0250	0.0150	0.0175
13	0.0250	0.0250	0.0150	0.0175
14	0.0250	0.0250	0.0150	0.0175
15	0.0225	0.0250	0.0150	0.0175
16	0.0200	0.0200	0.0150	0.0150
17	0.0200	0.0200	0.0150	0.0150
18	0.0200	0.0200	0.0150	0.0150
19	0.0200	0.0200	0.0150	0.0125
20	0.0200	0.0175	0.0150	0.0125
21	0.0200	0.0175	0.0150	0.0125
22	0.0200	0.0175	0.0150	0.0125
23	0.0200	0.0175	0.0150	0.0125
24	0.0200	0.0175	0.0150	0.0100
25	0.0200	0.0150	0.0150	0.0100
26	0.0200	0.0150	0.0150	0.0100
27	0.0200	0.0150	0.0150	0.0100

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Service (Beginning of Year)	Service Based Withdrawal			
	Regular Formula Employees		Alternate Formula Employees	
	Males	Females	Males	Females
28	0.0200	0.0150	0.0150	0.0100
29	0.0200	0.0150	0.0150	0.0100
30+	0.0200	0.0150	0.0150	0.0100

It is assumed that terminated employees will not be rehired. The rates apply only to employees who have not fulfilled the service requirement necessary for retirement at any given age.

Assumed rates of withdrawal from the System for Tier 2 members are as follows:

Service (Beginning of Year)	Service Based Withdrawal			
	Regular Formula Employees		Alternate Formula Employees	
	Males	Females	Males	Females
0	0.3300	0.2800	0.1000	0.1100
1	0.1650	0.1500	0.0800	0.0800
2	0.0600	0.0800	0.0625	0.0750
3	0.0600	0.0700	0.0550	0.0625
4	0.0575	0.0650	0.0425	0.0525
5	0.0500	0.0550	0.0300	0.0500
6	0.0450	0.0500	0.0250	0.0500
7	0.0450	0.0400	0.0225	0.0325
8	0.0300	0.0300	0.0150	0.0200
9	0.0300	0.0350	0.0150	0.0200
10	0.0300	0.0300	0.0150	0.0200
11	0.0250	0.0300	0.0150	0.0175
12	0.0250	0.0250	0.0150	0.0175
13	0.0250	0.0250	0.0150	0.0175
14	0.0200	0.0250	0.0150	0.0175
15	0.0200	0.0250	0.0150	0.0175
16	0.0200	0.0200	0.0150	0.0150
17	0.0200	0.0200	0.0150	0.0150
18	0.0200	0.0200	0.0150	0.0150
19	0.0200	0.0200	0.0150	0.0125
20	0.0250	0.0150	0.0150	0.0125
21	0.0250	0.0150	0.0150	0.0125
22	0.0250	0.0150	0.0150	0.0125
23	0.0250	0.0150	0.0150	0.0125
24	0.0200	0.0150	0.0150	0.0100
25	0.0200	0.0150	0.0150	0.0100
26	0.0200	0.0150	0.0150	0.0100
27	0.0200	0.0150	0.0150	0.0100
28	0.0200	0.0150	0.0150	0.0100
29	0.0200	0.0150	0.0150	0.0100
30+	0.0200	0.0150	0.0150	0.0100

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3. Unused Sick Leave and Optional Service Purchases

Current and future active member's service is increased by 5.0 months to account for increases of service at retirement due to converting unused sick leave and vacation days and purchasing applicable optional service.

4. Marriage Assumption

85.0% of active male participants and 65.0% of active female participants are assumed to be married. Actual marital status at benefit commencement is used for retirees.

Comment: We did not see any development of this assumption in the 2021 Experience Study.

5. Social Security Offset for Survivor Benefits

There is no offset assumption for male surviving spouses because it is assumed their own primary insurance amount (PIA) is as great as their spouses' PIA. 60% of married male members are assumed to have a dual income household. For the dual income household, it is assumed the offset at age 60 is 45.0% of the original survivor benefit. It is assumed the offset at age 62 is 10.0% of the original survivor benefit. Furthermore, it is assumed that 50% of retirees on or after July 1, 2009 will elect to remove the offset provision. In exchange for the removal, the member's retirement annuity is reduced by 3.825% monthly as mandated by Statutes (40 ILCS 5/14-121).

Comment: We did not see any development of this assumption in the 2021 Experience Study.

6. Disability

Because members who receive disability benefits typically spend less than one year on disability, they are considered active members. Therefore, a load of 1.50% of pay on the normal cost is applied to reflect the near-term cash flow. This assumption is based on 110% of the most recent disability benefit payment information as a percent of payroll and will be updated at each valuation date as experience emerges.

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7. Retirement

Employees are assumed to retire in accordance with the rates shown below. The rates apply only to employees who have fulfilled the service requirement necessary for retirement at any given age. Based on the 2021 Actuarial Experience Study, these rates were slightly decreased to reflect recent plan experience. It is anticipated that these changes will reduce the losses on retirement in the future compared to recent past experience.

Retirement Rates for Regular Formula Employees		
Age	Males	Females
50	15.00%	30.00%
51	24.00%	30.00%
52	24.00%	30.00%
53	24.00%	27.50%
54	24.00%	25.00%
55	24.00%	25.00%
56	18.00%	24.00%
57	18.00%	18.00%
58	18.00%	18.00%
59	18.00%	18.00%
60	13.00%	16.00%
61	12.00%	12.50%
62	19.00%	22.00%
63	16.50%	18.00%
64	16.50%	19.00%
65	22.50%	25.00%
66	22.50%	27.00%
67	22.50%	25.00%
68	22.50%	25.00%
69	22.50%	22.00%
70	22.50%	22.00%
71	20.00%	22.00%
72	20.00%	22.00%
73	20.00%	22.00%
74	20.00%	22.00%
75	100.00%	100.00%

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Early Retirement Rates for Regular Formula Employees		
Age	Males	Females
55	3.50%	2.50%
56	3.50%	2.50%
57	3.50%	3.50%
58	6.00%	4.00%
59	6.50%	5.00%

Retirement Rates for Alternative Formula Employees				
Age	Eligible for Alternate Formula Benefits Only		Eligible for Regular Formula Benefits Only	
	Males	Females	Males	Females
50	60.00%	41.50%	N/A	N/A
51	50.00%	31.00%	N/A	N/A
52	35.00%	25.00%	N/A	N/A
53	35.00%	25.00%	N/A	N/A
54	35.00%	25.00%	N/A	N/A
55	40.00%	40.00%	N/A	N/A
56	30.00%	25.00%	N/A	N/A
57	25.00%	25.00%	N/A	N/A
58	27.00%	25.00%	N/A	N/A
59	27.00%	25.00%	N/A	N/A
60	30.00%	30.00%	4.00%	5.00%
61	30.00%	30.00%	4.00%	5.00%
62	30.00%	30.00%	8.00%	10.00%
63	35.00%	30.00%	10.00%	10.00%
64	35.00%	30.00%	11.00%	15.00%
65	35.00%	50.00%	14.00%	20.00%
66	40.00%	50.00%	25.00%	20.00%
67	40.00%	50.00%	20.00%	25.00%
68	45.00%	50.00%	17.50%	30.00%
69	45.00%	50.00%	17.50%	30.00%
70	50.00%	50.00%	17.50%	30.00%
71	50.00%	50.00%	17.50%	30.00%
72	100.00%	100.00%	100.00%	100.00%

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Members hired after December 31, 2010, eligible for the regular formula benefits will retire according to the following age-based retirement rates:

Retirement Rates for Regular Formula Employees – Tier 2 Members			
Age	Employees Eligible for Normal Retirement	Age	Employees Eligible for Early Retirement
67	50.0%	62	30.0%
68	32.5%	63	15.0%
69	32.5%	64	15.0%
70	32.5%	65	15.0%
71	20.0%	66	15.0%
72	20.0%		
73	20.0%		
74	20.0%		
75	100.0%		

Members hired after December 31, 2010, eligible for the alternate formula benefits will retire according to the following age-based retirement rates:

Retirement Rates for Alternative Formula Employees		
Age	Males	Females
60	50.0%	50.0%
61	25.0%	30.0%
62	25.0%	35.0%
63	30.0%	30.0%
64	30.0%	35.0%
65	30.0%	50.0%
66	30.0%	50.0%
67	30.0%	50.0%
68	30.0%	50.0%
69	40.0%	50.0%
70	45.0%	50.0%
71	45.0%	50.0%
72	100.0%	100.0%

8. Spouse's Age

The female spouse is assumed to be three years younger than the male spouse.

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9. Children

It is assumed that married members have 2.2 children, one year apart in age.

The age of the youngest child of a deceased employee at his or her date of death is assumed to be as follows:

Age at Death of Employee	Age of Youngest Child	Age at Death of Employee	Age of Youngest Child
20	2	40	6
25	3	45	8
30	4	50	10
35	5	55	12
		60	14

Comment: We did not see any development of this assumption in the 2021 Experience Study.

10. Overtime and Shift Differentials

Reported earnings include base pay alone. It is assumed that overtime and shift differentials will increase total payroll by 3.5% over reported earnings.

Comment: We did not see any development of this assumption in the 2021 Experience Study.

11. Load for Inactive Members Eligible for Deferred Vested Pension Benefits

Load of 15% for Regular Formula members and 13% for Alternative Formula members to the liability attributable to inactive members eligible for deferred vested pension benefits for increase in final average salary due to participation in a reciprocal system after termination. The change in this assumption is supported by analysis on page C-78 of the July 15, 2022 report on the 2021 Experience Study.

12. Missing Data

If year-to-date earnings are not available, then the monthly pay rate is used. If both year-to-date earnings and the monthly pay rate are not available, the annual rate of pay is assumed to be the rate of pay for the population as a whole on the valuation date. For members with less than a year of service, the annual rate of pay is based on the greater of year-to-date earnings or annualized pay rate.

For the 2022 valuation, the earnings reported for the fiscal year ending June 30, 2022 includes retroactive pay for many active members. Consequently, for continuing active members, GRS set valuation pay for projecting future compensation to equal the lesser of: (1) last year's annual pay increased by the greater of the change in monthly pay rate or

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2.75% and (2) reported year-to-date earnings. We agree that this approach is reasonable for this valuation.

If a birth date was not available, the member was assumed to be age 35.

13. Decrement Timing

All decrements are assumed to occur mid-year.

14. Decrement Relativity

Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.

15. Decrement Operation

Disability and turnover decrements do not operate after member reaches retirement eligibility.

16. Eligibility Testing

Eligibility for benefits is determined based upon the age nearest birthday and service on the date the decrement is assumed to occur.

17. 415(b) and 401(a)(17) Limits

No explicit assumption is made with respect to these items.

18. Buyout Election Assumption

With respect to the COLA Buyout, 20% of Regular Formula eligible Tier 1 active members and 42% of Alternative Formula members not covered by Social Security, and 38% of Alternative Formula members covered by Social Security, are assumed to elect to receive a reduced and delayed AAI benefit at retirement and an accelerated pension benefit option in accordance with Public Act 100-0587.

With respect to the Total Buyout, 2% of eligible inactive members are assumed to elect to receive an accelerated pension benefit option in lieu of an annuity at retirement in accordance with Public Act 100-0587. The election percentages apply until the end of each Buyout Program, i.e., June 1, 2024 for the COLA Buyout and May 31, 2024 for the Total Buyout.

GRS notes these “COLA Buyout” assumptions are based upon experience through June 2022 provided by the System and this year they provided support for the assumption on page 44.

PURSUANT TO 30 ILCS 5/2-8.1

SECTION III – SUPPORTING ANALYSIS

19. Population Projection

For purposes of determining annual appropriations as a percentage of total covered payroll, the size of the active group is assumed to remain level at the number of actives as of the valuation date. New entrants are assumed to enter with an average age and an average pay as disclosed below. New entrants are assumed to have the same demographic profile as actual new entrants over the 15 years prior to the valuation date. The average increase in uncapped payroll for the projection period is 2.75% per annum. New entrants not covered by Social Security are assumed to participate in the Tier 2 defined benefit plan.

New Entrant Benefit Groups														
Total Salaries in Thousands														
New Entrants in Positions Formerly Eligible for Alternate Formula				New Entrants in Positions Formerly Eligible for Alternate Formula				New Entrants in Positions Formerly Eligible for Alternate Formula						
New Entrants Eligible for Regular Formula Benefits who are Covered by Social Security				New Entrants Eligible for Regular Formula Benefits who are not Covered by Social Security				New Entrants Eligible for Regular Formula Benefits who are not Covered by Social Security						
Age Group	No.	Salary	No.	Salary	No.	Salary	No.	Salary	No.	Salary	No.	Salary	Total	
Under 20	326	10,983			255	11,823	58	2,656	1	26	2	81	642	25,569
20-24	3,538	152,822	3	115	2,106	106,591	382	19,114	443	30,484	1	41	6,473	309,167
25-29	4,816	240,471			1,816	97,782	387	21,865	373	27,026	3	132	7,395	387,276
30-34	4,132	228,466			1,011	58,703	325	20,333	195	14,625	2	100	5,665	322,227
35-39	3,779	222,167	1	55	703	44,294	257	16,929	70	5,260			4,810	288,705
40-44	3,390	207,844	1	57	536	35,513	205	14,216	36	2,940			4,168	260,571
45-49	3,025	187,342	4	283	399	26,710	177	12,358	26	1,956	1	60	3,632	228,709
50-54	2,481	155,260	5	346	235	15,653	102	7,208	37	2,903			2,860	181,370
55-59	1,438	87,340	3	234	102	6,601	52	3,578	12	1,137			1,607	98,890
60-64	450	26,081			29	1,817	13	907	2	220			494	29,025
65-69	32	1,831			1	79	1	62					34	1,971
70 & Over														
Total	27,407	1,520,606	17	1,090	7,193	405,567	1,959	119,227	1,195	86,577	9	414	37,780	2,133,481
Avg. Salary		55,482				64,127		60,861		72,449		45,979		56,471
Avg. Age		36.90				45.28		33.64		28.62		27.47		35.25
Percent Male		42%				72%		66%		90%		100%		50%

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SECTION III – SUPPORTING ANALYSIS

C. Funding Methods

Actuarial funding methods consist of three components: (1) the actuarial cost method, which is the attribution of total costs to past, current, and future years; (2) the asset valuation method (i.e., asset smoothing); and (3) the amortization method.

1. *Actuarial Cost Method*

The System uses the projected Unit Credit cost method (PUC) to assign costs to years of service, as required under the Pension Code (40 ILCS 5/14). **We have no objections with respect to using the PUC method, although we would prefer the Entry Age Normal (EAN) cost method as it is more consistent with the requirement in 40 ILCS 5/14-131 for level percentage of pay funding.**

Under the PUC method, which is used by some public sector pension funds, the benefits of active participants are calculated based on their compensation projected with assumed annual increases to ages at which they are assumed to leave the active workforce by any of these causes: retirement, disability, turnover, or death. Only past service (through the valuation date, but not beyond) is taken into account in calculating these benefits. The present value of these benefits based on past service and future compensation is the actuarial liability for a given active participant. Under the PUC cost method, the value of an active participant's benefits tends to increase more sharply over his or her later years of service than over his or her earlier ones. While the PUC method is not an unreasonable method, as a result of this pattern of benefit values increasing, more plans use the EAN cost method to mitigate this effect. It should also be noted that the EAN cost method is the required method to calculate liability for GASB Nos. 67 and 68.

2. *Asset Valuation Method*

The Actuarial Value of Assets for the System is a smoothed market value. Unanticipated changes in market value are recognized over five years in the Actuarial Value of Assets. The primary purpose for smoothing out gains and losses over multiple years is so fluctuations in the contributions will be less volatile over time than if based on the Market Value of Assets.

The 2021 Public Retirement Systems Study by the National Conference on Public Employee Retirement Systems (NCPERS) survey of 156 public retirement funds found that the majority of plans responding to the survey have a five-year smoothing period.

Smoothing the market gains and losses over a period of five years to determine the Actuarial Value of Assets is a generally accepted approach in determining actuarial cost, and we concur with its use.

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3. Amortization Method

The mandated State contribution is based on a determination of the level percentage of payroll that is expected to achieve a 90% funded ratio in 2045. While not a traditional amortization method, this methodology effectively amortizes a portion of the unfunded actuarial liability over the remaining period until 2045, which is currently 23 years.

One of the principles of funding public plans identified by the American Academy of Actuaries is that there should be “a plan to make up for any variations in actual assets from the funding target within a defined and reasonable time period.” Because it only targets 90%, the State method does not include a plan to achieve the funding target over any period of time.

Typical public plan amortization methods are designed to increase each year by expected payroll growth. Under the State mandated method, however, the effective amortization payment increases each year by more than the expected growth in payroll. As a result, the State mandated method defers payments on the unfunded actuarial liability further into the future than under typical public plan amortization methods.

Finally, as the remaining period to achieve 90% funding shortens, the State mandated method will also produce more volatile contributions. Instead of a single fixed period, typical public plan amortization methods use layered amortization bases such that new assumption changes and experience gains and losses are amortized over a new period (e.g., 20 years) while the remaining period for the prior amortization layers becomes one year shorter.

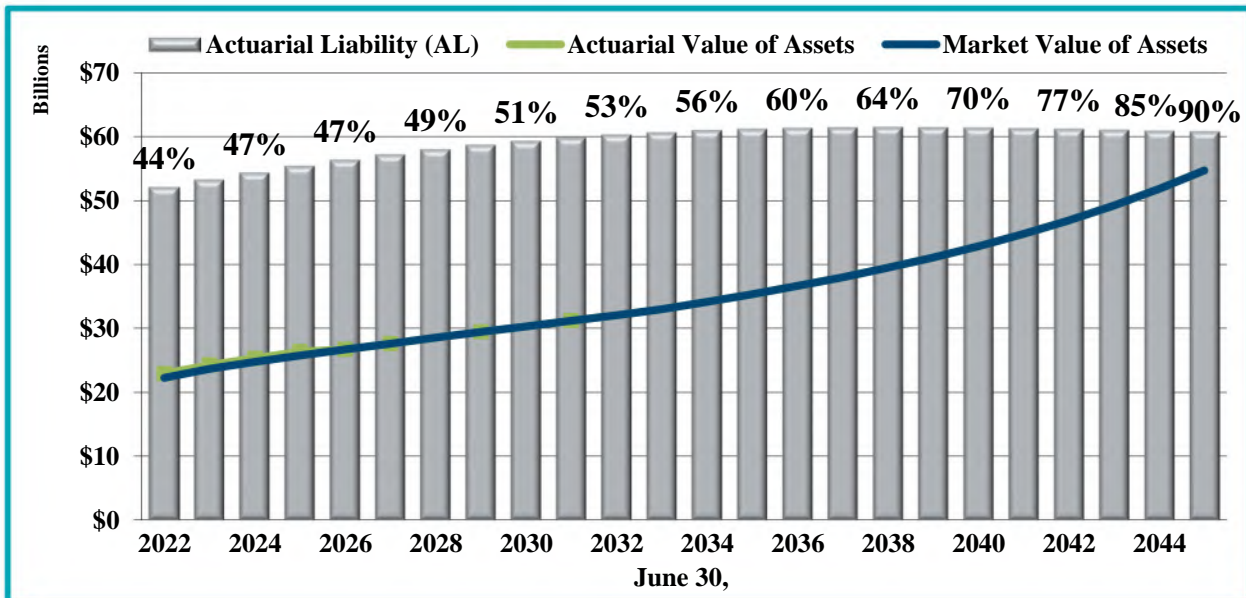
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SECTION IV – PROJECTION ANALYSIS

This section reviews the projections contained in the draft June 30, 2022 Actuarial Valuation of SERS. These projections are fundamental to the development of the required State contribution calculated under the current statutory funding requirement.

The following graphs are independent approximations of the projections performed by the State Actuary to verify that the System's funding projections are reasonable. They do not reflect all the precision of the projections applied by the System's actuary, but instead they are intended to verify the reasonableness of the modeling done by the System's actuary.

The graph below shows our projection of the expected future liabilities and assets in the System through 2045. As pointed out on page 12 of the draft June 30, 2022 Actuarial Valuation, the majority of the funding of the System occurs between 2034 and 2045. The **lines show the projected assets** (market value and actuarial value), and the **bars show the projected liabilities** of the System. The funded ratio for each five years is shown at the top of the bars. For example, in 2034, the funded ratio is projected to be approximately 56% with assets of approximately \$34 billion and liabilities of approximately \$61 billion.

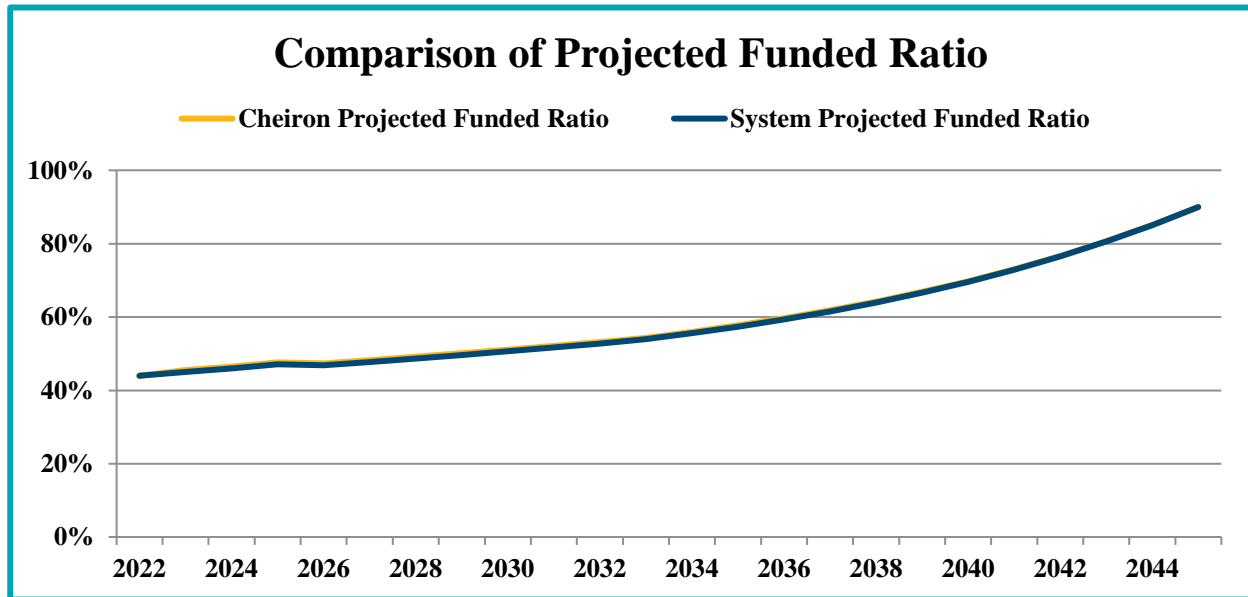


Source: Cheiron projection analysis.

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SECTION IV – PROJECTION ANALYSIS

When we compare our projected funded ratio against the results shown in the draft June 30, 2022 Actuarial Valuation, **we find a close match in expected funded ratio**. This close match of the funded ratio supports that the projections done by the System's actuary are reasonable and the fact we show slightly different funded ratios is a function of Cheiron's approximation.

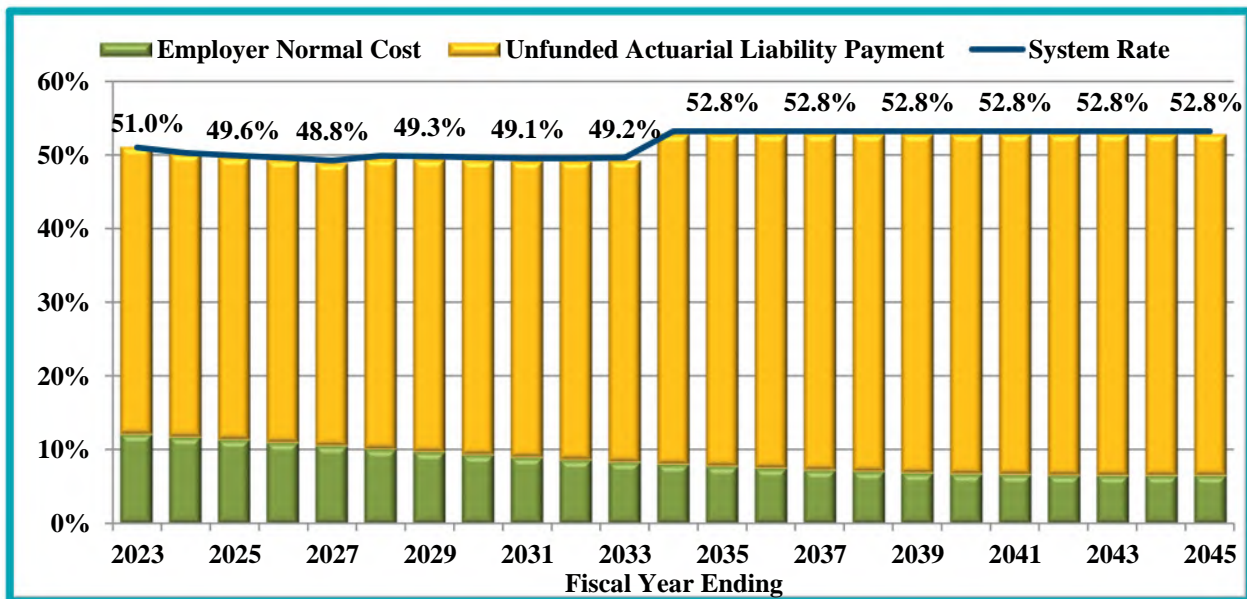


Source: Cheiron projection analysis.

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SECTION IV – PROJECTION ANALYSIS

The following graph shows the expected contributions calculated under the statutory method. The values shown for the fiscal year ending 2023 was set based on the June 30, 2021 Actuarial Valuation. The current valuation is the basis for setting the rates starting July 1, 2023 (Fiscal Year Ending June 30, 2024). The contribution requirement has two components: 1) the employer normal cost, which is the approximate value of the amount of benefits accrued by participants in the upcoming year, less employee contributions, based on the statutory funding method; and 2) an amortization payment on the unfunded liability. The normal cost amounts are shown by the green bars and the amortization payments of the unfunded actuarial liability (UAL) amounts by the yellow bars. The percentages shown are the total contribution rates as a percentage of payroll calculated by Cheiron, which are equal to the sum of the bars. The graph shows that larger percentages of the total contribution are being made toward the UAL payments later in the period. The blue line shows the projected contribution rates as percentages of payroll from the System actuary's draft June 30, 2022 Actuarial Valuation. The difference between Cheiron's approximation and the System's projections is the difference between the top of the bars and the line. In this instance, there is virtually no difference. The contributions are being limited by the maximum contribution described in the General Obligation Bond Act prior to 2033, which is why the rate increases after 2033.



Source: Cheiron projection analysis.

Our conclusion is that **the projections performed by the System's actuary are reasonable.**

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SECTION V – ANALYSIS OF FUNDING ADEQUACY

In this section, we examine the adequacy of the funding for the System, including funded ratio, the sources of changes in the unfunded actuarial liability (UAL), projections of the UAL, and statutory funding requirements compared to contributions needed to pay down the UAL.

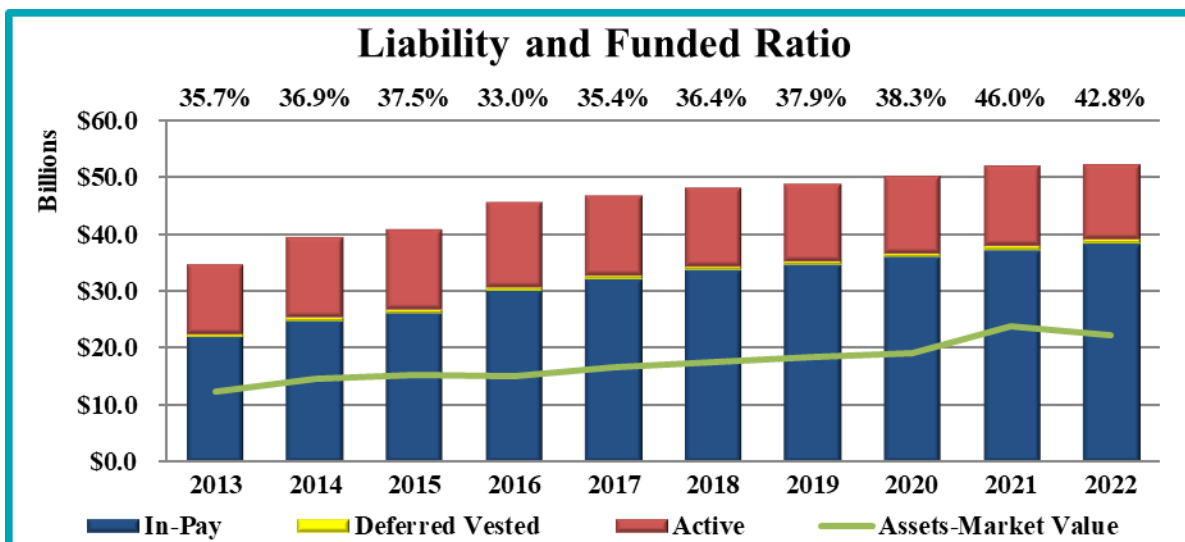
The actuarial valuation report prepared by GRS includes both traditional actuarial measurements, as well as additional risk measurements that are shown on pages 17 to 22 of the draft June 30, 2022 Actuarial Valuation report. Given the unique and substantial funding challenges faced by the Illinois pension systems, this additional information is quite important and supplements the information we present here on funding adequacy to better inform the legislature and other stakeholders about the adequacy of the System's funding.

System Funded Ratio

The first funding adequacy measure we present is the trend in funded ratio for the past 10 years. Funded ratio for this measure is defined as the ratio of the Market Value of Assets to the actuarial liability. The chart below shows SERS' funded ratio since 2013 has gone from 35.7% funded to 42.8% funded in 2022, an increase in funded ratio of 7.1%. In addition to showing the funded ratio, this chart also shows the breakdown of the Plan's liabilities by membership status:

- Active liability – the liability (attributable to service already performed) for future payments to members who are currently working in the System,
- Deferred Vested liability – the liability for future payments to members who are no longer working in the system, and
- In-Pay liability – the liability for future payments to retirees and beneficiaries who are currently receiving benefits.

This breakdown shows that today plan assets only cover about 58% of the liabilities for just those members currently in pay status.



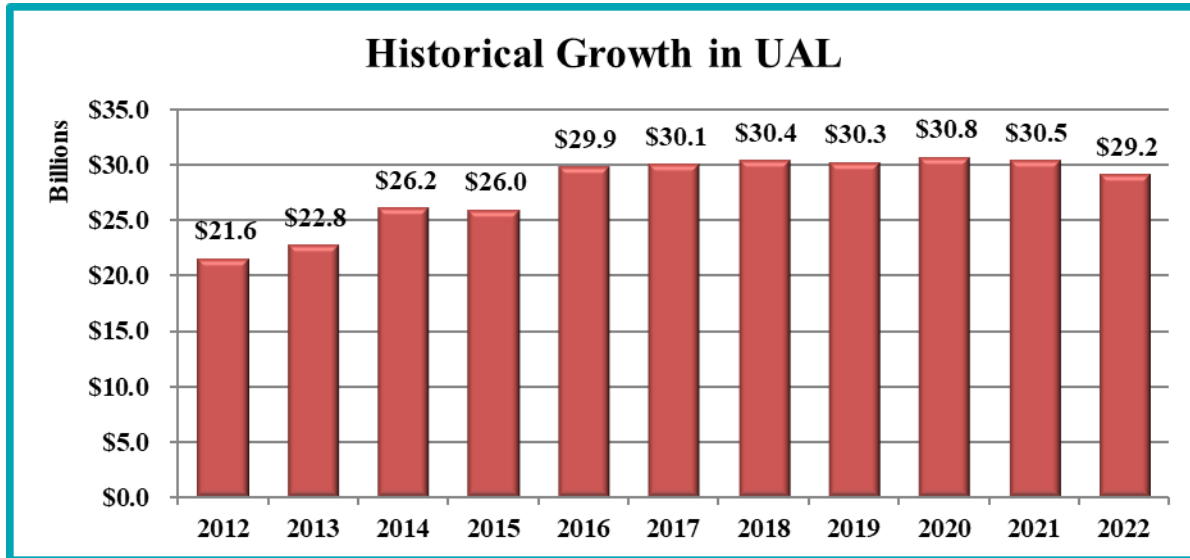
Source: Cheiron analysis of funding adequacy.

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SECTION V – ANALYSIS OF FUNDING ADEQUACY

Sources of Changes in the UAL

As shown in the chart below, SERS' unfunded actuarial liability (UAL) has grown from about \$21.6 billion in 2012 to \$29.2 billion in 2022, an increase of \$7.6 billion, \$8.3 billion of which occurred from 2012-2016. In order to understand how to reverse this trend, it is important to understand the sources contributing to it.



Source: Cheiron analysis of funding adequacy

The changes to the UAL from June 30, 2012 to June 30, 2022 can be separated into the following components:

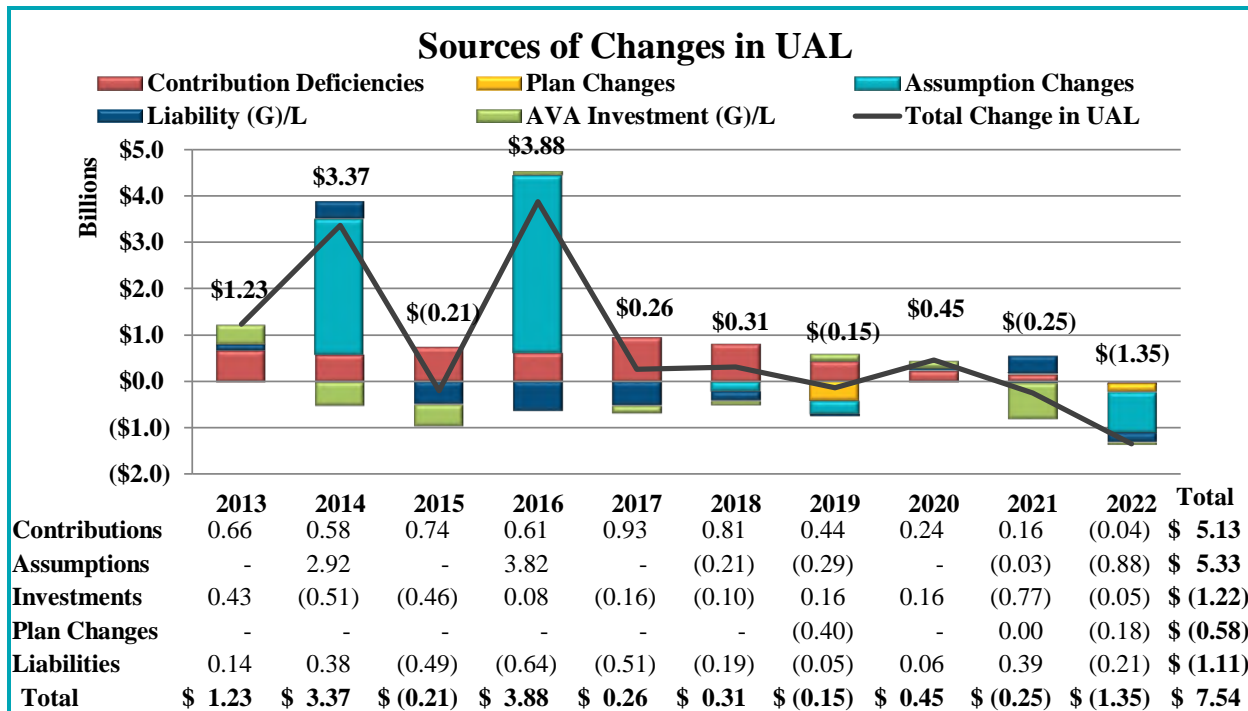
- **Contribution Deficiencies** – Contributions that are less than the tread water contribution cause the UAL to increase. The tread water contribution consists of two components: the normal cost, which is the cost of benefits earned in a given year, and the interest on the unfunded actuarial liability. This sum is referred to as the tread water contribution because it is the contribution necessary so that the UAL will remain constant, or “tread water” (absent experience gains or losses). The only year contributions exceeded tread water were for 2022. The differences between actual contributions and the tread water contributions have increased the UAL by \$5.13 billion over this period.
- **Assumption Changes** - Changes to actuarial assumptions as the System updated expectations, primarily on future investment returns and life expectancy. A positive aspect of the UAL increases due to assumption changes is that they are expected to result in liability measurements that more accurately reflect future expectations. Over this period, assumption changes have increased the UAL by \$5.33 billion.
- **Plan Changes** - Modifications of the design of the Plan, which have affected benefits already accrued. Since most of the changes to the System’s plan affect only future benefits the impact has been negligible during this period, reducing the liability by \$0.58 billion over this period.

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SECTION V – ANALYSIS OF FUNDING ADEQUACY

- **Liability (Gain) or Loss** - Changes in the UAL due to liability experience (i.e., mortality, terminations, salary increases, etc.). These were generally small but decreased the UAL by \$1.11 billion over this period.
- **AVA (Actuarial Value of Assets) Investment (Gain) or Loss** - Net investment gains or losses due to assets earning more or less than assumed. These have decreased the UAL over this period by \$1.22 billion.

The chart below shows the changes in UAL each year broken into these five components. The sum of all the components, as the total change in UAL, is shown as the black line. Values of each component as well as total by year are shown in the chart along with the totals for the period.



Source: Cheiron analysis of funding adequacy.

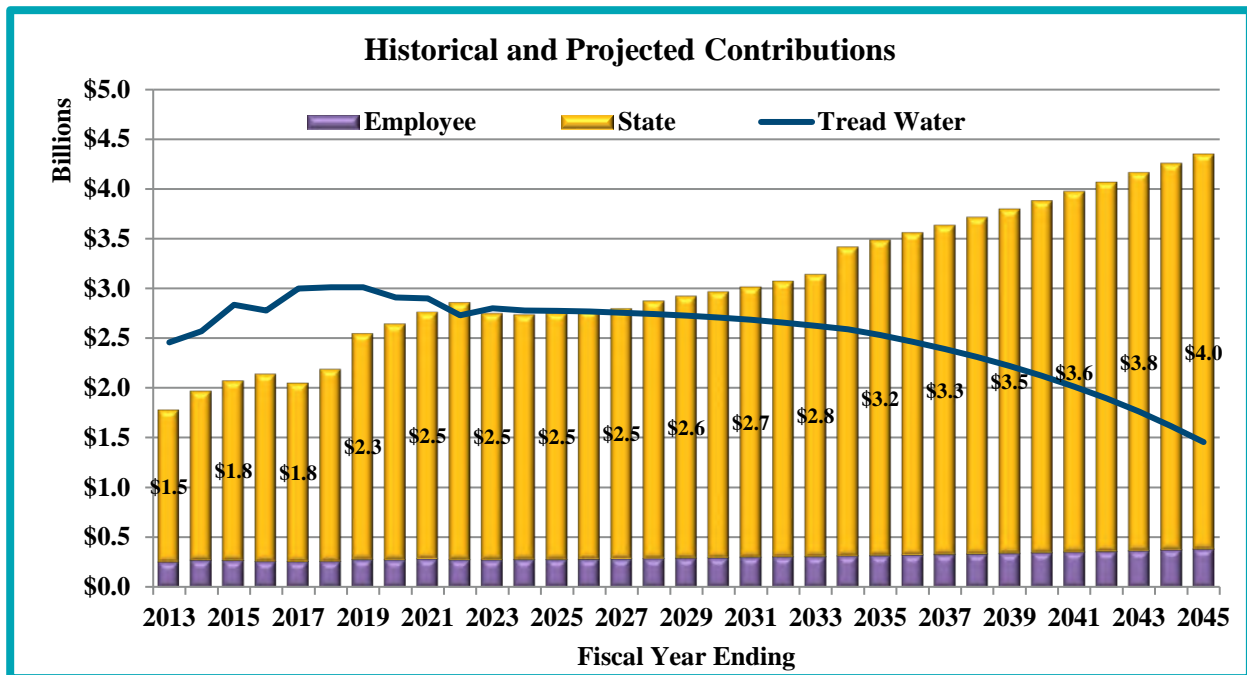
We expect that this chart will help stakeholders understand the sources of growth in the UAL over the past decade and inform discussions about the current funding requirements and adequacy.

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SECTION V – ANALYSIS OF FUNDING ADEQUACY

Actual Contributions Compared to Tread Water Contribution

One of the persistent sources of the increase in UAL is due to actual contributions to the System being less than the tread water contribution (the amount needed to prevent the UAL from increasing if all assumptions are met). As the chart below shows, actual contributions have been significantly less than the tread water cost, however this trend has reversed this year. When the total contributions are above the tread water cost (blue line), the UAL is expected to decline. During the period of 2013-2022, the accumulated contribution deficiencies have added approximately \$5.2 billion to the UAL.



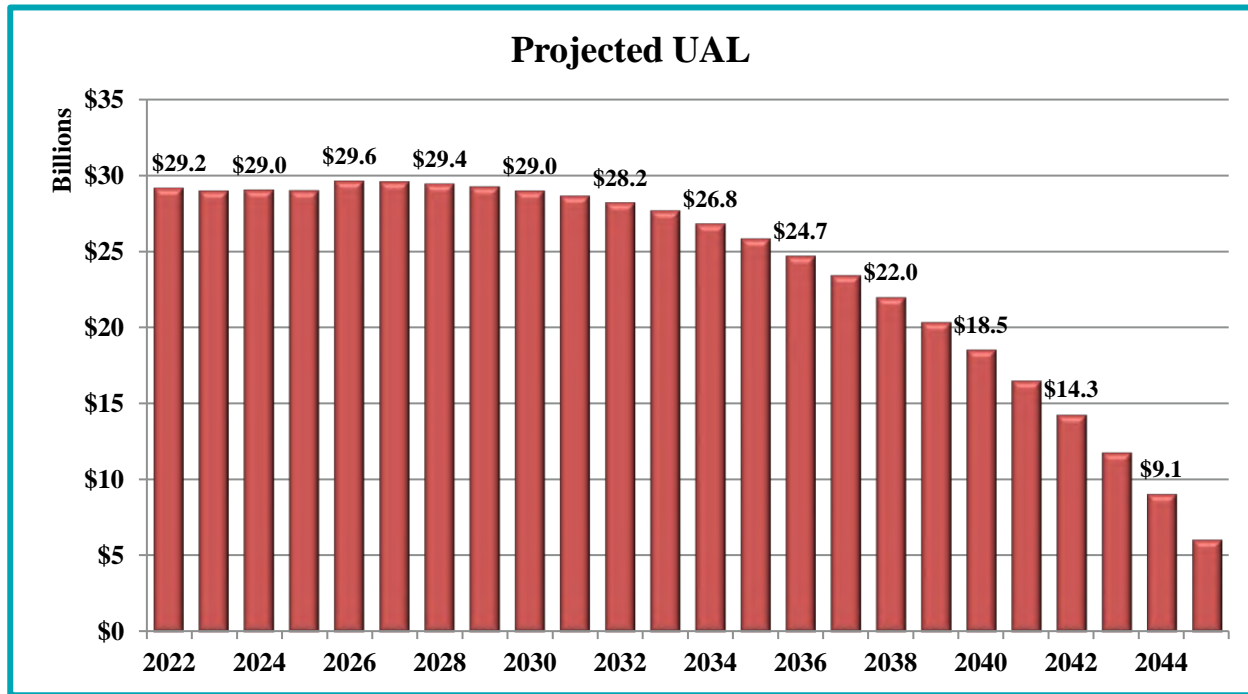
Source: Cheiron analysis of funding adequacy.

The System's actuary commented that "the statutory funding method generates a contribution requirement that is less than a reasonable actuarially determined contribution". Because a "reasonable actuarially determined contribution" has never been defined in actuarial standards, it isn't clear what standard the System's actuary is using to make this determination. However, a revision to ASOP 4 has defined a "Reasonable Actuarial Determination Contribution" and that definition will be first effective in next year's valuation. The actuary will need to consider the ASOP 4 definition when evaluating this statement next year.

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SECTION V – ANALYSIS OF FUNDING ADEQUACY

The next chart shows that if the Statutory contributions continue to be made each year and all other assumptions are met, the UAL is projected to decline from \$29.2 billion in 2022 to \$6.1 billion in 2045. As illustrated in the chart below, the UAL is projected to be fairly level until 2031 before the UAL starts to noticeably decline.



Source: Cheiron analysis of funding adequacy.

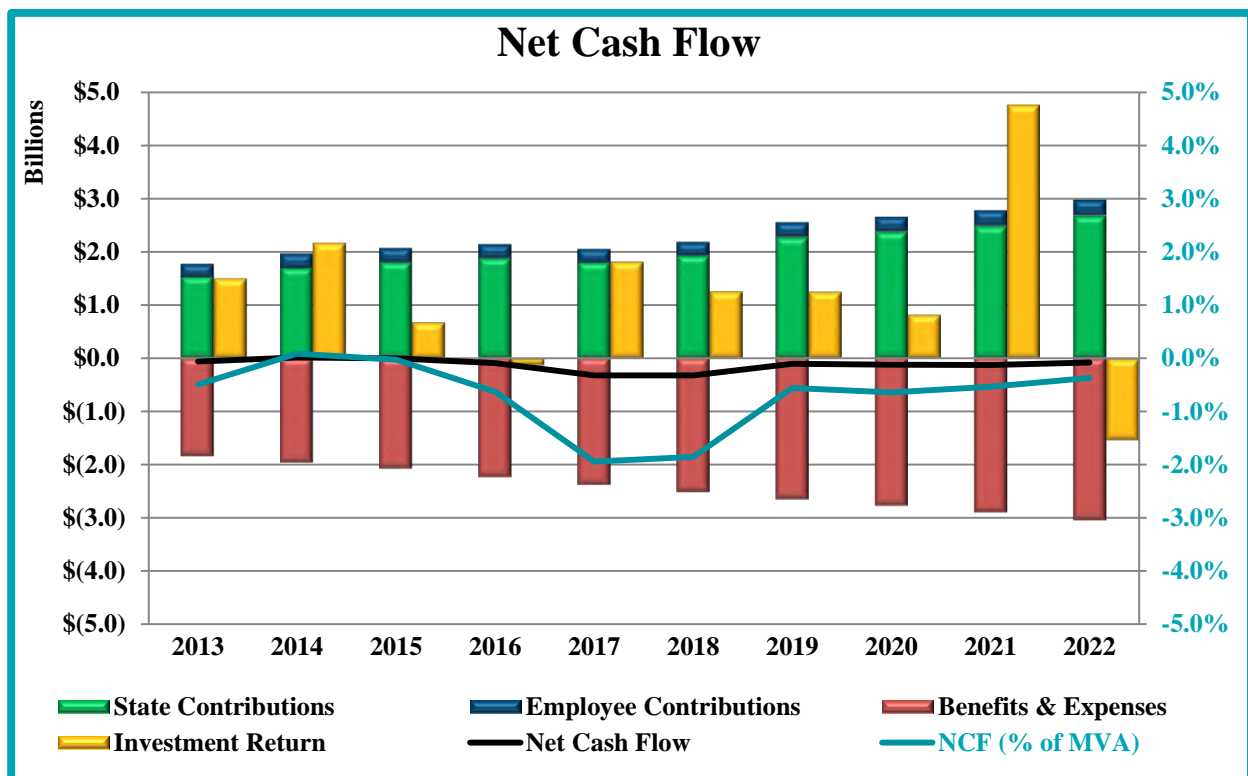
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SECTION V – ANALYSIS OF FUNDING ADEQUACY

Net Cash Flow Analysis

The Plan's net cash flow is defined as State and employee contributions less benefit payments and administrative expenses. The more negative net cash flow is as a percentage of the plan's assets, the more vulnerable the Plan is to market downturns. When a pension plan has more payouts than contributions and suffers an investment loss, it is left with fewer assets to invest and recapture during a recovery.

Looking at the chart below, SERS has slightly negative net cash flow (black line). If contributions increase as quickly as benefit payments, the net cash flow will remain stable. But if contributions do not continue to grow either because the Plan has become better funded or because the expected contributions are not made, negative net cash flow may become a more significant issue, therefore it should continue to be monitored. The teal line shows net cash flow as a percent of Market Value of Assets on the right-side axis. The greater the negative cash flows are relative to plan assets, the more vulnerable a plan is to market downturns. This is because once there is a market downturn, the plan assets lose on both the return and the negative cash flow, leaving a lower asset base from which to recover from the loss.



Source: Cheiron analysis of funding adequacy.

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STATUS OF RECOMMENDATIONS FROM THE 2021 STATE ACTUARY REPORT

Response to Recommendations in 2021

In the State Actuary's Preliminary Report on the State Employees' Retirement System of Illinois presented December 16, 2021, Cheiron made several recommendations. Below we summarize how these recommendations were reflected in either the System's comments last year or in this year's draft June 30, 2022 Actuarial Valuation.

Recommendations to Retirement System from 2021 State Actuary Report	Status	Comments
<p>1. We continue to recommend that the funding method be changed to fully fund plan benefits. Continuing the practice of inadequate contributions and targeting a funded percentage less than 100% increases the risk of the System becoming unsustainable. Consequently, we recommend that the funding method maintain contributions at a level that is expected to reduce the unfunded actuarial liability each year until the Plan is ultimately 100% funded. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.</p>	<p>Partially Implemented</p>	<p>The System has adopted a funding policy that would provide for annual State contributions, the "Actuarially Determined Contribution", and is used for informational purposes only.</p> <p>GRS continues to include strong language throughout their report recommending the use of an actuarially sound method and stating clearly that the statutory method is not actuarially sound. We find these statements to be appropriate and support their continuation.</p> <p>Recommendation repeated.</p>
<p>2. Because experience studies are performed every three years, we recommend that the phase-in period for the impact of assumption changes be reduced to three years. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.</p>	<p>Not Implemented</p>	<p>Recommendation repeated.</p>

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STATUS OF RECOMMENDATIONS FROM THE 2021 STATE ACTUARY REPORT

Recommendations to Retirement System from 2021 State Actuary Report	Status	Comments
3. We recommend including the basis of the assumptions on the percentage electing the accelerated pension benefit payments in the report or include the reference to another public document.	Implemented	Recommendation removed.
4. Section 3.2 of ASOP 51 requires the actuary to identify risks that “may reasonably be anticipated to significantly affect the plan’s future financial condition.” [emphasis added]. The risks currently identified appear to largely duplicate the list of examples in ASOP 51 and could apply to almost any pension plan. In future valuations, we recommend that the actuary explain how each risk identified would reasonably be anticipated to significantly affect the specific plan’s future financial condition.	Not Implemented	The risks currently identified appear to largely duplicate the list of examples in ASOP 51 and could apply to almost any pension plan. Recommendation repeated.
5. For each risk identified above, Section 3.3 of ASOP 51 requires the actuary to provide an assessment that takes into account “circumstances specific to the plan.” For some of the identified risks, the actuary has provided a quantitative assessment specific to the plan while for other identified risks, the actuary has only provided a generic statement that could apply to any plan. We recommend that for each identified risk the actuary provide an assessment, preferably quantitative, that considers the specific circumstances of this plan.	Partially Implemented	SERS added stress testing in appendices to the final Actuarial Valuation Report in a letter dated December 20, 2021 which adequately assessed the impact of various risks. We anticipate that similar stress testing will be included in the final June 30, 2022 Actuarial Valuation. While the System noted in its December 9, 2021 response that the ASOP 51 disclosure may be expanded to address many of Cheiron’s recommendations, the final 2021 Actuarial Valuation Report did not provide the recommended assessments. Recommendation repeated.

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STATUS OF RECOMMENDATIONS FROM THE 2021 STATE ACTUARY REPORT

Recommendations to Retirement System from 2021 State Actuary Report	Status	Comments
6. We recommend GRS provide additional explanation and justification for the methods used to develop the mortality assumptions used in the valuation.	Partially Implemented	GRS reviewed mortality with the current experience study report. However, they should provide the additional explanation and justification for selecting the Below-Median Income subset for the base mortality table. Recommendation modified.
7. We recommend the SERS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly.	Implemented	GRS has continued to do this, most recently providing a review in the <i>2021 Actuarial Experience Study report</i> dated July 15, 2022. We will continue to include this recommendation each year. Recommendation continued.

Chapter Four

Preliminary Report on the Judges' Retirement System

In accordance with 30 ILCS 5/2-8.1, Cheiron, the State Actuary, submitted a preliminary report to the Board of Trustees of the Judges' Retirement System

(JRS) concerning proposed certifications of required State contributions submitted to Cheiron by the Board. The preliminary report was submitted to JRS on December 1, 2022. The preliminary report was based on Cheiron's review of actuarial assumptions included in JRS' 2022 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the Judges' Retirement System. JRS' written response, provided on December 8, 2022, can be found in Appendix C.

OVERVIEW	
JUDGES' RETIREMENT SYSTEM	
as of June 30, 2022	
Actuarial accrued liability	\$2,955,628,361
Actuarial value of assets	\$1,309,800,342
Unfunded liability	\$1,645,828,019
Funded ratio	44.3%
Employer normal cost	\$31,333,252
State contribution (FY24)	\$147,838,000
Active members	940
Inactive members	24
Current benefit recipients	<u>1,323</u>
Total membership	2,287
Interest rate assumption	6.50%
Inflation assumption	2.25%
Actuarial cost method	Projected Unit Credit
Asset valuation method	5-year Smoothing
Executive Director	Tim Blair
Actuarial Firm	Gabriel, Roeder, Smith & Company
Source: June 30, 2022 JRS actuarial valuation report.	

December 15, 2022

Mr. Frank Mautino
Auditor General
740 East Ash Street
Springfield, Illinois 62703

Board of Trustees
Judges' Retirement System of Illinois
2101 South Veterans Parkway
P.O. Box 19255
Springfield, Illinois 62794-9255

Dear Trustees and Auditor General:

In accordance with the Illinois State Auditing Act (30 ILCS 5/2-8.1), Cheiron is submitting this preliminary report concerning the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contribution to the Judges' Retirement System of Illinois (JRS or System) for Fiscal Year 2024.

In summary, we believe that the assumptions and methods used in the draft June 30, 2022 Actuarial Valuation, which are used to determine the required Fiscal Year 2024 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, were properly calculated in accordance with State law.

Section I of this report describes the review process undertaken by Cheiron. Section II summarizes our findings and recommendations. Section III provides the supporting analysis for those findings and presents more details on our assessment of the actuarial assumptions and methods employed in GRS's Actuarial Certification, as well as our assessment of GRS's determination of the required State contribution for Fiscal Year 2024. Section III also includes comments on other issues impacting the funding of the Judges' Retirement System, including the implications of Article 18 of the Illinois Pension Code, which establishes the statutory minimum funding requirements for the System. **We agree with GRS that the statutory mandated minimum funding requirements have been and continue to be inadequate. In addition, the past inadequate funding has resulted in current and future contribution levels, measured as a percent of payroll, to be among the highest in the country. Making adequate contributions in the future to fully fund the system will be challenging.** Section IV reviews the projections contained in the draft June 30, 2022 Actuarial Valuation. Finally, Section V provides an analysis of funding adequacy.

In preparing this report, we relied on information (some oral and some written) supplied by JRS and GRS. This information includes actuarial assumptions and methods adopted by the JRS Board, System provisions, the draft June 30, 2022 Actuarial Valuation, the draft 2022 GASB 67/68 Report, the 2022 Valuation Results presentation, the 2021 Actuarial Experience Review, and minutes of the plan year 2022 JRS Board of Trustee meetings. A detailed description of all information provided for this review is contained in Appendix B.

This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys, and our firm does not provide any legal services or advice.

This report was prepared exclusively for the Office of the Auditor General and the Judges' Retirement System of Illinois for the purpose described herein. Other users of this report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to any other user.

Sincerely,
Cheiron

SIGNED ORIGINAL ON FILE

Gene Kalwarski, FSA, EA, FCA, MAAA
Principal Consulting Actuary

SIGNED ORIGINAL ON FILE

Matthew Wells, FSA, EA, MAAA
Associate Actuary

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE
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SECTION I – REPORT SCOPE

Illinois Public Act 097-0694 (the Act) amended the Illinois State Auditing Act (30 ILCS 5/2-8.1) and requires Cheiron, as the State Actuary, to review the actuarial assumptions and valuation of the Judges' Retirement System of Illinois (JRS or System) and to issue to the JRS Board this preliminary report on the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contributions for Fiscal Year (FY) 2024. The purpose of this review is to identify any recommended changes to the actuarial assumptions for the JRS Board to consider before finalizing its certification of the required State contributions for FY 2024.

While the Act states that just the actuarial assumptions and valuation are to be reviewed, we have also reviewed the actuarial methodologies (funding and asset smoothing methods) employed in preparing the Actuarial Certification, as these methods can have a material effect on the amount of the State contribution being certified. Finally, we have offered our opinion on the implications of Article 18-131 of the Illinois Pension Code, which impacts the contribution amount certified by GRS.

In conducting this review, Cheiron reviewed the draft June 30, 2022 Actuarial Valuation, the draft 2022 GASB 67/68 Report, the 2022 Actuarial Results presentation, the 2021 Actuarial Experience Review, and minutes of the plan year 2022 Board of Trustees meetings. The materials we reviewed are listed in Appendix B.

In addition to reviewing the Actuarial Certification of the required State contribution to JRS, the Act requires the State Actuary to conduct a review of the “actuarial practices” of the Board. While the term “actuarial practices” was not defined in the Act, we continue to interpret this language to mean that we review: (1) the use of a qualified actuary (as defined by the Qualification Standards of the American Academy of Actuaries) to prepare the annual actuarial valuation for determining the required State contribution; and (2) the conduct of periodic formal experience studies to justify the assumptions used in the actuarial valuation. In addition, we have included comments on actuarial communication and compliance with Actuarial Standards of Practice (ASOP) reflected in the draft June 30, 2022 Actuarial Valuation.

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SECTION II – SUMMARY OF RECOMMENDATIONS

This section summarizes recommendations from our review of the actuarial assumptions and methods employed in the draft June 30, 2022 Actuarial Valuation of JRS as well as the “actuarial practices” of the JRS Board. Section III of this report contains detailed analysis and rationale for these recommendations.

Proposed Certification of the Required State Contribution

Gabriel, Roeder, Smith & Company (GRS) has determined that the FY 2024 required State contribution calculated under the current statutory funding requirements is \$147,838,000. We have verified the arithmetic calculations made by GRS to develop this required State contribution and have reviewed the assumptions on which it was based. We have accepted GRS’s annual projections of future payroll, total normal costs, employee contributions, combined benefit payments and expenses, and total contributions.

State Mandated Funding Method

1. We recommend that the funding method be changed to employ a methodology that produces a Reasonable Actuarially Determined Contribution and fully funds plan benefits within a reasonable period. The State Mandated Method is entering a period in which the contribution amount it produces may be reasonable even though the overall methodology is not. This period offers an opportunity to change the methodology to one that is consistent with actuarial standards for a Reasonable Actuarially Determined Contribution (ADC) without significantly affecting the immediate contribution amount. Such a method would set contributions at a level that is expected to prevent the unfunded actuarial liability from growing and remain high enough to reduce the unfunded actuarial liability each year until the plan is ultimately 100% funded within a reasonable period. While the State Mandated Method is inadequate, it will also produce more volatile contribution levels as the remaining period to achieve 90% funding shortens. Consequently, we recommend that the funding method be changed to one that produces more stable contribution requirements while targeting 100% funding within a reasonable period and meets the actuarial standards for a Reasonable ADC. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

Recognition of Changes in Actuarial Assumptions

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modified the State’s funding policy to require that the contribution impact of all assumption changes be phased-in over a five-year period.

2. Because experience studies are performed every three years, we recommend that the phase-in period for the impact of assumption changes be reduced to no longer than three years. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

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SECTION II – SUMMARY OF RECOMMENDATIONS

Assessment of Actuarial Assumptions Used in the 2022 Valuation

30 ILCS 5/2-8.1 requires the State Actuary to identify recommended changes in actuarial assumptions that the JRS Board must consider before finalizing its certification of the required State contribution. We have reviewed all the actuarial assumptions used in the draft June 30, 2022 Actuarial Valuation and conclude that the assumptions are reasonable in general, based on the evidence provided to us.

Recommended Changes for Future Valuations

3. Section 3.2 of ASOP 51 requires the actuary to identify risks that “may reasonably be anticipated to **significantly affect** the plan’s future financial condition.” [emphasis added]. The risks currently identified appear to largely duplicate the list of examples in ASOP 51 and could apply to almost any pension plan. In future valuations, we recommend that the actuary explain how each risk identified would reasonably be anticipated to significantly affect the specific plan’s future financial condition.
4. For each risk identified above, Section 3.3 of ASOP 51 requires the actuary to provide an assessment that takes into account “circumstances specific to the plan.” For some of the identified risks, the actuary has provided a quantitative assessment specific to the plan while for other identified risks, the actuary has only provided a generic statement that could apply to any plan. We recommend that for each identified risk the actuary provide an assessment, preferably quantitative, that considers the specific circumstances of this plan.
5. We recommend the JRS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly, as they did for this valuation.

GASB 67 and 68

The 2022 JRS GASB 67 and 68 information was provided in a separate report. We find that the assumptions and methods used to prepare the 2022 JRS GASB 67 and 68 schedules are reasonable based on the evidence provided to us.

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SECTION III – SUPPORTING ANALYSIS

In this section we provide detailed analysis and supporting rationale for the recommendations that were presented in Section II of this report.

Proposed Certification of the Required State Contribution

As stated in our summary of recommendations in Section II, we have verified the arithmetic calculations made by GRS to develop the required State contribution, reviewed the assumptions on which it is based, and accepted GRS's annual projections of future payroll, total normal costs, benefits, expenses, and total contributions. However, in accordance with 30 ILCS 5/2-8.1, our review does not include a replication of the actuarial valuation results.

As previously recommended, the JRS Board retained an independent actuary, Foster & Foster, to complete a replication audit. Foster & Foster independently replicated the June 30, 2020 actuarial valuation and found no significant differences in the calculation of liabilities, assets, and contributions for JRS.

State Mandated Methods

The Illinois Pension Code (40 ILCS 5/18-131) establishes a method that does not adequately fund the System. This law requires the actuary to calculate the employer contribution as the level percentage of projected payroll that would accumulate assets equal to 90% of the Actuarial Accrued Liability in the year 2045 if all assumptions are met. This contribution methodology does not conform to generally accepted actuarial principles and practices. Generally accepted actuarial funding methods target the accumulation of assets equal to 100% of the Actuarial Accrued Liability, not 90%.

We recommend that the funding method be changed to employ a methodology that produces a Reasonable Actuarially Determined Contribution and fully fund plan benefits within a reasonable period of time (Recommendation #1). The State Mandated Method is entering a period in which the contribution amount it produces may be reasonable even though the overall methodology is not. This period offers an opportunity to change the methodology to one that is consistent with actuarial standards for a Reasonable Actuarially Determined Contribution (ADC) without significantly affecting the immediate contribution amount. Such a method would set contributions at a level that is expected to prevent the unfunded actuarial liability from growing and remain high enough to reduce the unfunded actuarial liability each year until the plan is ultimately 100% funded within a reasonable period. While the State Mandated Method is inadequate, it will also produce more volatile contribution levels as the remaining period to achieve 90% funding shortens. Consequently, we recommend that the funding method be changed to one that produces more stable contribution requirements while targeting 100% funding within a reasonable period and meets the actuarial standards for a Reasonable ADC.

The GRS June 30, 2022 Actuarial Valuation includes a recommended funding policy which would contribute the normal cost plus an amortization payment that would seek to fully pay off the total unfunded actuarial liability over a closed period by the year 2040. As of June 30, 2022, the remaining amortization period is 18 years. In the same report on pages 9 through 12, GRS also demonstrates the implications of the statutory funding amounts on the growth of the unfunded

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actuarial liability. The JRS Board of Trustees has agreed with this recommendation and adopted a separate funding policy to calculate an *Actuarially Determined Contribution (ADC)*. We note that this policy meets the requirements of a Reasonable Actuarially Determined Contribution and will satisfy the new ASOP 4 requirement effective in 2023 to calculate and disclose a Reasonable Actuarially Determined Contribution (ADC). According to this methodology, the State's contribution amount would be \$174,674,767 for FY 2024 compared to the statutory contribution amount of 147,838,000. It is important though to recognize that this policy does not affect the actual funding of the System.

We have reviewed the adopted policy. We agree that the policy is a reasonable method that conforms to the Actuarial Standards of Practice, and we agree with its use in the GASB report as an ADC. The funding policy calls for a funding amount equal to the normal cost plus a closed 25-year amortization as a level percentage of uncapped payroll of the unfunded actuarial liability. As of June 30, 2022, the remaining amortization period is 18 years. This policy defines a method that would ultimately fully fund the Plan and falls within generally accepted actuarial funding methods currently in use for public plans. Finally, while this method is an improvement to the State Mandated Funding Method, it would produce increasingly unstable contributions as 2040 approaches due to the method being a closed period amortization.

Recognition of Changes in Actuarial Assumptions

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modified the State's funding policy to require that the contribution impact of all assumption changes, including changes prior to P.A. 100-0023, be phased-in over a five-year period. As such, the Act delays the funding of the System. Assumption changes are intended to more accurately anticipate the obligations for funding based on the most recent experience analysis and forward-looking changes to future investment returns. However, only one-fifth of the impact of these changes are now recognized from the date of adoption. The remainder of the impact is recognized over four additional years such that the full impact is only recognized at the end of a five-year period beginning at the date of adoption. This phase-in provides time to adjust to a higher level of contributions. However, the Conference of Consulting Actuaries White Paper on Actuarial Funding Policies and Practices for Public Pension Plans recommends that the "phase-in period should be no longer than the time period until the next review of assumptions." **Since experience studies are performed every three years, we recommend the phase-in period for the impact of assumption changes be reduced to no longer than three years (Recommendation #2).**

Stress Testing

Based on the draft June 30, 2022 Actuarial Valuation, the funded ratio, measured as the ratio of the actuarial value of assets to the Actuarial Liability, is currently at 44.32%. The unfunded actuarial accrued liability is currently about \$1.6 billion which is expected to decrease in the future. The required State contribution rate is currently 91.91% of payroll and is scheduled to increase to 93.69% of payroll. However, if there is a significant market downturn, the unfunded actuarial liability could increase substantially and the required State contribution rate could increase significantly, putting the sustainability of the system further into question. As previously

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recommended, GRS did provide stress testing in the final 2021 Actuarial Valuation which provides important analysis to better understand these risks. We anticipate stress testing will be included in the final June 30, 2022 Actuarial Valuation.

Actuarial Standard of Practice 51

Actuarial Standard of Practice (ASOP) 51 provides guidance to actuaries on the assessment and disclosure of risks to help readers of the actuarial valuation report “*understand the effects of future experience differing from the assumptions used*” and “*the potential volatility of future measurements resulting from such differences*”.

ASOP 51's first requirement is to “*identify risks that, in the actuary's professional judgment, may reasonably be anticipated to significantly affect the plan's future financial condition.*” GRS identified six sources of risk to JRS: investment risk, asset/liability mismatch risk, contribution risk, salary and payroll risk, longevity risk and other demographic risks. With the exception of the contribution risk due to the statutorily required amount of contributions, the risks JRS identified are relatively generic and would apply to most pension plans. We believe JRS should stress the net cash flow situation as that is expected to become a problem in the future.

ASOP 51 requires the actuary to assess each of the risks identified. While the assessment does not have to be quantitative, it does have to take into account the specifics of the individual plan. ASOP 51 also describes several quantitative methods that may be used to assess risk.

- Investment Risk. GRS included additional stress testing in the last year's final actuarial valuation report that adequately assessed the investment risk with various investment return scenarios.
- Asset/Liability Mismatch Risk. GRS does not appear to provide an assessment of asset/liability mismatch risk other than to indicate that asset value changes that do not match liability changes will either increase or decrease costs. If GRS continues to identify this as a key risk, ASOP 51 requires that they also provide an assessment that takes into account “circumstances specific to the plan.”
- Contribution Risk. GRS discusses several issues with the statutorily required contribution amounts in the risk section as well as in other parts of the valuation report. The stress testing included in last year's final actuarial valuation report adequately assessed the impact of a declining contribution base (i.e., payroll).
- Salary and Payroll Risk. The stress testing included in last year's final actuarial valuation report adequately assessed the salary and payroll risk with alternative projected decreases in the active population.
- Longevity Risk. GRS does not appear to provide an assessment of longevity risk. The valuation report simply states that experience that differs from the assumptions will either increase or decrease costs. If GRS continues to identify this as a key risk, ASOP 51 requires that they also provide an assessment that takes into account “circumstances specific to the plan.”

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- Other Demographic Risk. GRS provides an explanation of demographic risks but does not appear to provide any assessment of these risks. If GRS continues to identify this as a key risk, ASOP 51 requires that they also provide an assessment that takes into account “circumstances specific to the plan.”

ASOP 51 requires the actuary to recommend a more detailed assessment of risks if it “*would be significantly beneficial.*” GRS adequately identified the primary drivers of these risks, provided background information and assessments about these identified risks, but did not in our opinion adequately communicate the significance of these risks to this Plan. That could have been achieved if GRS included additional stress testing for each risk identified in the report. GRS indicated that an additional risk assessment was performed. However, there is no communication about the findings from the additional risk assessment or any indication of where to find the additional risk assessment.

Section 3.2 of ASOP 51 requires the actuary to identify risks that “may reasonably be anticipated to significantly affect the plan’s future financial condition.” The risks currently identified appear to largely duplicate the list of examples in ASOP 51 and could apply to almost any pension plan. **In future valuations, we recommend that the actuary explain how each risk identified would significantly affect the specific plan’s future financial condition** (Recommendation #3).

For each risk identified above, Section 3.3 of ASOP 51 requires the actuary to provide an assessment that takes into account “circumstances specific to the plan.” For some of the identified risks, the actuary has provided a quantitative assessment specific to the plan while for other identified risks, the actuary has only provided a generic statement that could apply to any plan. **We recommend that for each identified risk the actuary provide an assessment, preferably quantitative, that considers the specific circumstances of this plan** (Recommendation #4).

Changes to Actuarial Standard of Practice 4

Actuarial Standard of Practice No. 4 (ASOP 4) was amended and the changes will become effective for JRS’ actuarial valuations starting June 30, 2023. There are three primary changes that will affect the JRS actuarial valuation:

1. The requirement to calculate and disclose a Reasonable Actuarially Determined Contribution as defined in ASOP 4,
2. The requirement to assess the implications of the funding policy, including four specific assessments, and
3. The requirement to calculate, disclose, and explain a Low-Default-Risk Obligation Measure (LDROM).

The requirement to calculate and disclose a Reasonable ADC is already incorporated in the JRS actuarial valuation and has been discussed in our analysis above. This section will discuss the remaining two requirements that will become effective for the June 30, 2023 actuarial valuation.

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Implications of the Funding Policy

Effective with the 2023 actuarial valuation, changes to ASOP No. 4 will require GRS to make four specific assessments of the State Mandated Funding Policy:

1. A qualitative assessment of the implications of the funding policy on expected future contributions and funded status,
2. An estimate of how long until contributions under the funding policy will exceed normal cost plus interest on the unfunded actuarial liability,
3. An estimate of how long until the unfunded actuarial liability is expected to be paid off, and
4. An assessment of whether the funding policy is significantly inconsistent with accumulating assets adequate to make benefit payments, and, if applicable, an estimate of the approximate time until assets are depleted.

GRS already provides the qualitative assessment required and discusses the principal issues but will need to add the specific estimates in future valuation reports.

Calculation and Disclosure of LDROM

The LDROM is calculated using a discount rate derived from low-default-risk fixed income securities whose cash flows are reasonably consistent with the plan's projected benefit payments. Consequently, the discount rate is likely to be significantly lower than the funding discount rate and the LDROM significantly higher than the Actuarial Liability.

The actuary has a few choices in the calculation of the LDROM, and those choices may depend on how the actuary wants to explain the significance of the LDROM as required by ASOP 4 "with respect to the funded status of the plan, plan contributions, and the security of participant benefits."

Public plan actuaries may explain the LDROM in terms of the expected taxpayer savings from investing in a diversified portfolio or the cost to eliminate investment risk. Using this framework for the explanation, actuaries would likely elect to use the same actuarial cost method as is used for funding and to derive the discount rate from yields on high quality corporate bonds. However, multiple other options are also possible.

Our review of this new disclosure will focus on the consistency between the explanation of LDROM's significance and the selected cost method and basis for discount rate.

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Assessment of Actuarial Assumptions Used in the 2022 Valuation

A. Economic Assumptions

1. Interest Rate

The interest rate assumption (also called the investment return or discount rate) is the most impactful assumption affecting the required State contribution amount. This assumption, which is used to value liabilities for funding purposes, remained at 6.50% for the June 30, 2022 Actuarial Valuation.

After reviewing all the materials (see Appendix B of this report) that were made available, Cheiron concludes that the interest rate of 6.50% for this valuation is reasonable.

We recommend that the JRS Board continue to annually review the economic assumptions (interest rate and inflation), as was done for this valuation, prior to commencing the valuation work and adjust assumptions accordingly (Recommendation #5).

The items we considered and our rationale for these two recommendations are as follows:

- A review of the interest and inflation rates does not involve the collection of significant data and can be updated annually. In addition, it keeps the Board focused more closely on these critical assumptions.
- In GRS's July 14, 2022 Actuarial Experience Study, they presented the opinions of five independent investment consultants on the future long term expected earnings of the System and concluded that, the 20-year expected geometric mean of the JRS portfolio is 6.66% (See Exhibit C of the 2022 Economic Assumption Update Review). They also presented the distribution of the 20-year average geometric net nominal return for these five consultants. This showed that JRS has a 52.22% chance of meeting or exceeding the 6.50% assumption (See the fifth column, bottom row). However, GRS in that same review presented a 10-year outlook which produced a 5.59% expected geometric mean with only 40.46% chance of meeting or exceeding 6.50%. This is why we find it is reasonable to anticipate a future reduction in the discount rate and recommend additional stress testing of a possible discount rate change in future valuations.

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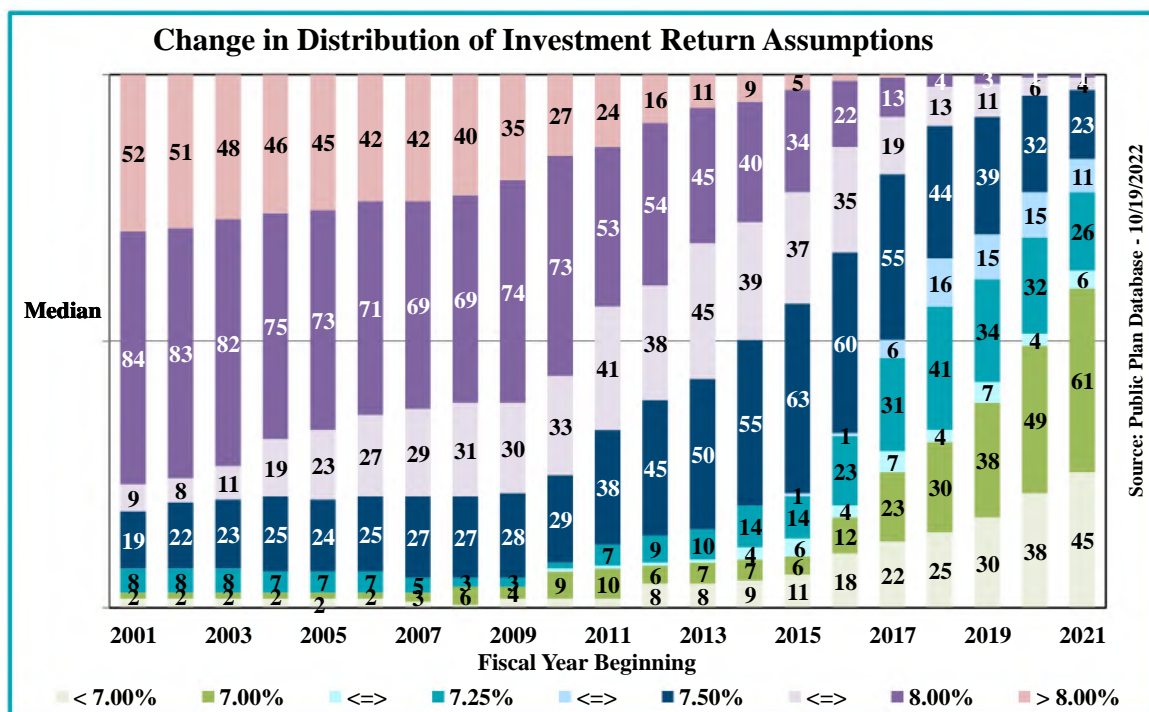
Distribution of 20-year Average Geometric Net Nominal Return

Investment Consultant	Distribution of 20-Year Average Geometric Net Nominal Return			Probability of exceeding 6.50%
	40th	50th	60th	
(1)	(2)	(3)	(4)	(5)
1	5.71%	6.39%	7.07%	48.33%
2	6.73%	7.46%	8.20%	63.50%
3	6.19%	6.88%	7.57%	55.53%
4	5.25%	6.04%	6.73%	43.32%
5	5.90%	6.56%	7.22%	50.87%
Average	5.98%	6.66%	7.36%	52.22%

- GRS's July 14, 2022 Actuarial Experience Study also presented the expectation of the Illinois State Board of Investment's investment consultant Meketa Investment Group. After adjusting for GRS's assumed rate of inflation, Meketa's expected 20-year geometric average return of the JRS portfolio is 6.51% (See Exhibit A of the GRS 2021 Actuarial Experience Study). Based on the capital market assumptions provided by Meketa, JRS has a 50.12% chance of meeting or exceeding the assumption of 6.50%. Given that JRS is only 44.32% funded on a market asset value, an expectation of achieving the investment return only 50% of the time could result in cost increases following years that the returns are below the assumption.
- The combination of the expectations from the Illinois State Board of Investment's investment consultant and the expectations from a variety of independent investment consultants supports the reasonableness of assuming a 6.50% interest rate for the current year.
- While the discount rate assumption should be based on the future expected investment returns for the System's investment portfolio, survey information can provide an important context for evaluating the assumption. The Public Plans Database is maintained by a partnership between the Center for State and Local Government Excellence (SLGE) and the Center for Retirement Research at Boston College with support from the National Association of State Retirement Administrators (NASRA). This database contains historical information on large public pension plans, including key assumptions used in their actuarial valuations. The following chart shows the distribution of investment return assumptions for the 177 plans in the Public Plans Database with consistent information from 2001 through 2021 as of October 19, 2022.

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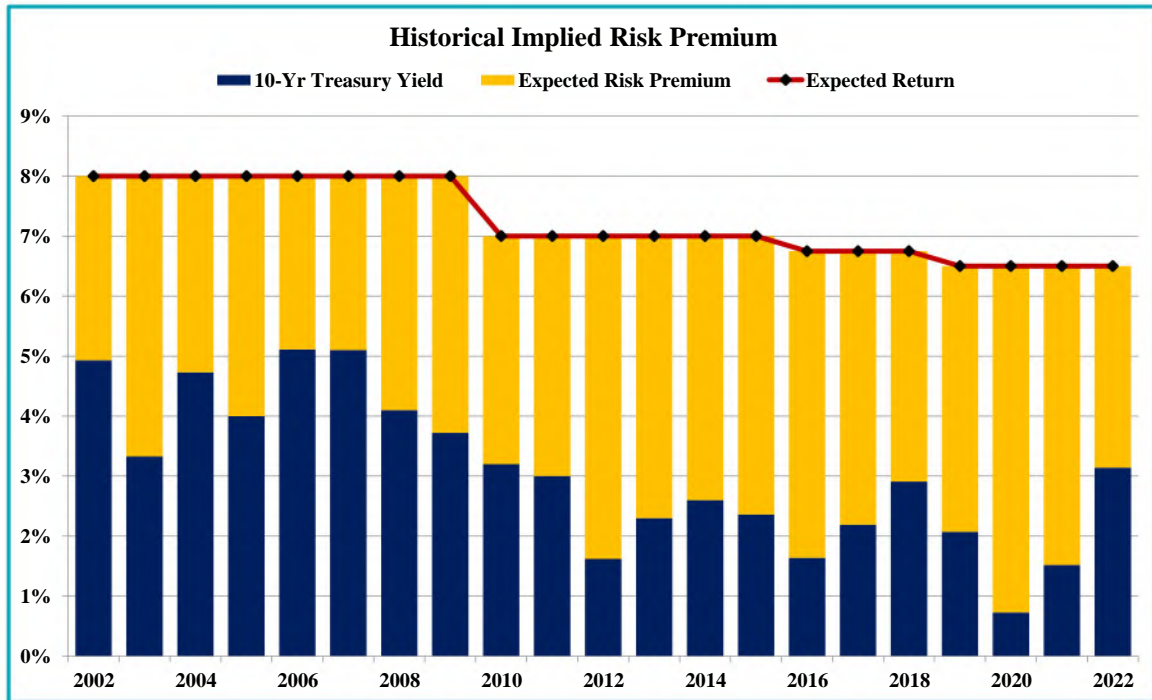
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- Over the period shown, there continues to be a pattern of reducing discount rates partially reflecting long-term changes in capital markets, interest rates and underlying inflation. Of the 177 plans shown, 113 have reduced their discount rate assumption since 2017. For these 113 plans, the average reduction is 0.44%.
- Over the last two decades, declining interest rates have forced pension plans to either reduce their discount rates, increase their exposure to investment risk, or some combination of the two. For example, as shown in the following chart, in June 2002, the yield on 10-year Treasury bonds (a proxy for a risk-free investments) was 4.9%. To achieve JRS then assumed return of 8.00%, the System's investments had to outperform the yield on the 10-year Treasury by 3.1%. In June 2020, the yield on the 10-year Treasury had dropped to 0.7%, and to achieve JRS assumed return of 6.50%, the System's investments need to exceed the 10-year Treasury yield by 5.80%. Even though JRS had reduced its return assumption by 150 basis points over the period, it still had to take more investment risk in 2020 to meet its assumption than it did in 2002. Since 2020, yields on 10-year Treasury bonds have increased, reducing the expected risk premium needed to achieve the System's assumed return. With recent action by the Federal Reserve, 10-year Treasury bond yields have increased rapidly from 1.5% in December 2021 to 3.1% in June 2022 and 4.0% in October 2022. If these higher Treasury bond yields persist, plans may be able to achieve the expected return with less exposure to investment risk. However, if these higher Treasury bond yields prove temporary, plans could quickly find the pressure returning to further reduce discount rates or increase their exposure to investment risk.

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- JRS has experienced a slightly negative cash flow for FY 2022 (contribution income less benefits and expense payouts). The negative cash flow of JRS is currently -0.92% of assets. Negative cash flow is expected to grow in the coming years as shown in the graph on page 11 and table 4d of the draft 2022 Actuarial Valuation. When short-term returns are expected to be lower than the long-term expectations, which is the current case with JRS, a plan with negative cash flows will have actuarial returns (i.e., dollar-weighted returns) that are less than their “time-weighted” returns.

2. Inflation Assumption

As recommended in the GRS July 14, 2022 Actuarial Experience Study, the inflation assumption of 2.25% was maintained for the June 30, 2022 Actuarial Valuation.

We find the 2.25% inflation assumption to be reasonable.

Our rationale for concurring with the 2.25% assumption:

- GRS’s July 14, 2022 Actuarial Experience Study included a survey of the inflation assumptions of independent investment consultants. The 5 investment consulting firms with longer time horizons (20+ years) reported an average of 2.22% and ranged from 2.11% to 2.31%. The 12 firms with a shorter time horizon reported an average of 2.19% and ranged from 1.92% to 3.10%.

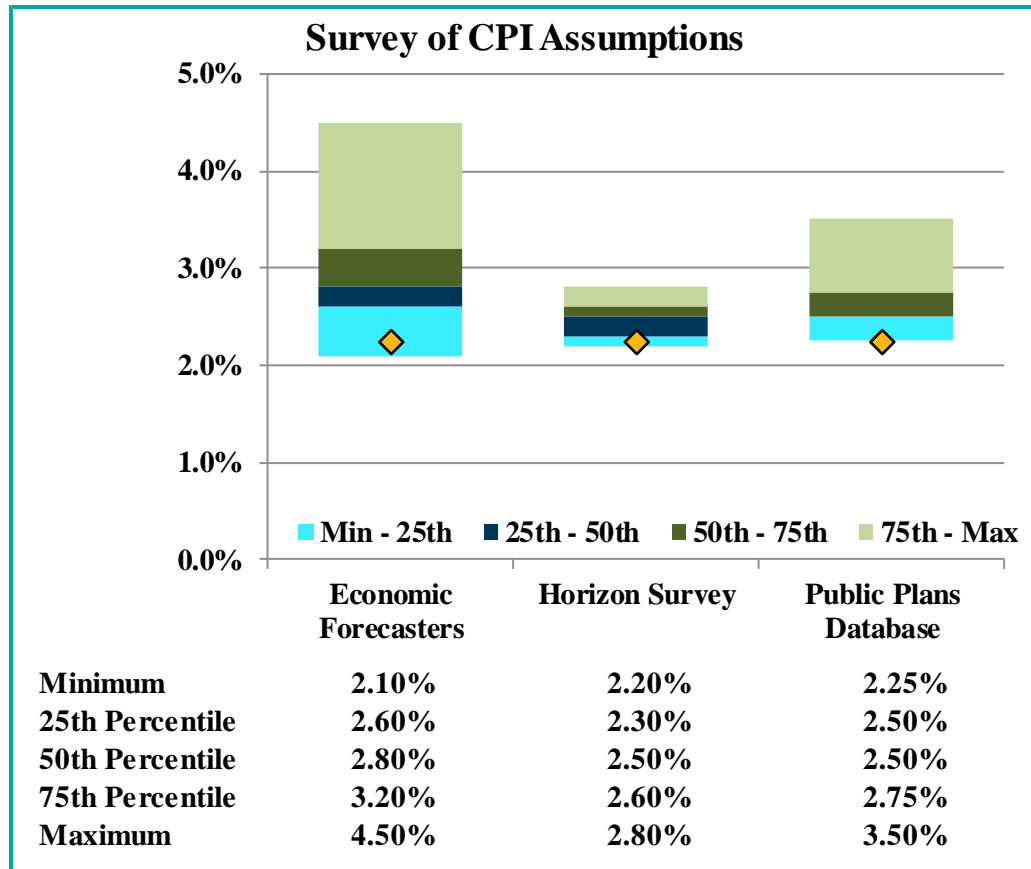
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- GRS's July 14, 2022 Actuarial Experience Study also included the forward-looking inflation forecasts from the Federal Reserve Bank of Cleveland as of January 1, 2022. This forecast shows inflation over the next 10 years of 1.80% increasing to 2.13% over 30 years.
- On Pages C-2 to C-4 of the July 14, 2022 Actuarial Experience Study, GRS provides significant data on inflation forecasts that all indicate expectations for the current high levels of inflation to decline over the next couple years. While some data presented point to slightly higher inflation than the current assumption, the current assumption remains within the reasonable range. However, going forward, should the current levels of inflation not decline significantly, consideration should be given to increase the current 2.25% assumption.
- The June 2022 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (next 75 years), inflation will average between 1.8% and 3.0% (<http://www.ssa.gov/oact/tr/2021/tr2021.pdf>). Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.4%.
- The following chart shows the distribution of inflation expectations for the Third Quarter 2022 survey of professional economic forecasters published by the Philadelphia Federal Reserve, the 2022 Horizon survey of investment consultant capital market assumptions (20-year), and the 2021 inflation assumptions used by plans in the Public Plans Database compared to the JRS assumption (indicated by the gold diamonds). The assumption of 2.25% is in the lower quartile of the range projected by professional economic forecasters and investment consultants, and is on the low end of the range used by other public plans.

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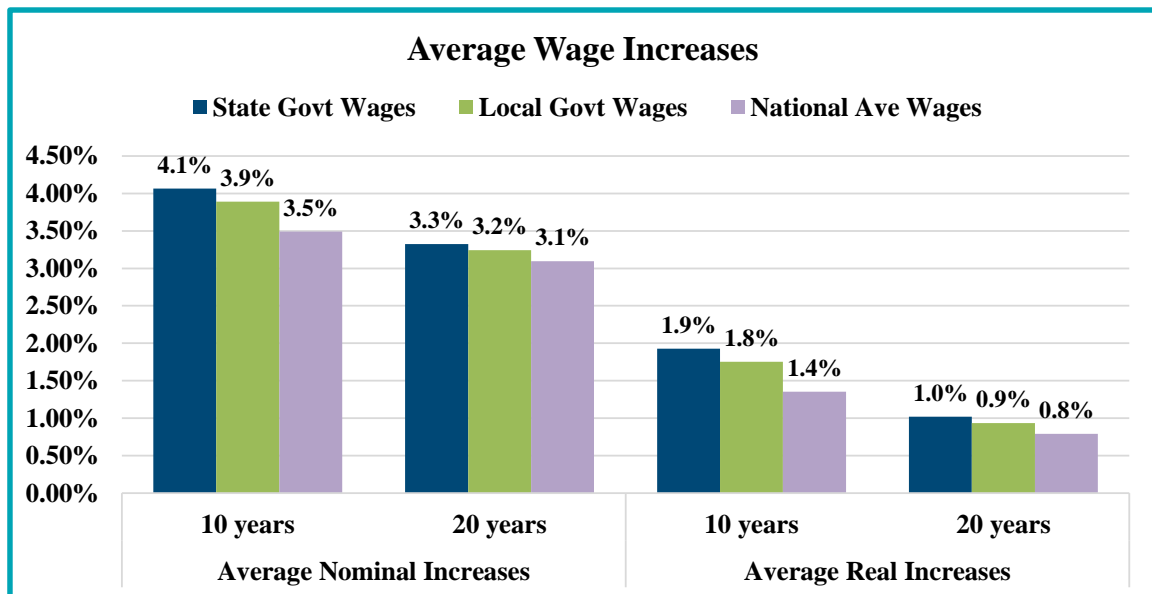
3. Salary (Annual Compensation) Increase Assumption

The salary increase assumption for uncapped payroll is 2.50% per year, compounded annually for all active members, regardless of age or service. It includes components of 2.25% per annum for inflation and 0.25% per annum for productivity.

We find the assumption and the basis for setting the assumption reasonable and consistent with the inflation assumption.

Our rationale for concurring with GRS's recommended salary increase assumption:

- The following chart shows the average nominal and real increases in wages over the last 10 and 20 years for State governments, local governments, and National Average Wages. State and local government data is from the Quarterly Census of Employment and Wages as published by the Bureau of Labor Statistics. National Average Wages is published by the Social Security Administration.



- The June 2022 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (next 75 years), real wage differential will average somewhere between 0.53% and 1.77%. Under the intermediate cost projection, the Social Security Administration uses an assumption of 1.15%.
- In our own experience with our public sector pension plans (about 60 large plans), we have witnessed a continued trend of lower salary increases for public sector employees.

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4. Cost of Living Adjustment Assumption

While Tier 1 members receive an annual automatic three percent COLA, Tier 2 members receive an annual increase equal to the lesser of the three percent received by Tier 1 and the annual change in the Consumer Price Index for all Urban Consumers.

We find the assumption and the basis for setting it reasonable.

5. Capped Pay Assumption

The Tier 2 capped payroll growth is 2.25% per year, compounded annually, which is the inflation assumption.

We find the assumption reasonable.

6. Expenses

Expenses are expected to increase with the projected capped payroll at 2.25% and are included in the service cost.

We find the assumption reasonable.

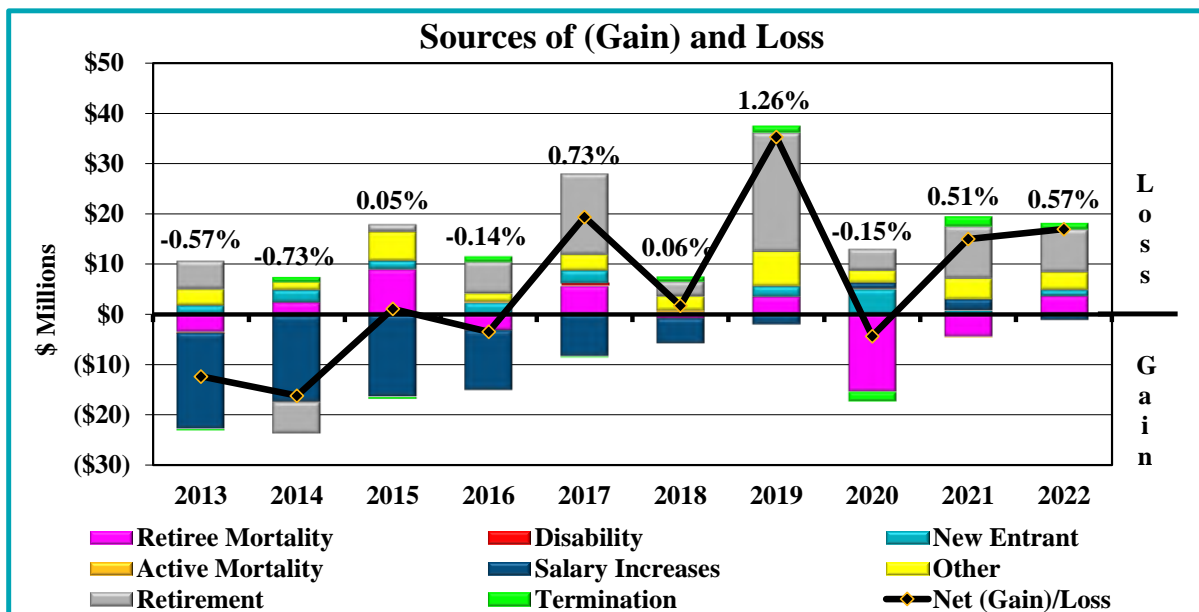
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B. Demographic Assumptions

In its annual actuarial valuation reports, GRS regularly reports sources of liability gains and losses. In the draft June 30, 2022 Actuarial Valuation, these are shown on page 22. In the chart below, we have collected similar data from past valuation reports dating back to 2013 and use these to present a historical review of past demographic and salary increase experience gains and losses.

The following chart shows the pattern of annual gains and losses attributable to eight different sources as shown in the legend. When the colored bar slices appear above zero on the Y-axis, it represents an experience loss with the value representing the increase in liabilities over what was expected. When the bar is below zero, it represents an experience gain for that year with liabilities less than expected. The net liability (gains)/losses are shown by the black line. This net (gain)/loss as a percent of liability is shown above the bars.



The percentages shown above the bars refer to net (gain)/loss as a percentage of liability.

Key observations from this chart are as follows:

1. Gains and losses due to salary have been very minor after consistent significant gains earlier in the period shown.
2. There have been a losses due to retirement in each of the last eight years.
3. Retiree mortality and termination have both been volatile over recent years.

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The demographic assumptions are summarized below. We reviewed the development of these assumptions based on the Experience Review Report dated July 14, 2022, and we have concluded all are reasonable and meet the requirements of ASOP No. 35, Section 3.3.4. We have noted comments on specific assumptions below.

1. Mortality

Post-Retirement Mortality

The mortality basis was updated with the June 30, 2022 Actuarial Valuation and is based on the Pub-2010 Above-Median Income General Healthy Retiree Mortality tables, sex distinct, with generational mortality improvement using the MP-2021 two-dimensional mortality improvement scales.

Pre-Retirement Mortality

The mortality basis was updated with the June 30, 2022 Actuarial Valuation and is based on the Pub-2010 Above-Median Income General Employee Mortality tables, sex distinct, with generational mortality improvement using the MP-2021 two-dimensional mortality improvement scales.

Future mortality improvements are found by projecting the base mortality tables forward from the base year of 2010 using the MP-2021 mortality improvement scale.

Comment: For analysis of mortality, GRS excluded the period of 7/1/2019 – 6/30/2021 from consideration. Due to the limited data set, they recommended the base Pub-2010 tables without scaling. **We find the assumption reasonable.**

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2. Termination

Overall termination rates were increased based on the 2021 Actuarial Experience Study for valuations beginning with the June 30, 2022 Actuarial Valuation.

Illustrative rates of withdrawal from the Plan are as follows:

Termination Rates - Tier 1		
	Males	Females
30	0.0159	0.0192
35	0.0159	0.0192
40	0.0159	0.0192
45	0.0149	0.0192
50	0.0124	0.0188
55	0.0099	0.0148
60	0.0086	0.0108
65	0.0076	0.0068

Termination Rates - Tier 2		
	Males	Females
30	0.0200	0.0200
35	0.0197	0.0195
40	0.0182	0.0170
45	0.0167	0.0170
50	0.0152	0.0165
55	0.0137	0.0140
60	0.0137	0.0115
65	0.0137	0.0090

It is assumed that terminated employees will not be rehired. The rates apply only to employees who have not fulfilled the service requirement necessary for retirement at any given age.

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3. Retirement

Tier 1 Retirement rates were modified based on the 2021 Actuarial Experience Study for valuations beginning with the June 30, 2022 Actuarial Valuation.

Assumed retirement rates are as follows:

Retirement Rates – Tier 1		
	Males	Females
55-59	5.50%	8.50%
60-69	12.00%	12.00%
70-79	13.00%	13.00%
80+	100.00%	100.00%

Retirement Rates – Tier 2	
Age	Male & Female
62	11.00%
63	12.00%
64	13.00%
65	14.00%
66	14.00%
67	30.00%
68-69	12.00%
70	13.00%
71	10.00%
72	11.00%
73	12.00%
74	13.00%
75-79	14.00%
80	100.00%

Comment: Due to a lack of data on Tier 2 member retirements, GRS maintained the prior valuation's assumed rates. **We find the assumption and the basis for setting it reasonable.**

4. Disability

No assumption for disability was assumed.

5. Spouse's Age

The female spouse is assumed to be four years younger than the male spouse.

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6. New Entrants

The new entrant profile includes uncapped and capped salary information. New entrants are assumed to enter with an average age of 47.76, average uncapped pay of \$213,249, average capped pay of \$130,166, and with 63.53% male. The size of the active group is assumed to remain level at the number of actives as of the valuation date. The average increase in uncapped payroll for the projection period is 2.50% per annum. The average increase in capped payroll for the projection period is 2.25% percent per year.

7. Decrement Timing

All decrements are assumed to occur beginning of year.

8. Decrement Relativity

Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.

9. Decrement Operation

Turnover decrements do not operate after member reaches retirement eligibility.

10. Eligibility Testing

Eligibility for benefits is determined based upon the age nearest birthday and service on the date the decrement is assumed to occur.

11. Marriage Assumption

80.0 percent of active and retired participants are assumed to be married.

12. Employee Contribution Election

All judges are assumed to elect to contribute only on increases in salary when eligible for this provision.

13. 415(b) and 401(a)(17) Limits

No explicit assumption is made with respect to these items.

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Other Assumptions as a result of Public Act 96-0889

Members hired after December 31, 2010 are assumed to make contributions on salary up to the final average compensation cap in a given year until this plan provision or administrative procedure is clarified.

State contributions, expressed as a percentage of pay, are calculated based upon capped pay.

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C. Funding Methods

Actuarial funding methods consist of three components: (1) the actuarial cost method, which is the attribution of total costs to past, current, and future years; (2) the asset valuation method (i.e., asset smoothing); and (3) the amortization method.

1. Actuarial Cost Method

The System uses the projected unit credit cost method (PUC) to assign costs to years of service, as required under the Pension Code (40 ILCS 5/18). **We have no objections with respect to using the PUC method, although we would prefer the Entry Age Normal (EAN) cost method, as it is more consistent with the requirement in 40 ILCS 5/18-131 for level percentage of pay funding.**

Under the PUC method, which is used by some public sector pension funds, the benefits of active participants are calculated based on their compensation projected with assumed annual increases to ages at which they are assumed to leave the active workforce by any of these causes: retirement, disability, turnover, or death. Only past service (through the valuation date, but not beyond) is taken into account in calculating these benefits. The present value of these benefits based on past service and future compensation is the actuarial liability for a given active participant. Under the PUC cost method, the value of an active participant's benefits tends to increase more sharply over his or her later years of service than over his or her earlier ones. While the PUC method is not an unreasonable method, as a result of this pattern of benefit values increasing, more plans use the EAN cost method to mitigate this effect. It should also be noted that the EAN cost method is the required method to calculate liability for GASB Nos 67 and 68.

2. Asset Valuation Method

The Actuarial Value of Assets for the System is a smoothed market value. Unanticipated changes in market value are recognized over five years in the Actuarial Value of Assets. The primary purpose for smoothing out gains and losses over multiple years is so fluctuations in the contributions will be less volatile over time than if based on the Market Value of Assets.

The 2021 Public Retirement Systems Study by the National Conference on Public Employee Retirement Systems (NCPERS) survey of 156 public retirement funds found that the majority of plans responding to the survey have a five-year smoothing period.

Smoothing the market gains and losses over a period of five years to determine the Actuarial Value of Assets is a generally accepted approach in determining actuarial cost, and we concur with its use.

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3. Amortization Method

The mandated State contribution is based on a determination of the level percentage of payroll that is expected to achieve a 90% funded ratio in 2045. While not a traditional amortization method, this methodology effectively amortizes a portion of the unfunded actuarial liability over the remaining period until 2045, which is currently 23 years.

One of the principles of funding public plans identified by the American Academy of Actuaries is that there should be “a plan to make up for any variations in actual assets from the funding target within a defined and reasonable time period.” Because it only targets 90%, the State method does not include a plan to achieve the funding target over any period of time.

Typical public plan amortization methods are designed to increase each year by expected payroll growth. Under the State mandated method, however, the effective amortization payment increases each year by more than the expected growth in payroll. As a result, the State mandated method defers payments on the unfunded actuarial liability further into the future than under typical public plan amortization methods.

Finally, as the remaining period to achieve 90% funding shortens, the State mandated method will also produce more volatile contributions. Instead of a single fixed period, typical public plan amortization methods use layered amortization bases such that new assumption changes and experience gains and losses are amortized over a new period (e.g., 20 years) while the remaining period for the prior amortization layers becomes one year shorter.

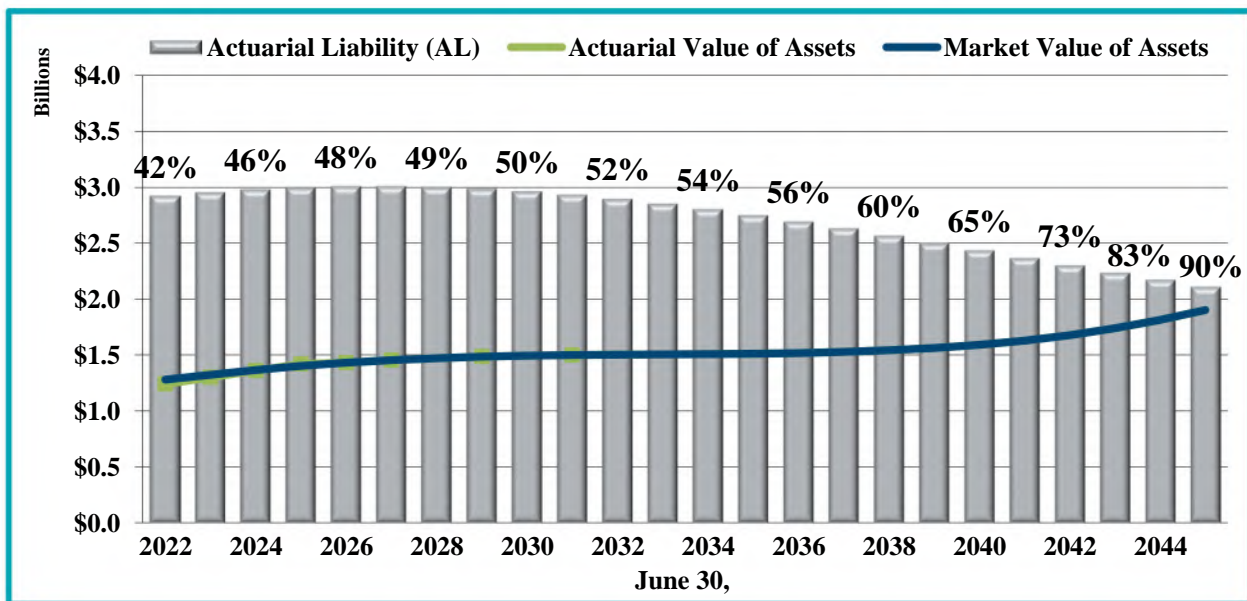
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SECTION IV – PROJECTION ANALYSIS

This section reviews the projections contained in the draft June 30, 2022 Actuarial Valuation of JRS. These projections are fundamental to the development of the required State contribution calculated under the current statutory funding requirement.

The following graphs are independent approximations of the projections performed by the State Actuary to verify that the System's funding projections are reasonable. They do not reflect all the precision of the projections applied by the System's actuary, but instead they are intended to verify the reasonableness of the modeling done by the System's actuary.

The graph below shows our projection of the expected future liabilities and assets in the System through 2045. As pointed out on page 10 of the draft June 30, 2022 Actuarial Valuation, the majority of the funding of the System occurs in the 2nd half of the projections. The **lines show the projected assets** (market value and actuarial value), and the **bars show the projected liabilities** of the System. The funded ratio for every other year is shown at the top of the bars. For example, in 2034, the funded ratio is projected to be approximately 54% with assets being approximately \$1.5 billion and liabilities being approximately \$2.8 billion.

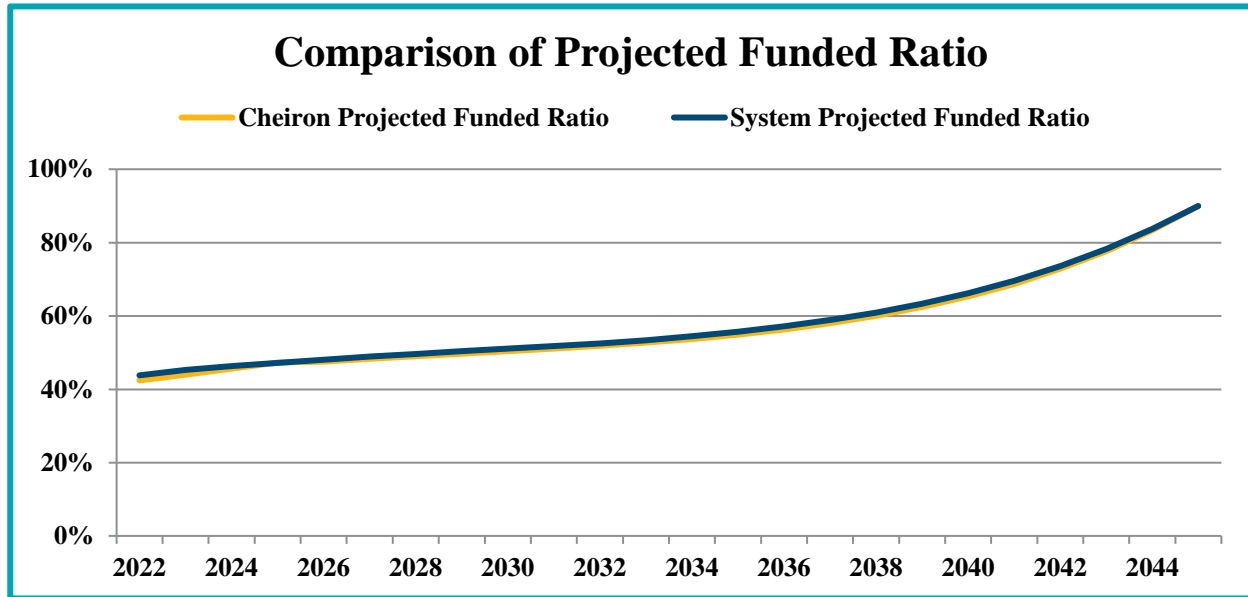


Source: Cheiron projection analysis.

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When we compare our projected funded ratio against the results shown in the draft June 30, 2022 Actuarial Valuation, **we find a close match in expected funded ratio**. This close match of the funded ratio indicates that the projections done by the System's actuary are reasonable.

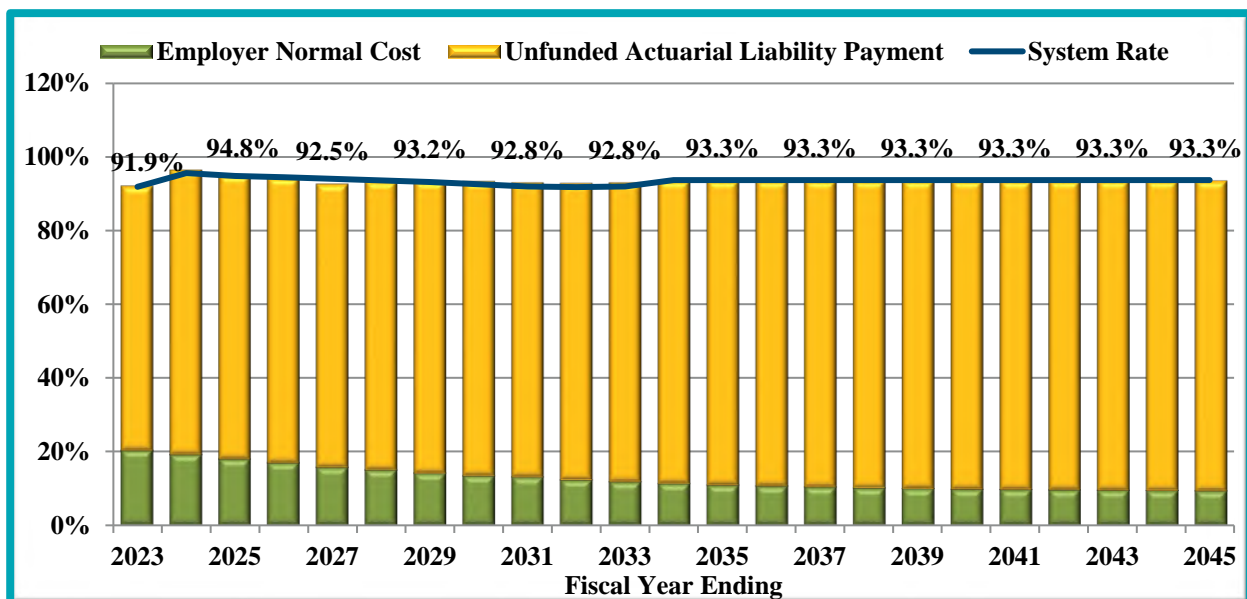


Source: Cheiron projection analysis.

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The following graph shows the expected contribution calculated under the statutory method. The contribution as a percentage of payroll is shown above each bar. The value shown for the fiscal year ending 2023 was set based on the June 30, 2021 Actuarial Valuation. The current valuation is the basis for setting the rates starting July 1, 2023 (Fiscal Year Ending June 30, 2024). The contribution requirement has two components: 1) the employer normal cost, which is the approximate value of the amount of benefits accrued by participants not covered by employee contributions based on the statutory funding method; and 2) an amortization of the unfunded liability. The normal cost amounts are shown by the green bars and the amortization of the unfunded actuarial liability (UAL) amounts by the yellow bars. The percentages shown are the total contribution rates calculated by Cheiron, which are equal to the sum of the bars. The graph shows that a larger percentage of the total contribution is being made toward the UAL payment later in the period. The blue line shows the projected contribution rates as percentages of payroll from the draft June 30, 2022 Actuarial Valuation. The difference between Cheiron's approximation and the System's projections is the difference between the top of the bars and the line.



Source: Cheiron projection analysis.

Our conclusion is that **the projections performed by the System's actuary are reasonable.**

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SECTION V – ANALYSIS OF FUNDING ADEQUACY

In this section, we examine the adequacy of the funding for the System, including funded ratio, the sources of changes in the unfunded actuarial liability (UAL), and projections of the UAL and statutory funding requirements compared to contributions needed to pay down the UAL.

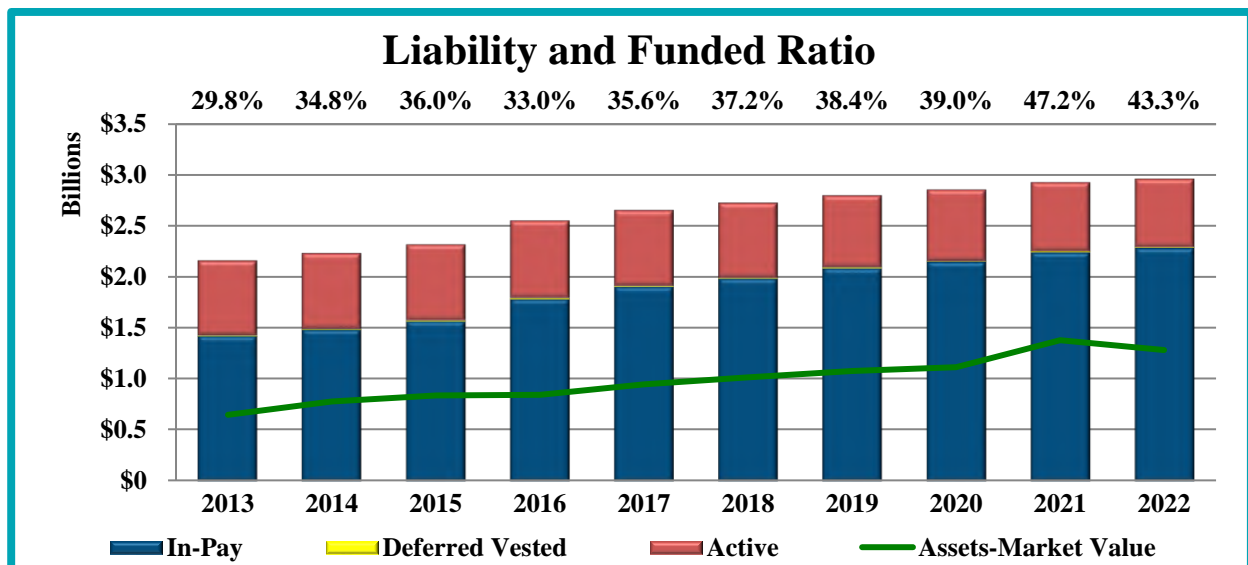
The actuarial valuation report prepared by GRS includes both traditional actuarial measurements, as well as additional risk measurements that are shown on pages 14 to 18 of the draft June 30, 2022 Actuarial Valuation report. Given the unique and substantial funding challenges faced by the Illinois pension systems, this additional information is quite important and supplements the information we present here on funding adequacy to better inform the legislature and other stakeholders about the adequacy of the System's funding.

System Funded Ratio

The first funding adequacy measure is the historical trend of the System's funded ratio for the past ten years. Funded ratio for this purpose is defined as the ratio of the Market Value of Assets to the Actuarial Liability. The chart below shows JRS' funded ratio since 2013 has gone from 29.8% funded to 43.3% funded in 2022, an increase in funded ratio of 13.5%. In addition to showing the funded ratio, this chart also shows the breakdown of the Plan's liabilities by membership status:

- Active liability – the liability (attributable to service already performed) for future payments to members who are currently working in the System,
- Deferred Vested liability – the liability for future payments to members who are no longer working in the System, and
- In-Pay liability – the liability for future payments to retirees and beneficiaries who are currently receiving benefits.

This breakdown shows that today plan assets only cover about 62% of the liabilities for just those members currently in pay status.



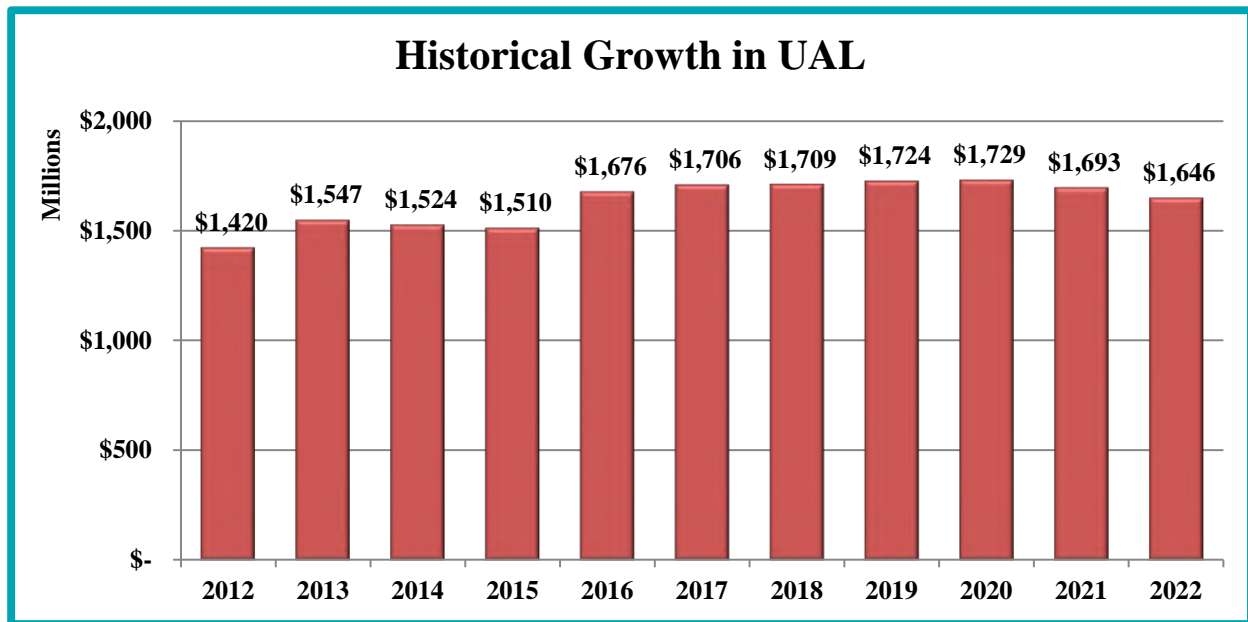
Source: Cheiron analysis of funding adequacy.

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Sources of Changes in the UAL

As shown in the chart below, JRS' unfunded actuarial liability (UAL) has grown from about \$1.42 billion in 2012 to \$1.65 billion in 2022, an increase of about \$226 million. In order to understand how to reverse this trend, it is important to understand the sources contributing to it.



Source: Cheiron analysis of funding adequacy.

The changes to the UAL from June 30, 2012 to June 30, 2022 can be separated into the following components:

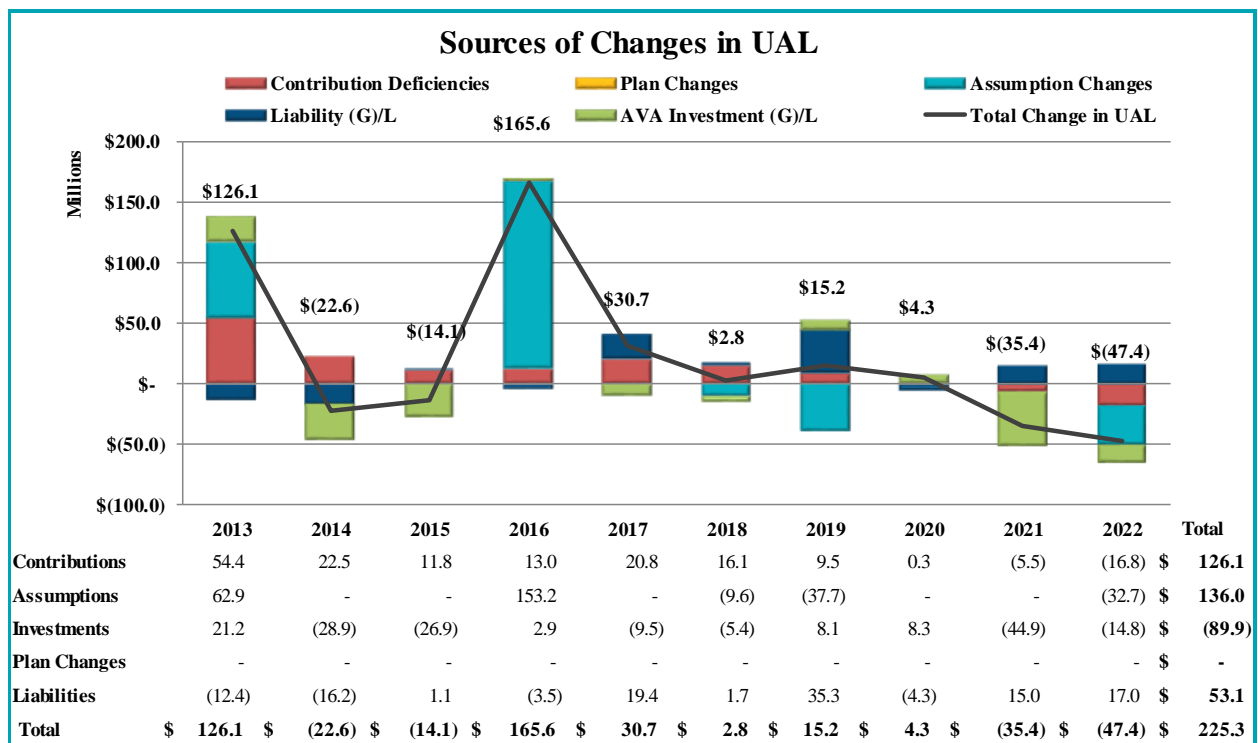
- **Contribution Deficiencies** – Contributions that are less than the tread water contribution causes the UAL to increase. The tread water contribution consists of two components: the normal cost, which is the cost of benefits earned in a given year, and the interest on the unfunded actuarial liability. This sum is referred to as the tread water contribution because it is the contribution necessary so that the UAL will remain constant, or “tread water” (absent experience gains or losses). The difference between actual contributions and the tread water contributions increased the UAL by \$126.1 million over this period.
- **Assumption Changes** – Changes to actuarial assumptions over this period increased the UAL by \$136.0 million. A positive aspect of the UAL increases due to assumption changes is that they will result in liability measurements that more accurately reflect future expectations.
- **Plan Changes** – Modifications to the design of the Plan had a negligible impact over this period as most of the changes only affected future benefits.

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- **Liability (Gain) or Loss** – The changes in the UAL due to liability experience (i.e., mortality, terminations, salary increases, etc.) and increased the UAL by \$53.1 million over this period.
- **AVA (Actuarial Value of Assets) Investment (Gain) or Loss** – The net investment gain or loss due to assets earning more or less than assumed decreased the UAL over this period by \$89.9 million.

The chart below shows the changes in UAL each year broken into these five components. The sum of all the components (total change in UAL) is shown as the black line. Values of each component as well as total by year are shown in the chart along with the totals for the period.



Source: Cheiron analysis of funding adequacy.

We expect that this chart will help stakeholders understand the sources of growth in the UAL over recent years and inform discussions about the current funding requirements and adequacy.

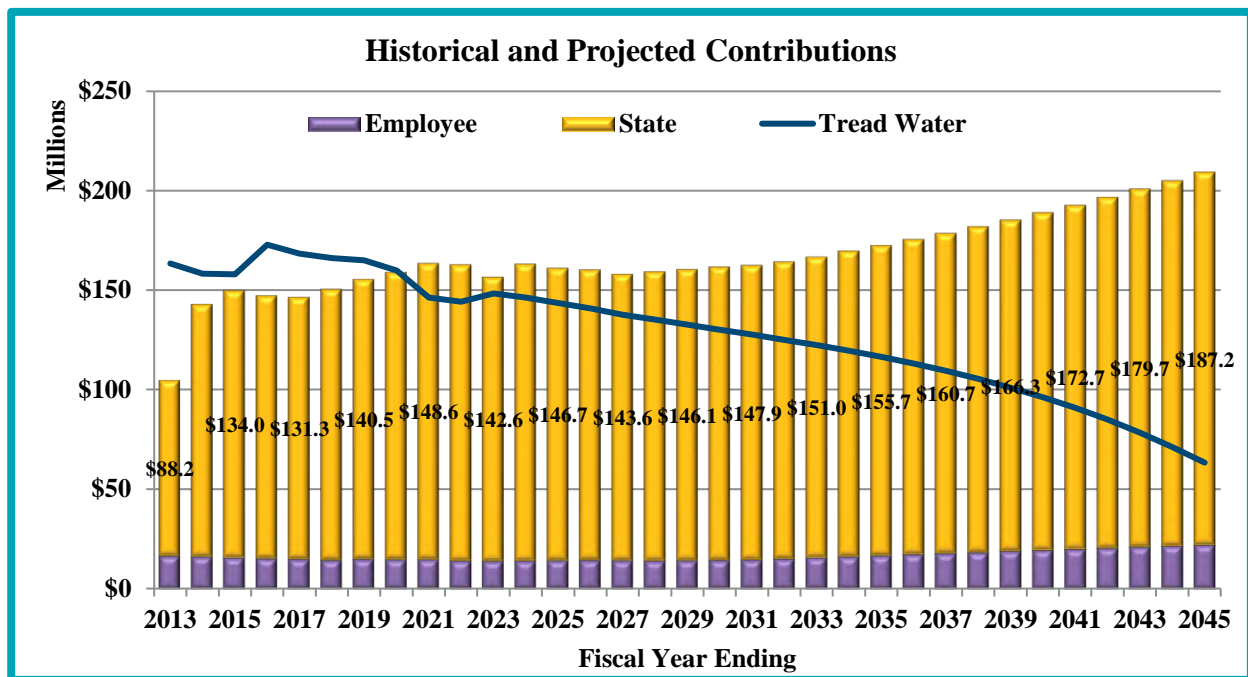
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Actual Contributions Compared to Tread Water Contribution

One of the persistent sources of the increase in UAL is due to actual contributions to the System being less than the tread water contribution (the amount needed to prevent the UAL from increasing if all assumptions are met). Until 2021, these contribution deficiencies added between \$0.3 and \$54 million to the UAL each year over the historical period shown.

As the chart below shows, actual contributions had been significantly less than the tread water cost prior to 2014. Each year that total contributions remain below the tread water cost (blue line), the UAL is expected to grow. As shown in the graph below the contributions from the State have increased significantly and the total contribution reached the tread water contribution in 2021 and has begun to pay down the UAL.



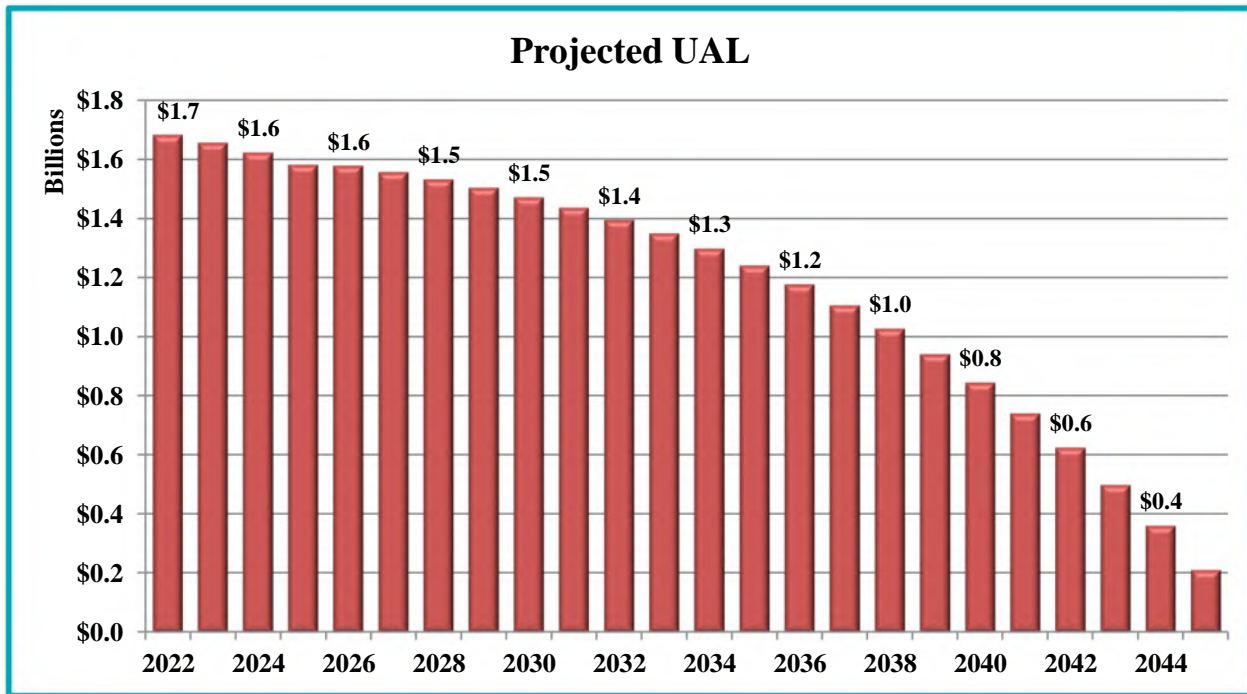
Source: Cheiron analysis of funding adequacy.

The System's actuary commented that "the statutory funding method generates a contribution requirement that is less than a reasonable actuarially determined contribution". Because a "reasonable actuarially determined contribution" has never been defined in actuarial standards, it isn't clear what standard the System's actuary is using to make this determination. However, a revision to ASOP 4 has defined a "Reasonable Actuarial Determination Contribution" and that definition will be first effective for next year's valuation. The actuary will need to consider the ASOP 4 definition when evaluating this statement next year particularly since the current contribution amount is sufficient to reduce the UAL in FYE 2024 if all assumptions are met, as evidenced by the FYE 2024 contribution amount exceeding tread water in the graph above.

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The next chart shows that if the Minimum Required Contributions continue to be made each year and all other assumptions are met, the UAL is projected to decline each year.



Source: Cheiron analysis of funding adequacy.

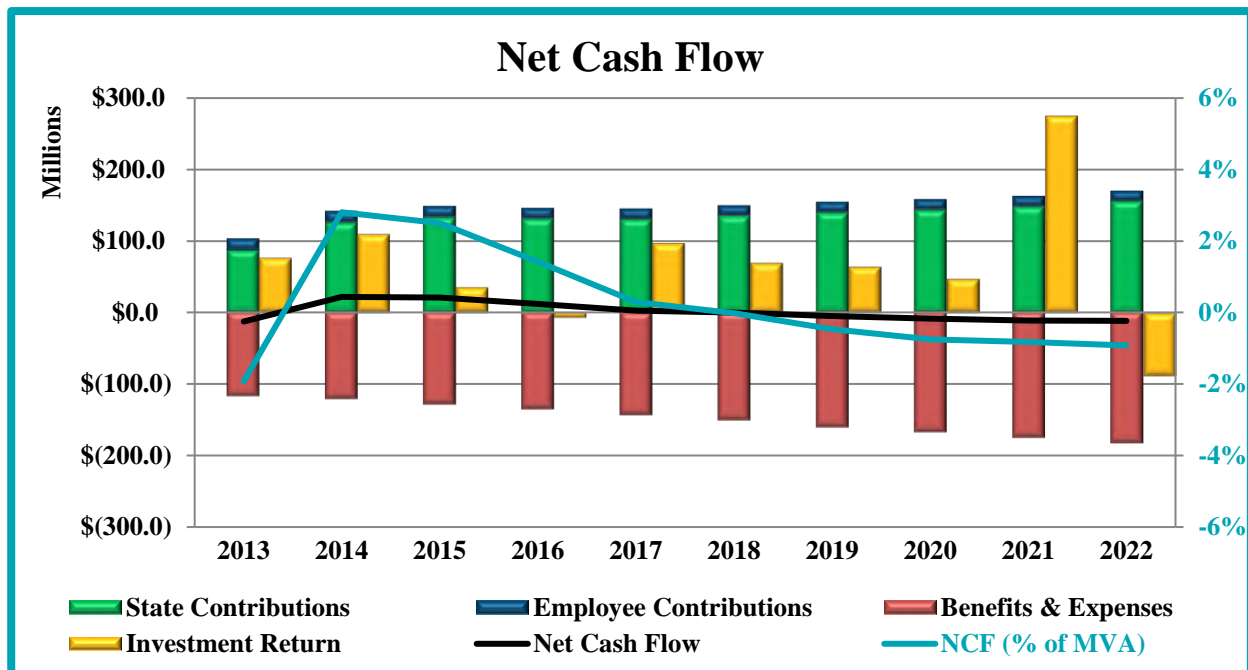
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Net Cash Flow Analysis

The Plan's net cash flow is defined as State and Member contributions less benefit payments and administrative expenses. The more negative net cash flow is as a percentage of the plan's assets, the more vulnerable the Plan is to market downturns. When a pension plan has more payouts than contributions and suffers an investment loss, it is left with fewer assets to invest and recapture during a recovery.

Looking at the following chart, JRS is neither mature nor immature on a net cash flow basis (black line), as the net cash flow has been close to zero relative to the size of the System's assets. This measure should continue to be monitored as negative cash flow increases the System's vulnerability to market downturns. The teal line shows net cash flow as a percent of Market Value of Assets on the right-side axis. The greater the negative cash flows are relative to plan assets the more vulnerable a plan is to market downturns. This is because once there is a market downturn, the plan assets lose both on the return and the negative cash flow, leaving it with a lower asset base from which to recover from the loss.



Source: Cheiron analysis of funding adequacy.

GRS's graph of cash flows on page 11 of the June 30, 2022 Actuarial Valuation shows that benefit payments and expenses in the years 2031 to 2036 are expected to come close to exceeding investment income at 6.50%. This should be monitored closely as assets can deteriorate quickly if investments earn less than what is assumed.

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STATUS OF RECOMMENDATIONS FROM THE 2021 STATE ACTUARY REPORT

Response to Recommendations in 2021

In the State Actuary's Preliminary Report on the Judges' Retirement System of Illinois presented December 15, 2021, Cheiron made several recommendations. Below we summarize how these recommendations were reflected in either the System's comments last year or in this year's draft June 30, 2022 Actuarial Valuation.

Recommendations to Retirement System from 2021 State Actuary Report	Status	Comments
1. We continue to recommend that the funding method be changed to fully fund plan benefits. Continuing the practice of inadequate contributions and targeting a funded percentage less than 100% increases the risk of the System becoming unsustainable. Consequently, we recommend that the funding method maintain contributions at a level that is expected to reduce the unfunded actuarial liability each year until the Plan is ultimately 100% funded. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.	Not Implemented	<p>The System has adopted a funding policy that would provide for annual State contributions, the "Actuarially Determined Contribution", and is used for informational purposes only.</p> <p>GRS continues to include strong language throughout their report recommending the use of an actuarially sound method and stating clearly that the statutory method is not actuarially sound. We find these statements to be appropriate and support their continuation.</p> <p>Recommendation repeated.</p>
2. Because experience studies are performed every three years, we recommend that the phase-in period for the impact of assumption changes be reduced to three years. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.	Partially Implemented	<p>While, the System noted in its December 10, 2021 response that they agree with the recommendation, changing the funding method is under the jurisdiction of State law and not the Retirement System.</p> <p>Recommendation continued.</p>

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STATUS OF RECOMMENDATIONS FROM THE 2021 STATE ACTUARY REPORT

Recommendations to Retirement System from 2021 State Actuary Report	Status	Comments
3. We continue to recommend that GRS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g., membership declines, lower salary growth) can have on future State costs. In particular, the tests should illustrate the potential stresses on the System and its contributing sponsors so that an assessment of sustainability can be made. GRS did include stress testing in last year's final report but did not include such stress testing in this year's draft report or in any supplemental report.	Implemented	JRS added stress testing in appendices to the final Actuarial Valuation Report in a letter dated December 18, 2021 which adequately assessed the impact of various risks. We anticipate that similar stress testing will be included in the final June 30, 2022 Actuarial Valuation. Recommendation removed.
4. Section 3.2 of the ASOP 51 requires the actuary to identify risks that "may reasonably be anticipated to significantly affect the plan's future financial condition." The risks currently identified appear to largely duplicate the list of examples in ASOP 51 and could apply to almost any pension plan. In future valuations, we recommend that the actuary explain how each risk identified would reasonably be anticipated to significantly affect the specific plan's future financial condition.	Not Implemented	While, the System noted in its December 10, 2021 response that the ASOP 51 disclosure may be expanded to address many of Cheiron's recommendations, the preliminary 2022 Actuarial Valuation Report did not provide the recommended explanations. Recommendation repeated.
5. As required by section 3.3 of ASOP 51, we recommend that GRS provide an assessment for each of the six key risks they have identified.	Not Implemented	While, the System noted in its December 10, 2021 response that the ASOP 51 disclosure may be expanded to address many of Cheiron's recommendations, the preliminary 2022 Actuarial Valuation Report did not provide the recommended assessments. Recommendation repeated.

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STATUS OF RECOMMENDATIONS FROM THE 2021 STATE ACTUARY REPORT

Recommendations to Retirement System from 2021 State Actuary Report	Status	Comments
6. We recommend the JRS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly.	Implemented	GRS has continued to do this, most recently providing a review in the <i>2021 Actuarial Experience Study report</i> dated July 14, 2022. We will continue to include this recommendation each year. Recommendation continued.

Chapter Five

Preliminary Report on the General Assembly Retirement System

In accordance with 30 ILCS 5/2-8.1, Cheiron, the State Actuary, submitted a preliminary report to the Board of Trustees of the General Assembly Retirement

OVERVIEW**GENERAL ASSEMBLY RETIREMENT SYSTEM**

as of June 30, 2022

Actuarial accrued liability	\$363,153,424
Actuarial value of assets	\$79,720,515
Unfunded liability	\$283,432,909
Funded ratio	22.0%

Employer normal cost	\$1,710,782
State contribution (FY24)	\$26,474,000

Active members	122
Inactive members	55
Current benefit recipients	443
Total membership	620

Interest rate assumption	6.50%
Inflation assumption	2.25%
Actuarial cost method	Projected Unit Credit
Asset valuation method	5-year Smoothing

Executive Director	Tim Blair
Actuarial Firm	Gabriel, Roeder, Smith & Company

Source: June 30, 2022 GARS actuarial valuation report.

System (GARS) concerning proposed certifications of required State contributions submitted to Cheiron by the Board. The preliminary report was submitted to GARS on December 2, 2022. The preliminary report was based on Cheiron's review of actuarial assumptions included in GARS' 2022 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the General Assembly Retirement System. GARS' written response, provided on December 8, 2022, can be found in Appendix C.

December 15, 2022

Mr. Frank Mautino
Auditor General
740 East Ash Street
Springfield, Illinois 62703

Board of Trustees
General Assembly Retirement System of Illinois
2101 South Veterans Parkway
P.O. Box 19255
Springfield, Illinois 62794-9255

Dear Trustees and Auditor General:

In accordance with the Illinois State Auditing Act (30 ILCS 5/2-8.1), Cheiron is submitting this preliminary report concerning the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contribution to the General Assembly Retirement System of Illinois (GARS or System) for Fiscal Year 2024.

In summary, we believe that the assumptions and methods used in the draft June 30, 2022 Actuarial Valuation, which are used to determine the required Fiscal Year 2024 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, were properly calculated in accordance with State law.

Section I of this report describes the review process undertaken by Cheiron. Section II summarizes our findings and recommendations. Section III provides the supporting analysis for those findings and presents more details on our assessment of the actuarial assumptions and methods employed in GRS's Actuarial Certification, as well as our assessment of GRS's determination of the required State contribution for Fiscal Year 2024. Section III also includes comments on other issues impacting the funding of the General Assembly Retirement System, including the implications of Article 2 of the Illinois Pension Code, which establishes the statutory minimum funding requirements for the System. **We agree with GRS that the statutory mandated minimum funding requirements have been inadequate. In addition, the past inadequate funding has resulted in current and future contribution levels, measured as a percent of payroll, to be among the highest in the country.** Section IV reviews the projections contained in the draft June 30, 2022 Actuarial Valuation. Finally, Section V provides an analysis of funding adequacy.

In preparing this report, we relied on information (some oral and some written) supplied by GARS and GRS. This information includes actuarial assumptions and methods adopted by the GARS Board, System provisions, the draft June 30, 2022 Actuarial Valuation, the draft 2022 GASB 67/68 Report, the 2022 Valuation Results presentation, the 2021 Actuarial Experience Study the actuarial audit of the June 30, 2020 actuarial valuation, minutes of the plan year 2021, January 2022, March 2022, and April 2022 GARS Board of Trustee meetings, and agenda of the October 2022 GARS

Board of Trustee meeting. A detailed description of all information provided for this review is contained in Appendix B.

This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys, and our firm does not provide any legal services or advice.

This report was prepared exclusively for the Office of the Auditor General and the General Assembly Retirement System of Illinois for the purpose described herein. Other users of this report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to any other user.

Sincerely,
Cheiron

SIGNED ORIGINAL ON FILE

Jake Libauskas, FSA, EA, FCA, MAAA
Consulting Actuary

SIGNED ORIGINAL ON FILE

Heath Merlak, FSA, EA, FCA, MAAA
Principal Consulting Actuary

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE
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SECTION I – REPORT SCOPE

Illinois Public Act 097-0694 (the Act) amended the Illinois State Auditing Act (30 ILCS 5/2-8.1) and requires Cheiron, as the State Actuary, to review the actuarial assumptions and valuation of the General Assembly Retirement System of Illinois (GARS or System) and to issue to the GARS Board this preliminary report on the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contributions for Fiscal Year (FY) 2024. The purpose of this review is to identify any recommended changes to the actuarial assumptions for the GARS Board to consider before finalizing its certification of the required State contributions for FY 2024.

While the Act states that just the actuarial assumptions and valuation are to be reviewed, we have also reviewed the actuarial methodologies (funding and asset smoothing methods) employed in preparing the Actuarial Certification, as these methods can have a material effect on the amount of the State contribution being certified. Finally, we have offered our opinion on the implications of Article 2-124 of the Illinois Pension Code, which impacts the contribution amount certified by GRS.

In conducting this review, Cheiron reviewed the draft June 30, 2022 Actuarial Valuation, the draft 2022 GASB 67/68 Report, the 2022 Actuarial Results presentation, the 2021 Actuarial Experience Study, the actuarial audit of the June 30, 2020 actuarial valuation, minutes of the plan year 2021, January 2022, March 2022, and April 2022 Board of Trustees meetings, and agenda of the October 2022 GARS Board of Trustee meeting. The materials we reviewed are listed in Appendix B.

In addition to reviewing the Actuarial Certification of the required State contribution to GARS, the Act requires the State Actuary to conduct a review of the “actuarial practices” of the Board. While the term “actuarial practices” was not defined in the Act, we continue to interpret this language to mean that we review: (1) the use of a qualified actuary (as defined by the Qualification Standards of the American Academy of Actuaries) to prepare the annual actuarial valuation for determining the required State contribution; and (2) the conduct of periodic formal experience studies to justify the assumptions used in the actuarial valuation. In addition, we have included comments on actuarial communication and compliance with Actuarial Standards of Practice (ASOP) reflected in the draft June 30, 2022 Actuarial Valuation.

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SECTION II – SUMMARY OF RECOMMENDATIONS

This section summarizes recommendations from our review of the actuarial assumptions and methods employed in the draft June 30, 2022 Actuarial Valuation of GARS, as well as the “actuarial practices” of the GARS Board. Section III of this report contains detailed analysis and rationale for these recommendations.

Proposed Certification of the Required State Contribution

Gabriel, Roeder, Smith & Company (GRS) has determined that the FY 2024 required State contribution calculated under the current statutory funding requirements is \$26,474,000. We have verified the arithmetic calculations made by GRS to develop this required State contribution and have reviewed the assumptions on which it was based. We have accepted GRS’s annual projections of future payroll, total normal costs, employee contributions, combined benefit payments and expenses, and total contributions.

State Mandated Funding Method

1. We recommend that the funding method be changed to employ a methodology that produces a Reasonable Actuarially Determined Contribution and fully funds plan benefits within a reasonable period. The State Mandated Method is entering a period in which the contribution amount it produces may be reasonable even though the overall methodology is not. This period offers an opportunity to change the methodology to one that is consistent with actuarial standards for a Reasonable Actuarially Determined Contribution (ADC) without significantly affecting the immediate contribution amount. Such a method would set contributions at a level that is expected to prevent the unfunded actuarial liability from growing and remain high enough to reduce the unfunded actuarial liability each year until the plan is ultimately 100% funded within a reasonable period. While the State Mandated Method is inadequate, it will also produce more volatile contribution levels as the remaining period to achieve 90% funding shortens. Consequently, we recommend that the funding method be changed to one that produces more stable contribution requirements while targeting 100% funding within a reasonable period and meets the actuarial standards for a Reasonable ADC. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

Recognition of Changes in Actuarial Assumptions

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modified the State’s funding policy to require that the contribution impact of all assumption changes be phased-in over a five-year period.

2. Because experience studies are performed every three years, we recommend that the phase-in period for the impact of assumption changes be reduced to no longer than three years. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

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SECTION II – SUMMARY OF RECOMMENDATIONS

Assessment of Actuarial Assumptions Used in the 2022 Valuation

30 ILCS 5/2-8.1 requires the State Actuary to identify recommended changes in actuarial assumptions that the GARS Board must consider before finalizing its certification of the required State contribution. We have reviewed the experience study completed this year and all the actuarial assumptions used in the draft June 30, 2022 Actuarial Valuation and conclude that the assumptions are reasonable in general, based on the evidence provided to us.

Recommended Additional Disclosures for the 2022 Valuation

3. We recommend that GRS disclose the retirement age assumption for deferred vested members.
4. We recommend GRS disclose whether members who leave active employment are assumed to elect a deferred annuity or a refund of contributions.

Recommended Changes for Future Valuations

5. Section 3.2 of ASOP 51 requires the actuary to identify risks that “may reasonably be anticipated to **significantly affect** the plan’s future financial condition.” [emphasis added]. The risks currently identified appear to largely duplicate the list of examples in ASOP 51 and could apply to almost any pension plan. In future valuations, we recommend that the actuary explain how each risk identified would reasonably be anticipated to significantly affect the specific plan’s future financial condition.
6. For each risk identified above, Section 3.3 of ASOP 51 requires the actuary to provide an assessment that takes into account “circumstances specific to the plan.” For some of the identified risks, the actuary has provided a quantitative assessment specific to the plan while for other identified risks, the actuary has only provided a generic statement that could apply to any plan. We recommend that for each identified risk the actuary provide an assessment, preferably quantitative, that considers the specific circumstances of this plan.
7. We recommend that GRS consider the number of general assembly members that are in the defined contribution plan when projecting the ultimate number of active members in GARS. Since there are 177 members of the Illinois general assembly (59 state senators and 118 state representatives), we would anticipate an ultimate GARS active population of 97, based on GRS’ assumption that 55% of new members elect the defined benefit plan and 45% elect the defined contribution plan. In addition, we recommend that GRS include annual opt-out data in the Active Membership table shown on page 11 of the Actuarial Valuation.
8. We recommend GRS expand the participant data section to include average pay and service for active members and information on inactive members owed a benefit in the future. In addition, a reconciliation of changes in member status from the prior year to the current year would improve the user’s understanding of membership changes.

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SECTION II – SUMMARY OF RECOMMENDATIONS

9. We recommend that GRS consider the average retirement age when reviewing the retirement assumption in the next experience study. The average retirement age in the 2021 experience study was 64.4 and it was 65.5 in the 2018 experience study. The recommended retirement rates in the 2021 experience study would have resulted in an average retirement age of 68.1.
10. We recommend that GRS review the retirement age experience for deferred vested members in the next experience study.
11. We recommend the GARS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly, as they did for this valuation.

GASB 67 and 68

The 2022 GARS GASB 67 and 68 information was provided in a separate report. We find that the assumptions and methods used to prepare the 2022 GARS GASB 67 and 68 schedules are reasonable based on the evidence provided to us.

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SECTION III – SUPPORTING ANALYSIS

In this section we provide detailed analysis and supporting rationale for the recommendations that were presented in Section II of this report.

Proposed Certification of the Required State Contribution

As stated in our summary of recommendations in Section II, we have verified the arithmetic calculations made by GRS to develop the required State contribution, reviewed the assumptions on which it is based, and accepted GRS's annual projections of future payroll, total normal costs, benefits, expenses, and total contributions. However, in accordance with 30 ILCS 5/2-8.1, our review does not include a replication of the actuarial valuation results.

As previously recommended, the GARS Board retained an independent actuary, Foster & Foster, to complete a replication audit. Foster & Foster independently replicated the June 30, 2020 actuarial valuation and found no significant differences in the calculation of liabilities, assets, and contributions for GARS.

State Mandated Methods

The Illinois Pension Code (40 ILCS 5/2-124) establishes a method that does not adequately fund the System. This law requires the actuary to calculate the employer contribution as the level percentage of projected payroll that would accumulate assets equal to 90% of the Actuarial Accrued Liability in the year 2045 if all assumptions are met. This contribution methodology does not conform to generally accepted actuarial principles and practices. Generally accepted actuarial funding methods target the accumulation of assets equal to 100% of the Actuarial Accrued Liability, not 90%.

We recommend that the funding method be changed to employ a methodology that produces a Reasonable Actuarially Determined Contribution and fully fund plan benefits within a reasonable period of time (Recommendation #1). The State Mandated Method is entering a period in which the contribution amount it produces may be reasonable even though the overall methodology is not. This period offers an opportunity to change the methodology to one that is consistent with actuarial standards for a Reasonable Actuarially Determined Contribution (ADC) without significantly affecting the immediate contribution amount. Such a method would set contributions at a level that is expected to prevent the unfunded actuarial liability from growing and remain high enough to reduce the unfunded actuarial liability each year until the plan is ultimately 100% funded within a reasonable period. While the State Mandated Method is inadequate, it will also produce more volatile contribution levels as the remaining period to achieve 90% funding shortens. Consequently, we recommend that the funding method be changed to one that produces more stable contribution requirements while targeting 100% funding within a reasonable period and meets the actuarial standards for a Reasonable ADC.

The GRS June 30, 2022 Actuarial Valuation includes a recommended funding policy which would contribute the normal cost plus an amortization payment that would seek to fully pay off the total

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unfunded actuarial liability over a closed period of 13 years as of June 30, 2022. The GARS Board of Trustees has agreed with this recommendation and adopted a separate funding policy to calculate an *Actuarially Determined Contribution (ADC)*. We note that this policy meets the requirements of a Reasonable Actuarially Determined Contribution and will satisfy the new ASOP 4 requirement effective in 2023 to calculate and disclose a Reasonable Actuarially Determined Contribution (ADC). According to this methodology, the State's contribution amount would be \$34,724,251 for FY 2024 compared to the statutory contribution amount of \$26,474,000. It is important though to recognize that this policy does not affect the actual funding of the System.

We have reviewed the adopted policy. We agree that the policy is a reasonable method that conforms to the Actuarial Standards of Practice, and we agree with its use in the GASB report as an ADC. The funding policy calls for a funding amount equal to the normal cost plus a closed 20-year amortization as a level percentage of uncapped payroll of the unfunded actuarial liability. As of June 30, 2022, the remaining amortization period is 13 years. This policy defines a method that would ultimately fully fund the Plan and falls within generally accepted actuarial funding methods currently in use for public plans.

Recognition of Changes in Actuarial Assumptions

Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modified the State's funding policy to require that the contribution impact of all assumption changes, including changes prior to P.A. 100-0023, be phased-in over a five-year period. As such, the Act delays the recognition of the impact of assumption changes when calculating the contribution requirement of the System. Assumption changes are intended to more accurately anticipate the obligations for funding based on the most recent experience analysis and forward-looking changes to future investment returns. However, only one-fifth of the impact of these changes are now recognized from the date of adoption. The remainder of the impact is recognized over four additional years such that the full impact is only recognized at the end of a five-year period beginning at the date of adoption. This phase-in provides time to adjust to a new level of contributions. However, the Conference of Consulting Actuaries White Paper on Actuarial Funding Policies and Practices for Public Pension Plans recommends that the "phase-in period should be no longer than the time period until the next review of assumptions." **Since experience studies are performed every three years, we recommend the phase-in period for the impact of assumption changes be reduced to no longer than three years (Recommendation #2).**

Stress Testing

Based on the draft June 30, 2022 Actuarial Valuation, the funded ratio, measured as the ratio of the actuarial value of assets to the Actuarial Liability, is currently at 21.95%. The unfunded actuarial accrued liability is currently about \$283 million and is expected to decrease over time. The required State contribution rate is currently 278.65% of payroll for the current fiscal year and is scheduled to decrease to 267.71% of payroll for FY 2024. However, if there is a significant market downturn, the unfunded actuarial liability could increase substantially and the required State contribution rate could increase significantly, putting the sustainability of the system further

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into question. As previously recommended, GRS did provide stress testing in the final 2021 Actuarial Valuation which provides important analysis to better understand these risks. We anticipate stress testing will be included in the final June 30, 2022 Actuarial Valuation.

Actuarial Standard of Practice 51

Actuarial Standard of Practice (ASOP) 51 provides guidance to actuaries on the assessment and disclosure of risks to help readers of the actuarial valuation report “*understand the effects of future experience differing from the assumptions used*” and “*the potential volatility of future measurements resulting from such differences*”.

ASOP 51’s first requirement is to “*identify risks that, in the actuary’s professional judgment, may reasonably be anticipated to significantly affect the plan’s future financial condition.*” GRS identified six sources of risk to GARS: investment risk, asset/liability mismatch risk, contribution risk, salary and payroll risk, longevity risk and other demographic risks. With the exception of the contribution risk due to the statutorily required amount of contributions, the risks GRS identified are relatively generic and would apply to most pension plans.

ASOP 51 requires the actuary to assess each of the risks identified. While the assessment does not have to be quantitative, it does have to take into account the specifics of the individual plan. ASOP 51 also describes several quantitative methods that may be used to assess risk.

- Investment Risk. GRS included additional stress testing in the last year’s final actuarial valuation report that adequately assessed the investment risk with various investment return scenarios.
- Asset/Liability Mismatch Risk. GRS does not appear to provide an assessment of asset/liability mismatch risk other than to indicate that asset value changes that do not match liability changes will either increase or decrease costs. If GRS continues to identify this as a key risk, ASOP 51 requires that they also provide an assessment that takes into account “circumstances specific to the plan.”
- Contribution Risk. GRS discusses several issues with the statutorily required contribution amounts in the risk section as well as in other parts of the valuation report. The stress testing included in last year’s final actuarial valuation report adequately assessed the impact of a declining contribution base (i.e. payroll).
- Salary and Payroll Risk. The stress testing included in last year’s final actuarial valuation report adequately assessed the salary and payroll risk with alternative projected decreases in the active population.
- Longevity Risk. GRS does not appear to provide an assessment of longevity risk. The valuation report simply states that experience that differs from the assumptions will either increase or decrease costs. If GRS continues to identify this as a key risk, ASOP 51 requires

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that they also provide an assessment that takes into account “circumstances specific to the plan.”

- Other Demographic Risk. GRS provides an explanation of demographic risks but does not appear to provide any assessment of these risks. If GRS continues to identify this as a key risk, ASOP 51 requires that they also provide an assessment that takes into account “circumstances specific to the plan.”

ASOP 51 requires the actuary to recommend a more detailed assessment of risks if it “*would be significantly beneficial.*” GRS adequately identified the primary drivers of these risks, provided background information and assessments about these identified risks, but did not in our opinion adequately communicate the significance of all of these risks to this Plan. The stress testing included in last year’s final actuarial valuation report provided a quantitative assessment of the investment risk, contribution risk, and salary and payroll risk and we anticipate similar stress testing will be included in this year’s valuation actuarial valuation report. However, the other risks were only assessed with a generic statement that could apply to any pension plan.

Section 3.2 of ASOP 51 requires the actuary to identify risks that “may reasonably be anticipated to significantly affect the plan’s future financial condition.” The risks currently identified appear to largely duplicate the list of examples in ASOP 51 and could apply to almost any pension plan. **In future valuations, we recommend that the actuary explain how each risk identified would reasonably be anticipated to significantly affect the specific plan’s future financial condition.** (Recommendation #5)

For each risk identified above, Section 3.3 of ASOP 51 requires the actuary to provide an assessment that takes into account “circumstances specific to the plan.” For some of the identified risks, the actuary has provided a quantitative assessment specific to the plan while for other identified risks, the actuary has only provided a generic statement that could apply to any plan. **We recommend that for each identified risk the actuary provide an assessment, preferably quantitative, that considers the specific circumstances of this plan.** (Recommendation #6)

Changes to Actuarial Standard of Practice 4

Actuarial Standard of Practice No. 4 (ASOP 4) was amended and the changes will become effective for GARS’ actuarial valuations starting June 30, 2023. There are three primary changes that will affect the GARS actuarial valuation:

1. The requirement to calculate and disclose a Reasonable Actuarially Determined Contribution as defined in ASOP 4,
2. The requirement to assess the implications of the funding policy, including four specific assessments, and
3. The requirement to calculate, disclose, and explain a Low-Default-Risk Obligation Measure (LDROM).

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The requirement to calculate and disclose a Reasonable ADC is already incorporated in the GARS actuarial valuation and has been discussed in our analysis above. This section will discuss the remaining two requirements that will become effective for the June 30, 2023 actuarial valuation.

Implications of the Funding Policy

Effective with the 2023 actuarial valuation, changes to ASOP No. 4 will require GRS to make four specific assessments of the State Mandated Funding Policy:

1. A qualitative assessment of the implications of the funding policy on expected future contributions and funded status,
2. An estimate of how long until contributions under the funding policy will exceed normal cost plus interest on the unfunded actuarial liability,
3. An estimate of how long until the unfunded actuarial liability is expected to be paid off, and
4. An assessment of whether the funding policy is significantly inconsistent with accumulating assets adequate to make benefit payments, and, if applicable, an estimate of the approximate time until assets are depleted.

GRS already provides the qualitative assessment required and discusses the principal issues but will need to add the specific estimates in future valuation reports.

Calculation and Disclosure of LDROM

The LDROM is calculated using a discount rate derived from low-default-risk fixed income securities whose cash flows are reasonably consistent with the plan's projected benefit payments. Consequently, the discount rate is likely to be significantly lower than the funding discount rate and the LDROM significantly higher than the Actuarial Liability.

The actuary has a few choices in the calculation of the LDROM, and those choices may depend on how the actuary wants to explain the significance of the LDROM as required by ASOP 4 "with respect to the funded status of the plan, plan contributions, and the security of participant benefits."

Public plan actuaries may explain the LDROM in terms of the expected taxpayer savings from investing in a diversified portfolio or the cost to eliminate investment risk. Using this framework for the explanation, actuaries would likely elect to use the same actuarial cost method as is used for funding and to derive the discount rate from yields on high quality corporate bonds. However, multiple other options are also possible.

Our review of this new disclosure will focus on the consistency between the explanation of LDROM's significance and the selected cost method and basis for discount rate.

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Assessment of Actuarial Assumptions Used in the 2022 Valuation

A. Economic Assumptions

1. Interest Rate

The interest rate assumption (also called the investment return or discount rate) is the most impactful assumption affecting the required State contribution amount. This assumption, which is used to value liabilities for funding purposes, was maintained at 6.50% for the June 30, 2022 Actuarial Valuation.

After reviewing all the materials (see Appendix B of this report) that were made available, Cheiron concludes that the interest rate of 6.50% for this valuation is reasonable.

We recommend that the GARS Board continue to annually review the economic assumptions (interest rate and inflation), as was done for this valuation, prior to commencing the valuation work and adjust assumptions accordingly (Recommendation #11).

The items we considered and our rationale for this recommendation are as follows:

- A review of the interest and inflation rates does not involve the collection of significant data and can be updated annually. In addition, it keeps the Board focused more closely on these critical assumptions.
- In GRS's April 14, 2022 Actuarial Experience Study, they presented the expectations for the GARS portfolio of the Illinois State Board of Investment's investment consultant Meketa Investment Group. Meketa's expected 20-year geometric average return of the GARS portfolio is 6.51% (see page C-9 of the Actuarial Experience Study). Based on the capital market assumptions provided by Meketa, GARS has a 50.12% chance of meeting or exceeding the assumption of 6.50%.
- GRS's April 14, 2022 review of economic assumptions also presented the expectations for the GARS portfolio based on capital market assumptions for a 10-year or shorter time horizon of twelve independent investment consultants and concluded that, adjusting for GRS's assumed rate of inflation, the average expected geometric return for the GARS portfolio is 5.59% (See page C-9 of GRS's April 14, 2022 Actuarial Experience Study). This analysis estimated GARS has a 40.46% chance of meeting or exceeding the 6.50% assumption over a 10-year time horizon. In the future, we suggest that GRS disclose more information about these capital market assumptions, including a list of the investment consulting firms included and the dates of the capital market assumptions.

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- GRS also presented the expectations for the GARS portfolio based on capital market assumptions for a 20-year or longer time horizon of five independent investment consultants. As shown in the chart below, the average 20-year geometric mean for the GARS portfolio was 6.66% and GARS is estimated to have a 52.22% chance of meeting or exceeding the 6.50% assumption (See page C-9 of GRS's April 14,, 2022 Actuarial Experience Study). In the future, we suggest that GRS disclose more information about these capital market assumptions, including a list of the investment consulting firms included and the dates of the capital market assumptions.

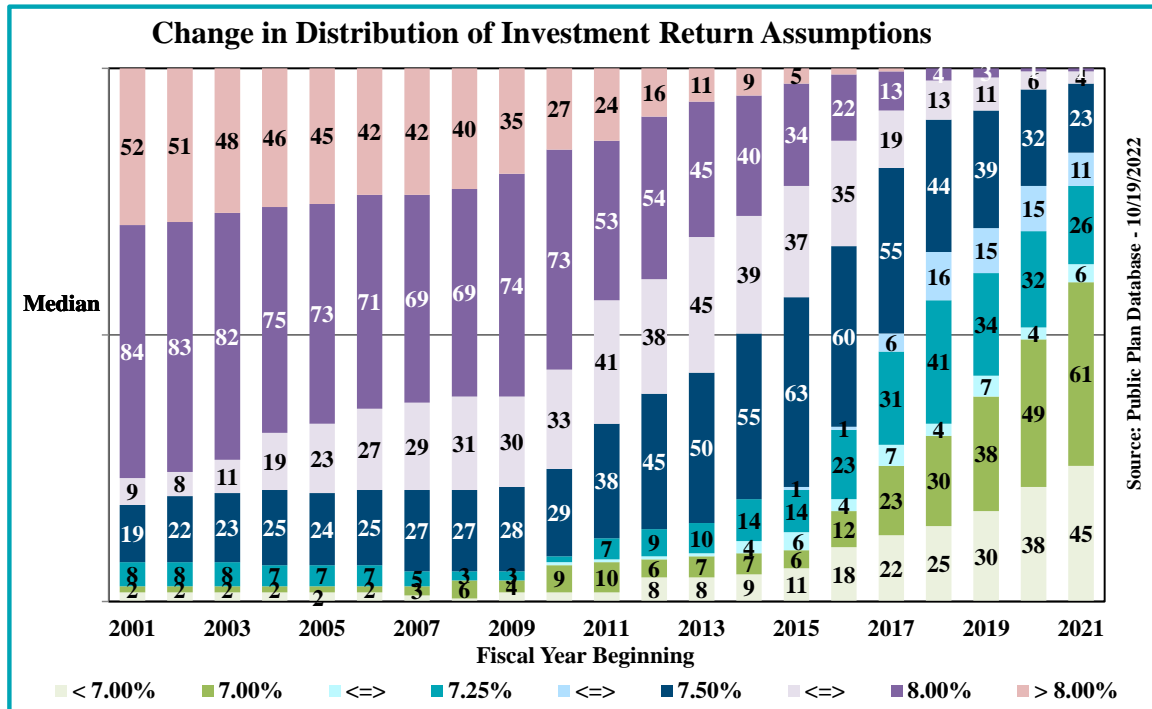
Distribution of 20-year Average Geometric Net Nominal Return

Investment Consultant	Distribution of 20-Year Average Geometric Net Nominal Return			Probability of exceeding 6.50%
	40 th	50 th	60 th	
(1)	(2)	(3)	(4)	(5)
1	5.71%	6.39%	7.07%	48.33%
2	6.73%	7.46%	8.20%	63.05%
3	6.19%	6.88%	7.57%	55.53%
4	5.35%	6.04%	6.73%	43.32%
5	5.90%	6.56%	7.22%	50.87%
Average	5.98%	6.66%	7.36%	52.22%

- The combination of the expectations from the Illinois State Board of Investment's investment consultant and the expectations from a variety of independent investment consultants supports the reasonableness of assuming a 6.50% interest rate for the current year.
- While the discount rate assumption should be based on the future expected investment returns for the System's investment portfolio, survey information can provide an important context for evaluating the assumption. The Public Plans Database is maintained by a partnership between the Center for State and Local Government Excellence (SLGE) and the Center for Retirement Research at Boston College with support from the National Association of State Retirement Administrators (NASRA). This database contains historical information on large public pension plans, including key assumptions used in their actuarial valuations. The following chart shows the distribution of investment return assumptions for the 177 plans in the Public Plans Database with consistent information from 2001 through 2022 as of October 19, 2022.

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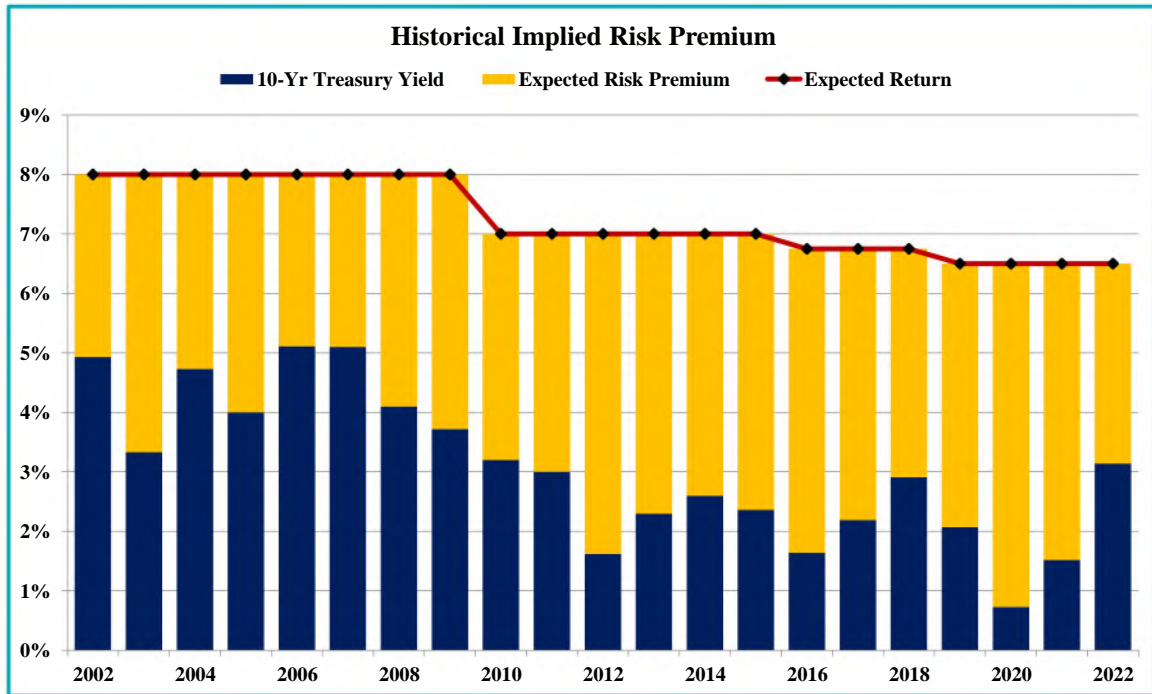


Over the period shown, there continues to be a pattern of reducing discount rates partially reflecting long-term changes in capital markets, interest rates and underlying inflation. Of the 177 plans shown, 113 have reduced their discount rate assumption since 2017. For these 113 plans, the average reduction is 0.44%.

- Over the last two decades, declining interest rates have forced pension plans to either reduce their discount rates, increase their exposure to investment risk, or some combination of the two. For example, as shown in the chart below, in June 2002, the yield on 10-year Treasury bonds (a proxy for a risk-free investment) was 4.90%. To achieve GARS then assumed return of 8.00%, the System's investments had to outperform the yield on the 10-year Treasury by 3.10%. In June 2020, the yield on the 10-year Treasury had dropped to 0.70%, and to achieve GARS assumed return of 6.50%, the System's investments need to exceed the 10-year Treasury yield by 5.80%. Even though GARS had reduced its return assumption by 150 basis points over the period, it still had to take more investment risk in 2020 to meet its assumption than it did in 2002. Since 2020, yields on 10-year Treasury bonds have increased, reducing the expected risk premium needed to achieve the System's assumed return. With recent action by the Federal Reserve, 10-year Treasury bond yields have increased rapidly from 1.5% in December 2021 to 3.1% in June 2022 and 4.0% in October 2022. If these higher Treasury bond yields persist, plans may be able to achieve the expected return with less exposure to investment risk. However, if these higher Treasury bond yields prove temporary, plans could quickly find the pressure returning to further reduce discount rates or increase their exposure to investment risk.

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- GARS has experienced positive cash flow for FY 2022 (contribution income less benefits and expense payouts). The positive cash flow of GARS is currently 3.05% of assets. However, negative cash flow is expected for FY 2024 through FY 2040 as shown in the graph on page 10 of the draft 2022 Actuarial Valuation. When short-term returns are expected to be lower than the long-term expectations, which is the current case with GARS, a plan with negative cash flows will have actuarial returns (i.e., dollar-weighted returns) that are less than their “time-weighted” returns.

2. Inflation Assumption

As recommended in the GRS April 14, 2022 Actuarial Experience Review, the inflation assumption of 2.25% was maintained for the June 30, 2022 Actuarial Valuation.

We find the 2.25% inflation assumption to be reasonable.

Our rationale for concurring with the 2.25% assumption:

- GRS’s April 14, 2022 Actuarial Experience Study included a survey of the inflation assumptions of independent investment consultants. The 5 investment consulting firms with longer time horizons (20+ years) reported an average of 2.22% and ranged from 2.11% to 2.31%. The 12 firms with a shorter time horizon reported an average of 2.19% and ranged from 1.92% to 3.10%. In the future, we suggest that GRS disclose more

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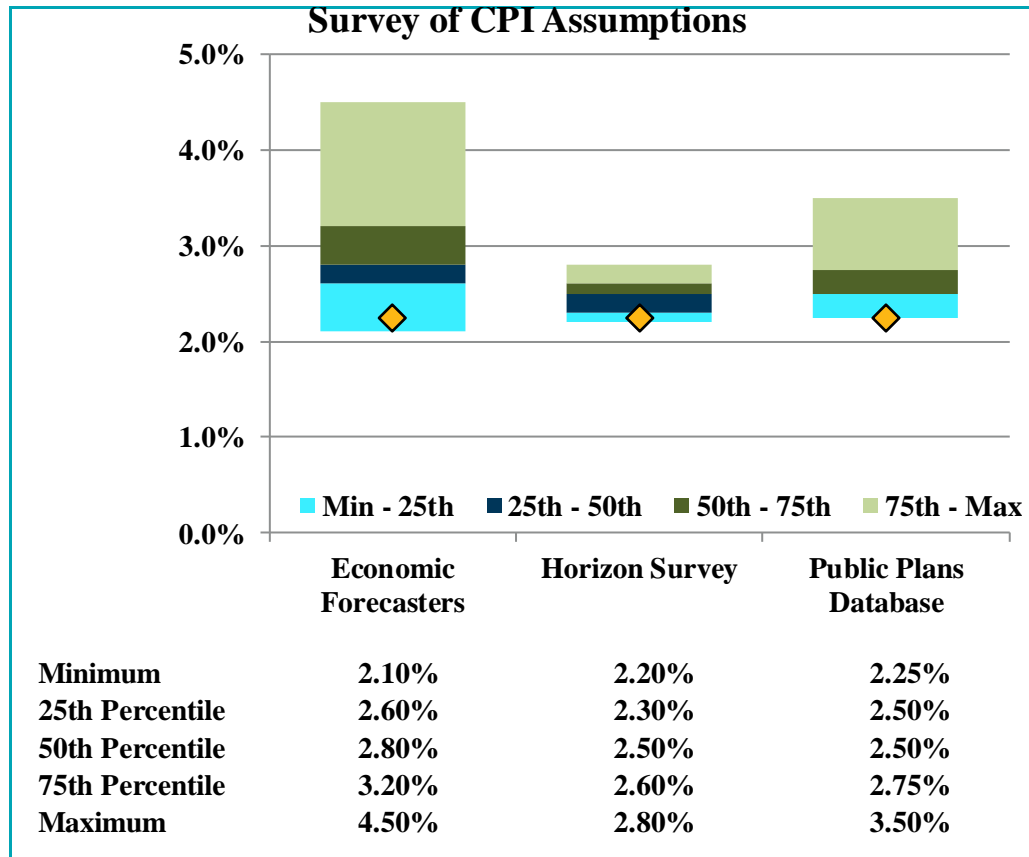
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information about this survey, including a list of the investment consulting firms included and the dates of the inflation assumptions.

- GRS's April 14, 2022 Actuarial Experience Study also included the forward-looking inflation forecasts from the Federal Reserve Bank of Cleveland as of December 1, 2021. This forecast shows inflation over the next 10 years of 1.76% increasing to 2.09% over 30 years.
- The June 2022 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (next 75 years), inflation will average between 1.8% and 3.0% (<http://www.ssa.gov/oact/tr/2022/tr2022.pdf>). Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.4%.
- GRS's April 14, 2022 review of economic assumptions included forward-looking price inflation forecasts from numerous sources where inflation forecasts ranged from 2.27% to 2.90% (please see page C-4 of the 2021 Actuarial Experience Study).
- The following chart shows the distribution of inflation expectations for the Third Quarter 2022 survey of professional economic forecasters published by the Philadelphia Federal Reserve, the 2022 Horizon survey of investment consultant capital market assumptions (20-year), and the 2021 inflation assumptions used by plans in the Public Plans Database compared to the GARS assumption (indicated by the gold diamonds). The assumption of 2.25% is in the lower quartile of the range projected by professional economic forecasters and investment consultants, and is on the low end of the range used by other public plans.

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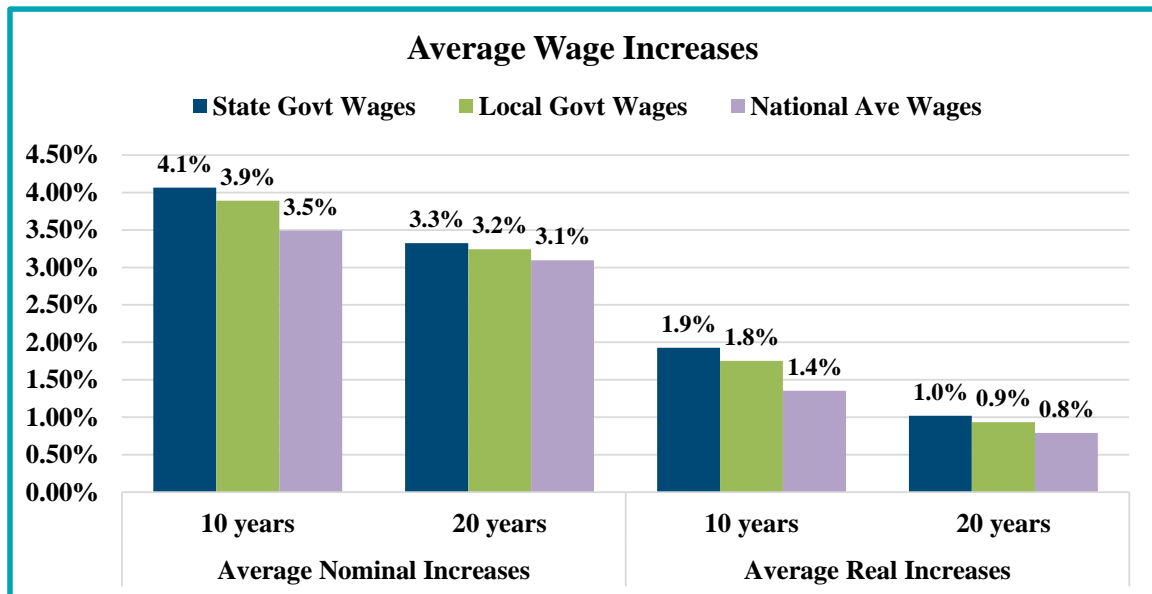
3. Salary (Annual Compensation) Increase Assumption

The salary increase assumption for uncapped payroll is 2.50% per year, compounded annually for all active members, regardless of age or service. It includes components of 2.25% per annum for inflation and 0.25% per annum for productivity.

We find the assumption and the basis for setting the assumption reasonable and consistent with the inflation assumption.

Our rationale for concurring with GRS's recommended salary increase assumption:

- The following chart shows the average nominal and real increases in wages over the last 10 and 20 years for State governments, local governments, and National Average Wages. State and local government data is from the Quarterly Census of Employment and Wages as published by the Bureau of Labor Statistics. National Average Wages is published by the Social Security Administration.



- The June 2022 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (next 75 years), real wage differential will average somewhere between 0.53% and 1.77%. Under the intermediate cost projection, the Social Security Administration uses an assumption of 1.15%.
- In our own experience with our public sector pension plans (about 60 large plans), we have witnessed a continued trend of lower salary increases for public sector employees.

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4. Cost of Living Adjustment Assumption

While Tier 1 members receive an annual automatic three percent COLA, Tier 2 members receive an annual increase equal to the lesser of the three percent received by Tier 1 and the annual change in the Consumer Price Index for all Urban Consumers. The Tier 2 COLA assumption is 2.25% per year, compounded annually, which is the inflation assumption.

We find the assumption and the basis for setting it reasonable.

5. Capped Pay Assumption

The Tier 2 capped payroll growth is 2.25% per year, compounded annually, which is the inflation assumption.

We find the assumption reasonable.

6. Expenses

Expenses are expected to increase with the projected capped payroll at 2.25% and are included in the service cost.

We find the assumption reasonable.

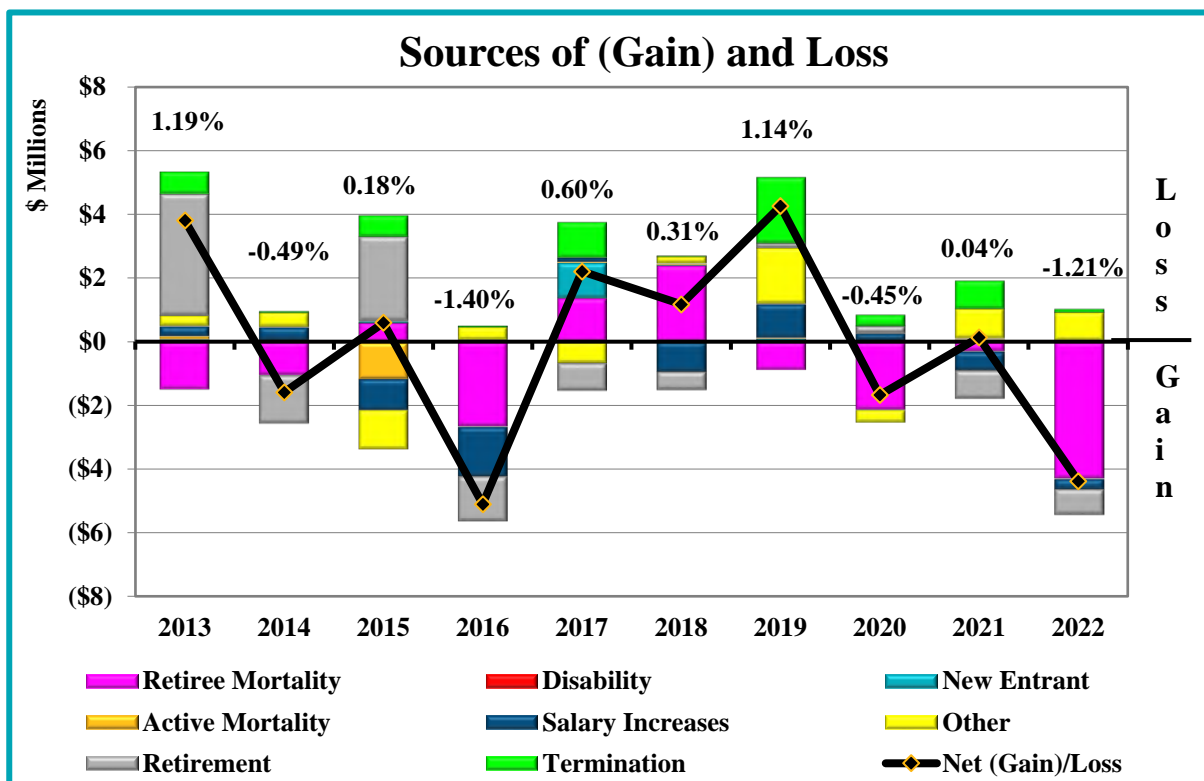
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B. Demographic Assumptions

In its annual actuarial valuation reports, GRS regularly reports sources of liability gains and losses. In the draft June 30, 2022 Actuarial Valuation, these are shown on page 21. In the chart below, we have collected similar data from past valuation reports dating back to 2013 and use these to present a historical review of past demographic and salary increase experience gains and losses.

The following chart shows the pattern of annual gains and losses attributable to eight different sources as shown in the legend. When the colored bar slices appear above zero on the Y-axis, it represents an experience loss with the value representing the increase in liabilities over what was expected. When the bar is below zero, it represents an experience gain for that year with liabilities less than expected. The net liability (gains)/losses are shown by the black line. This net (gain)/loss as a percent of liability is shown above the bars.



The percentages shown above the bars refer to net (gain)/loss as a percentage of liability.

Key observations from this chart are as follows:

1. There have been termination losses in each of the last ten years. Over the last three years, there have been more terminations than expected but there are termination losses occurring each year. The losses from terminations should continue to be monitored and the assumption may need to be revised if it continues to result in losses.

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2. Retirement experience has been volatile over the years, but the magnitude of the gains and losses has declined in recent years.
3. Mortality experience has also been volatile over the last several years. In years where there were losses, it means fewer deaths were observed than anticipated. Another way to express this is retirees are living longer than the current mortality assumption predicts. In contrast, in years where there were gains, it means there were more deaths than anticipated. For 2022, there is a sizable gain due to mortality experience which may be attributable to COVID.
4. While there have been both salary gains and losses, total payroll has decreased significantly due to the decline in the active membership while the average pay has been relatively stable.

Below we summarize the demographic assumptions that we reviewed, and we have concluded all are reasonable and meet the requirements of ASOP No. 35, Section 3.3.4.

1. Mortality

Post-Retirement Mortality

The mortality basis was updated with the June 30, 2022 Actuarial Valuation and is based on the Pub-2010 Above-Median Income General Healthy Retiree Mortality tables, sex distinct, with no scaling factors, with generational mortality improvement using the MP-2021 two-dimensional mortality improvement scales.

Pre-Retirement Mortality

The mortality basis was updated with the June 30, 2022 Actuarial Valuation and is based on the Pub-2010 Above-Median Income General Employee Mortality tables, sex distinct, with no scaling factors and with generational mortality improvement using the MP-2021 two-dimensional mortality improvement scales.

Future mortality improvements are found by projecting the base mortality tables forward from the base year of 2010 using the MP-2021 mortality improvement scale.

2. Termination

Rates of withdrawal are assumed to be equal to seven percent for all ages 20 through 65 for both Tier 1 and Tier 2 members.

It is assumed that terminated employees will not be rehired. The rates apply only to employees who have not fulfilled the service requirement necessary for retirement at any given age.

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It is unclear whether members who leave active employment are assumed to elect a deferred annuity or a refund of contributions. **We recommend that GRS disclose this assumption in the Actuarial Valuation.** (Recommendation #4).

3. Retirement

Retirement rates were increased at select ages for Tier 1 members based on the Actuarial Experience Study for valuations beginning with the June 30, 2022 Actuarial Valuation.

Rates of retirement for Tier 1 members are as follows:

Retirement Rates	
Age	Male and Female
55	10.00%
56-64	15.00%
65-69	20.00%
70-74	25.00%
75	100.00%

Rates of retirement for Tier 2 members are as follows:

Retirement Rates	
Age	Male and Female
62	20.00%
63	10.00%
64	12.00%
65	14.00%
66	16.00%
67	35.00%
68-70	25.00%
71-74	20.00%
75	100.00%

The retirement rates for vested terminated members is not disclosed in the Actuarial Valuation. **We recommend that GRS disclose the retirement age assumption for deferred vested members.** (Recommendation #3).

4. Marriage Assumption

75.0% of active and retired participants are assumed to be married.

5. Disability

No assumption for disability was assumed.

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6. New Entrants

The new entrant profile includes uncapped and capped salary information. New entrants are assumed to enter with an average age (41.84), average uncapped pay of \$83,664, and average capped pay of \$83,103. Based on the assumption that 45 percent of future members elect to opt out of the pension system, the population is projected to decrease from 122 members as of the valuation date, to 70 members in 2045 and ultimately reach 67 members in 2056. The average increase in uncapped payroll for the projection period is 2.50% per annum.

The 2021 Actuarial Experience Study noted the 2021 opt-out experience was 40% which is in line with the current assumption. More historical experience would be helpful to compare the historical trend to the ongoing assumption.

The opt-out assumption appears to be applied to new entrants replacing current active members in GARS who are assumed to leave covered employment. **We recommend that GRS consider the number of general assembly members that are in the defined contribution plan when projecting the ultimate number of active members in GARS.** Since there are 177 members of the Illinois general assembly (59 state senators and 118 state representatives), we would anticipate an ultimate GARS active population of 97, based on GRS' assumption that 55% of new members elect the defined benefit plan and 45% elect the defined contribution plan. **In addition, we recommend that GRS include annual opt-out data in the Active Membership table shown on page 11 of the Actuarial Valuation.** (Recommendation #7)

7. Spouse's Age

The female spouse is assumed to be four years younger than the male spouse.

8. Decrement Timing

All decrements are assumed to occur beginning of year.

9. Decrement Relativity

Decrement rates are used directly from the experience study without adjustment for multiple decrement table effects.

10. Decrement Operation

Turnover decrements do not operate after member reaches retirement eligibility.

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11. Eligibility Testing

Eligibility for benefits is determined based upon the age nearest birthday and service on the date the decrement is assumed to occur.

12. 415(b) and 401(a)(17) Limits

No explicit assumption is made with respect to these items.

13. Other Assumptions as a result of Public Act 96-0889

Members hired after December 31, 2010 are assumed to make contributions on salary up to the final average compensation cap in a given year until this plan provision or administrative procedure is clarified.

State contributions, expressed as a percentage of pay, are calculated based upon capped pay.

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C. Funding Methods

Actuarial funding methods consist of three components: (1) the actuarial cost method, which is the attribution of total costs to past, current, and future years; (2) the asset valuation method (i.e., asset smoothing); and, (3) the amortization method.

1. Actuarial Cost Method

The System uses the projected unit credit cost method (PUC) to assign costs to years of service, as required under the Pension Code (40 ILCS 5/2). **We have no objections with respect to using the PUC method, although we would prefer the Entry Age Normal (EAN) cost method, as it is more consistent with the requirement in 40 ILCS 5/2-124 for level percentage of pay funding.**

Under the PUC method, which is used by some public sector pension funds, the benefits of active participants are calculated based on their compensation projected with assumed annual increases to ages at which they are assumed to leave the active workforce by any of these causes: retirement, disability, turnover, or death. Only past service (through the valuation date but not beyond) is taken into account in calculating these benefits. The present value of these benefits based on past service and future compensation is the actuarial liability for a given active participant. Under the PUC cost method, the value of an active participant's benefits tends to increase more sharply over his or her later years of service than over his or her earlier ones. While the PUC method is not an unreasonable method, as a result of this pattern of benefit values increasing, more plans use the EAN cost method to mitigate this effect. It should also be noted that the EAN cost method is the required method to calculate liability for GASB Nos 67 and 68.

2. Asset Valuation Method

The Actuarial Value of Assets for the System is a smoothed market value. Unanticipated changes in market value are recognized over five years in the Actuarial Value of Assets. The primary purpose for smoothing out gains and losses over multiple years is so fluctuations in the contributions will be less volatile over time than if based on the Market Value of Assets.

The 2021 Public Retirement Systems Study by the National Conference on Public Employee Retirement Systems (NCPERS) survey of 156 public retirement funds found that the majority of plans responding to the survey have a five-year smoothing period.

Smoothing the market gains and losses over a period of five years to determine the Actuarial Value of Assets is a generally accepted approach in determining actuarial cost, and we concur with its use.

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3. Amortization Method

The mandated State contribution is based on a determination of the level percentage of payroll that is expected to achieve a 90% funded ratio in 2045. While not a traditional amortization method, this methodology effectively amortizes a portion of the unfunded actuarial liability over the remaining period until 2045, which is currently 23 years.

One of the principles of funding public plans identified by the American Academy of Actuaries is that there should be “a plan to make up for any variations in actual assets from the funding target within a defined and reasonable time period.” Because it only targets 90%, the State method does not include a plan to achieve the funding target over any period of time.

Finally, as the remaining period to achieve 90% funding shortens, the State mandated method will also produce more volatile contributions. Instead of a single fixed period, typical public plan amortization methods use layered amortization bases such that new assumption changes and experience gains and losses are amortized over a new period (e.g., 20 years) while the remaining period for the prior amortization layers becomes one year shorter.

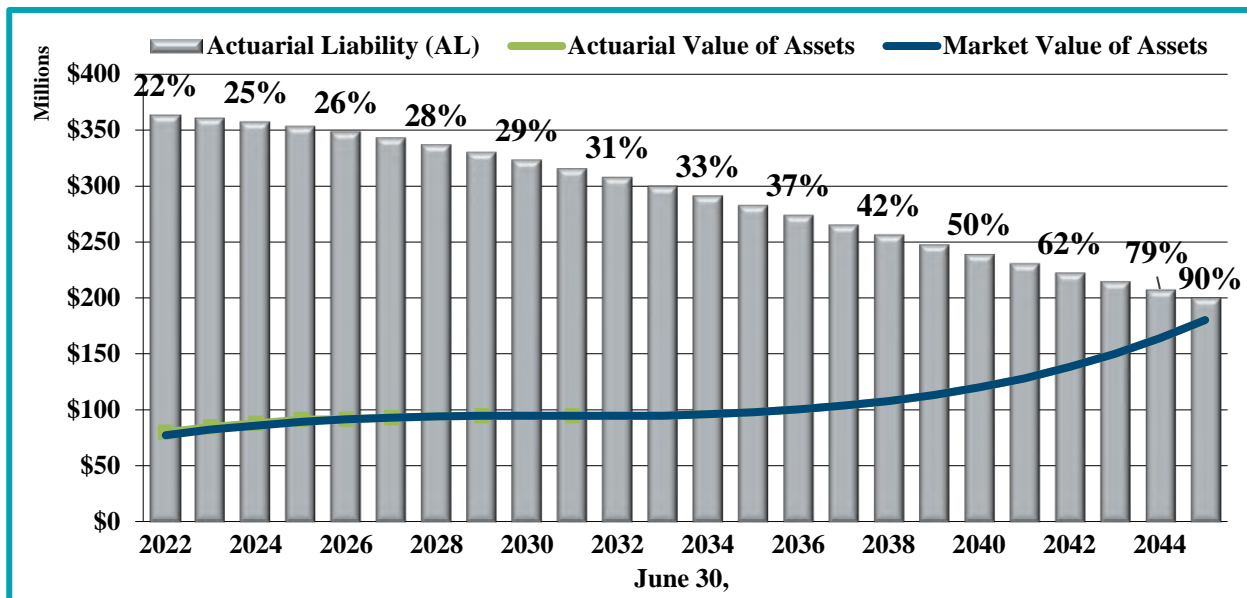
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SECTION IV– PROJECTION ANALYSIS

This section reviews the projections contained in the draft June 30, 2022 Actuarial Valuation of GARS. These projections are fundamental to the development of the required State contribution calculated under the current statutory funding requirement.

The following graphs are independent approximations of the projections performed by the State Actuary to verify that the System's funding projections are reasonable. They do not reflect all the precision of the projections applied by the System's actuary, but instead they are intended to verify the reasonableness of the modeling done by the System's actuary.

The graph below shows our projection of the expected future liabilities and assets in the System through 2045. As pointed out on page 9 of the draft June 30, 2022 Actuarial Valuation, the majority of the funding of the System occurs in the later years of the projections. The **lines show the projected assets** (market value and actuarial value), and the **bars show the projected liabilities** of the System. The funded ratio for each year is shown at the top of the graph. For example, in 2034, the funded ratio is projected to be approximately 33% with assets being approximately \$96 million and liabilities being approximately \$291 million.

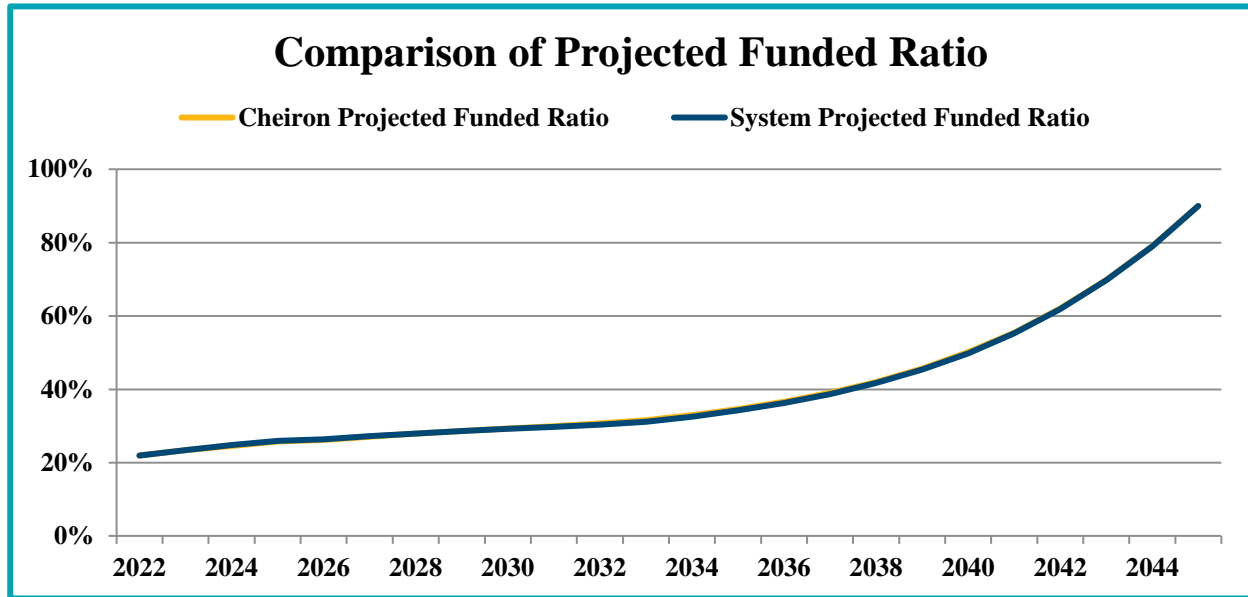


Source: Cheiron projection analysis.

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When we compare our projected funded ratio against the results shown in the draft June 30, 2022 Actuarial Valuation, **we find a close match in expected funded ratio**. This close match of the funded ratio indicates that the projections done by the System's actuary are reasonable.

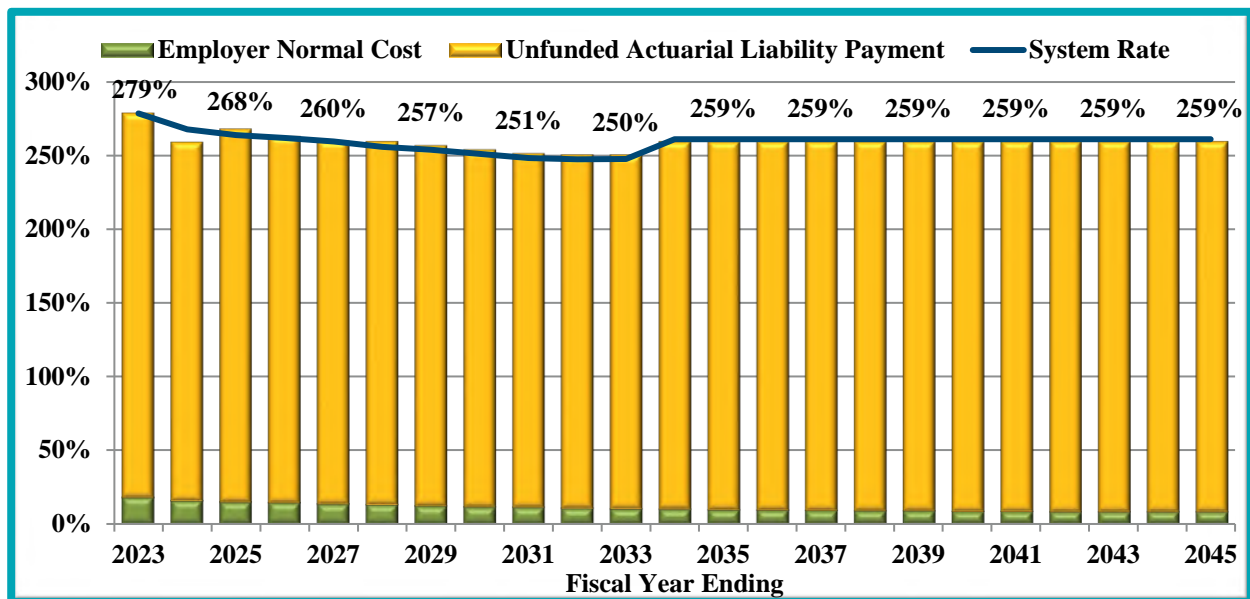


Source: Cheiron projection analysis.

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The following graph shows the expected contribution calculated under the statutory method. The contribution as a percentage of payroll is shown above each bar. The value shown for the fiscal year ending 2023 was set based on the June 30, 2021 Actuarial Valuation. The current valuation is the basis for setting the rates starting July 1, 2023 (Fiscal Year Ending June 30, 2024). The contribution requirement has two components: 1) the employer normal cost, which is the approximate value of the amount of benefits accrued by participants not covered by employee contributions based on the statutory funding method; and 2) an amortization of the unfunded liability. The normal cost amounts are shown by the green bars and the amortization of the unfunded actuarial liability (UAL) amounts by the yellow bars. The percentages shown are the total contribution rates calculated by Cheiron, which are equal to the sum of the bars. The graph shows that a larger percentage of the total contribution is being made toward the UAL payment later in the period. The blue line shows the projected contribution rates as percentages of payroll from the draft June 30, 2022 Actuarial Valuation. The difference between Cheiron's approximation and the System's projections is the difference between the top of the bars and the line. The contributions are being limited by the maximum contribution described in the General Obligation Bond Act prior to 2033, which is why the rate increases after 2033.



Source: Cheiron projection analysis.

Our conclusion is that **the projections performed by the System's actuary are reasonable.**

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SECTION V – ANALYSIS OF FUNDING ADEQUACY

In this section, we examine the adequacy of the funding for the System, including funded ratio, the sources of changes in the unfunded actuarial liability (UAL), and projections of the UAL and statutory funding requirements compared to contributions needed to pay down the UAL.

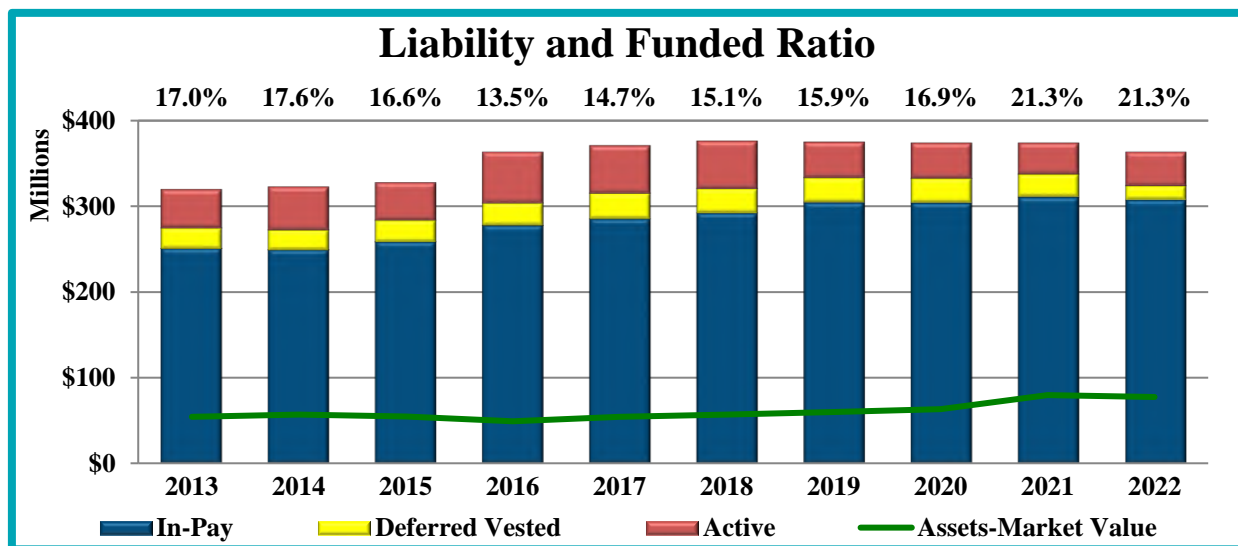
The actuarial valuation report prepared by GRS includes both traditional actuarial measurements, as well as additional risk measurements that are shown on pages 13 to 17 of the draft June 30, 2022 Actuarial Valuation report. Given the unique and substantial funding challenges faced by the Illinois pension systems, this additional information is quite important and supplements the information we present here on funding adequacy to better inform the legislature and other stakeholders about the adequacy of the System's funding.

System Funded Ratio

The first funding adequacy measure is the historical trend of the System's funded ratio for the past ten years. Funded ratio for this purpose is defined as the ratio of the Market Value of Assets to the Actuarial Liability. The chart below shows that GARS' funded ratio has improved from 17.0% in 2013 to 21.3% in 2022, an increase in funded ratio of 4.3%. In addition to showing the funded ratio, this chart also shows the breakdown of the plan's liabilities by membership status:

- Active liability – the liability (attributable to service already performed) for future payments to members who are currently working in the System,
- Deferred Vested liability – the liability for future payments to members who are no longer working in the System, and
- In-Pay liability – the liability for future payments to retirees and beneficiaries who are currently receiving benefits.

This breakdown shows that today plan assets only cover about 25% of the liabilities for just those members currently in pay status.



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Sources of Changes in the UAL

As shown in the chart below, GARS' unfunded actuarial liability (UAL) has grown from \$247.4 million in 2012 to \$283.4 million in 2022, an increase of \$36 million. In order to understand how to reverse this trend, it is important to understand the sources contributing to it.



Source: Cheiron analysis of funding adequacy.

The changes to the UAL from June 30, 2012 to June 30, 2022 can be separated into the following components:

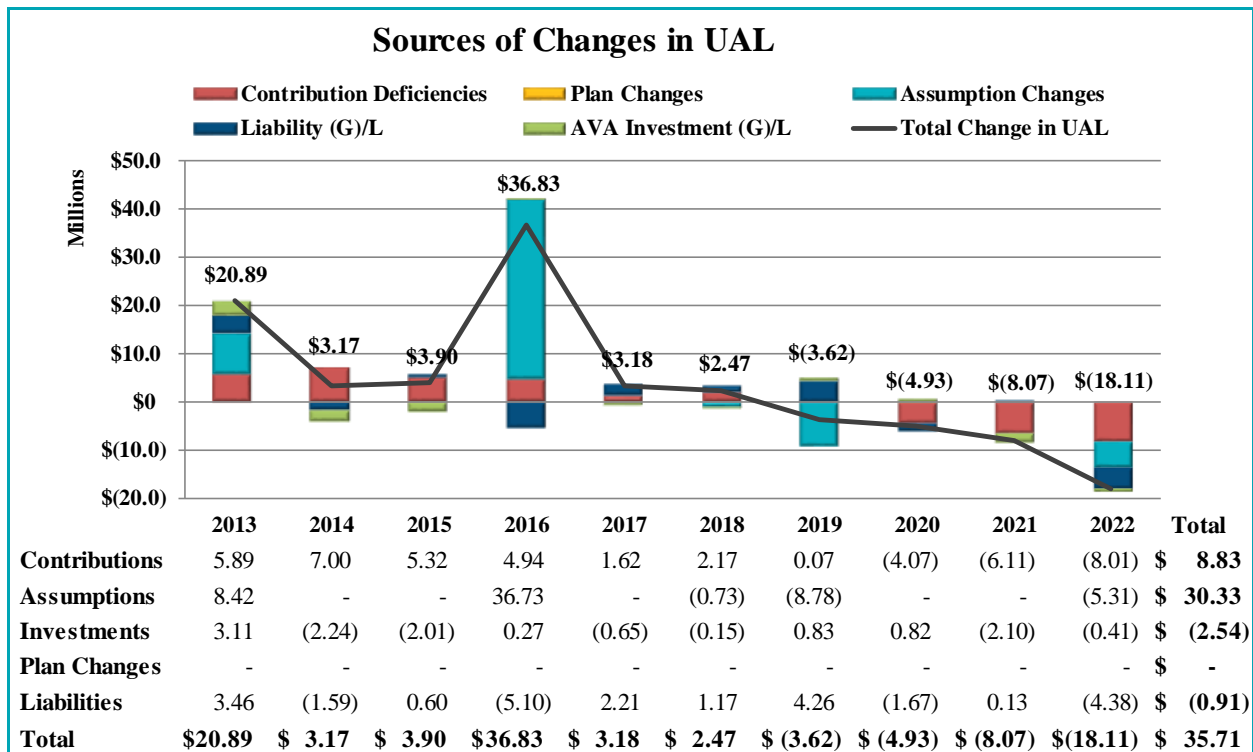
- **Contribution Deficiencies** – Contributions that are less than the tread water contribution causes the UAL to increase. The tread water contribution consists of two components: the normal cost, which is the cost of benefits earned in a given year, and the interest on the unfunded actuarial liability. This sum is referred to as the tread water contribution because it is the contribution necessary so that the UAL will remain constant, or “tread water” (absent experience gains or losses). For each year from 2013-2019, contributions were below tread water which increased the UAL by \$27 million. However, since 2020 contributions have been above tread water which decreased the UAL by \$18.2 million. The difference between actual contributions and the tread water contributions increased the UAL by \$8.8 million over this period.
- **Assumption Changes** – changes to actuarial assumptions over this period increased the UAL by \$30.3 million. A positive aspect of the UAL increases due to assumption changes is that they will result in liability measurements that more accurately reflect future expectations.

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- **Plan Changes** – modifications to the design of the plan had a negligible impact over this period as most of the changes only affected future benefits.
- **Liability (Gain) or Loss** – the changes in the UAL due to liability experience (i.e., mortality, terminations, salary increases, etc.) were generally small and only decreased the UAL by \$0.9 million over this period.
- **AVA (Actuarial Value of Assets) Investment (Gain) or Loss** – the net investment gain or loss due to assets earning more or less than assumed increased the UAL over this period decreased the UAL by \$2.5 million.

The chart below shows the changes in UAL each year broken into these five components. The sum of all the components (total change in UAL) is shown as the black line. Values of each component as well as total by year are shown in the chart along with the totals for the period.



Source: Cheiron analysis of funding adequacy.

We expect that this chart will help stakeholders understand the sources of growth in the UAL over recent years and inform discussions about the current funding requirements and adequacy.

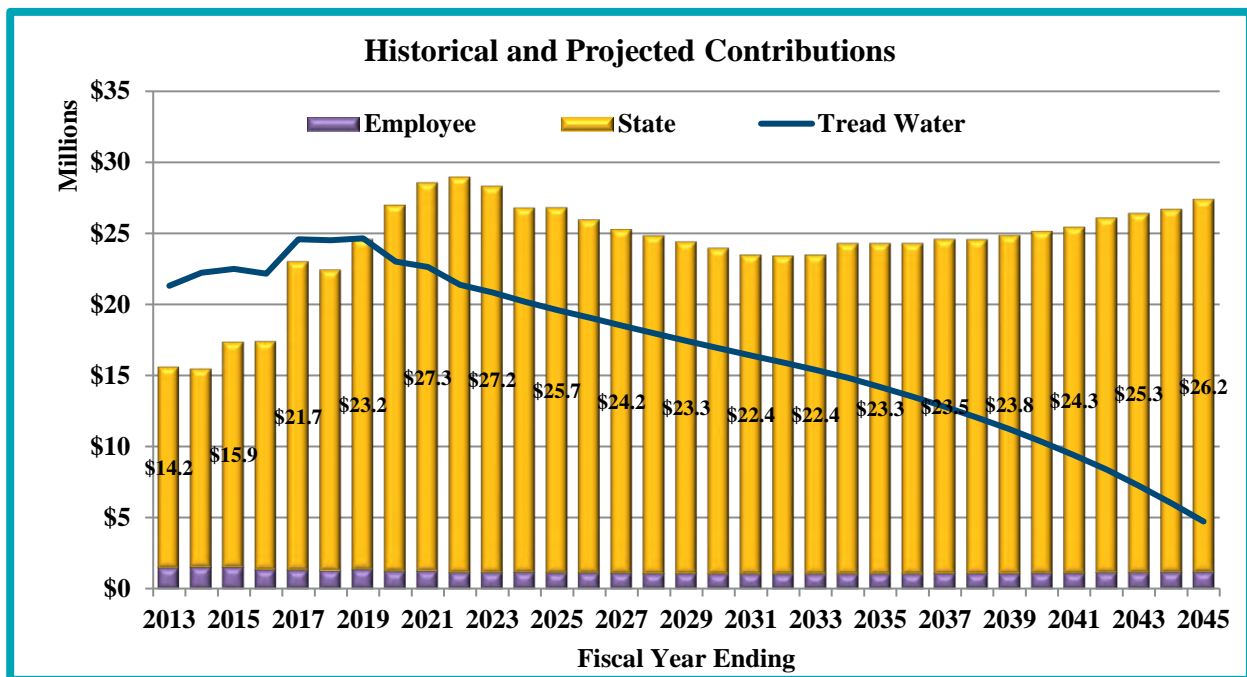
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Actual Contributions Compared to Tread Water Contribution

One of the historical sources of the increase in UAL is due to actual contributions to the System being less than the tread water contribution (the amount needed to prevent the UAL from increasing if all assumptions are met). These contribution deficiencies added between \$0.1 to \$7.0 million to the UAL each year from 2013 through 2019. Since 2020, the contributions have exceeded the tread water contribution which has resulted in decreases in the UAL.

As the chart below shows, actual contributions had been significantly less than the tread water cost through 2016 and were slightly less than the tread water contribution from 2017 through 2019. Starting in 2020, the contributions have exceeded tread water. Each year that total contributions remain above the tread water cost (blue line), the UAL is expected to decline.



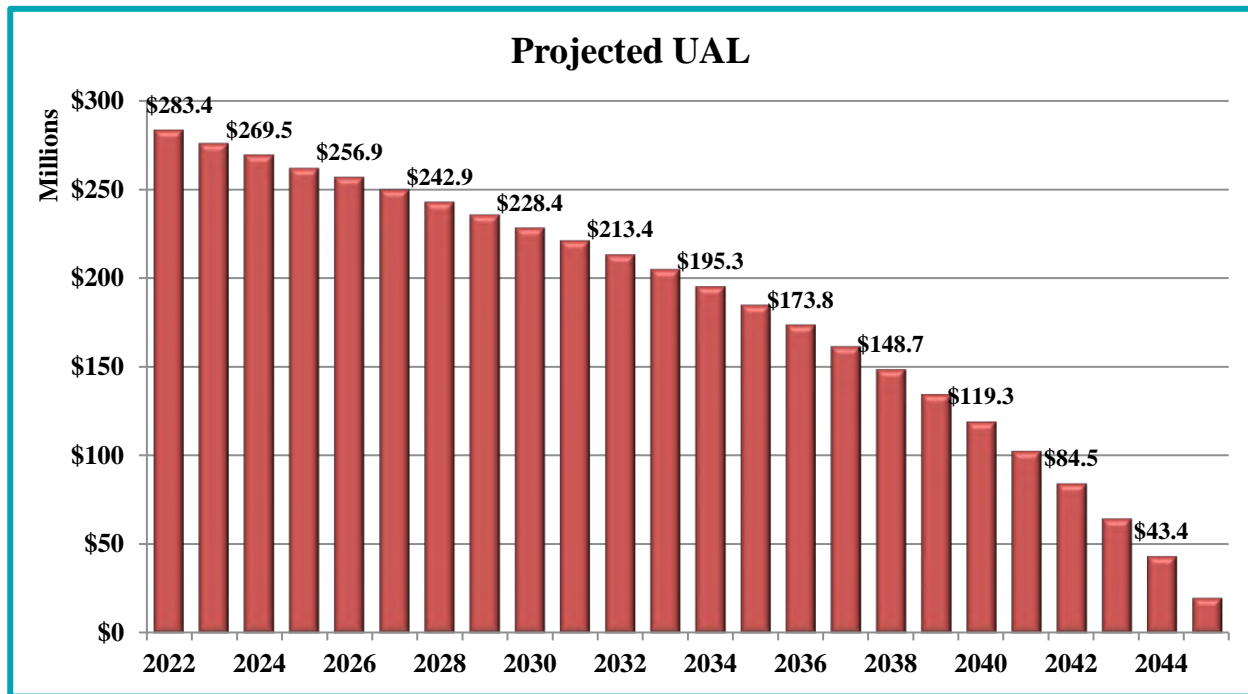
Source: Cheiron analysis of funding adequacy.

The System’s actuary commented that “the statutory funding method generates a contribution requirement that is less than a reasonable actuarially determined contribution”. Because a “reasonable actuarially determined contribution” has never been defined in actuarial standards, it isn’t clear what standard the System’s actuary is using to make this determination. However, a revision to ASOP 4 has defined a “Reasonable Actuarial Determination Contribution” and that definition will be first effective in next year’s valuation. The actuary will need to consider the ASOP 4 definition when evaluating this statement next year particularly since the current contribution amount is sufficient to reduce the UAL in FYE 2024 if all assumptions are met, as evidenced by the FYE 2024 contribution amount exceeding tread water in the graph above.

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SECTION V – ANALYSIS OF FUNDING ADEQUACY

The next chart shows that if the Statutory Contributions continue to be made each year and all other assumptions are met, the UAL is projected to decline each year.



Source: Cheiron analysis of funding adequacy.

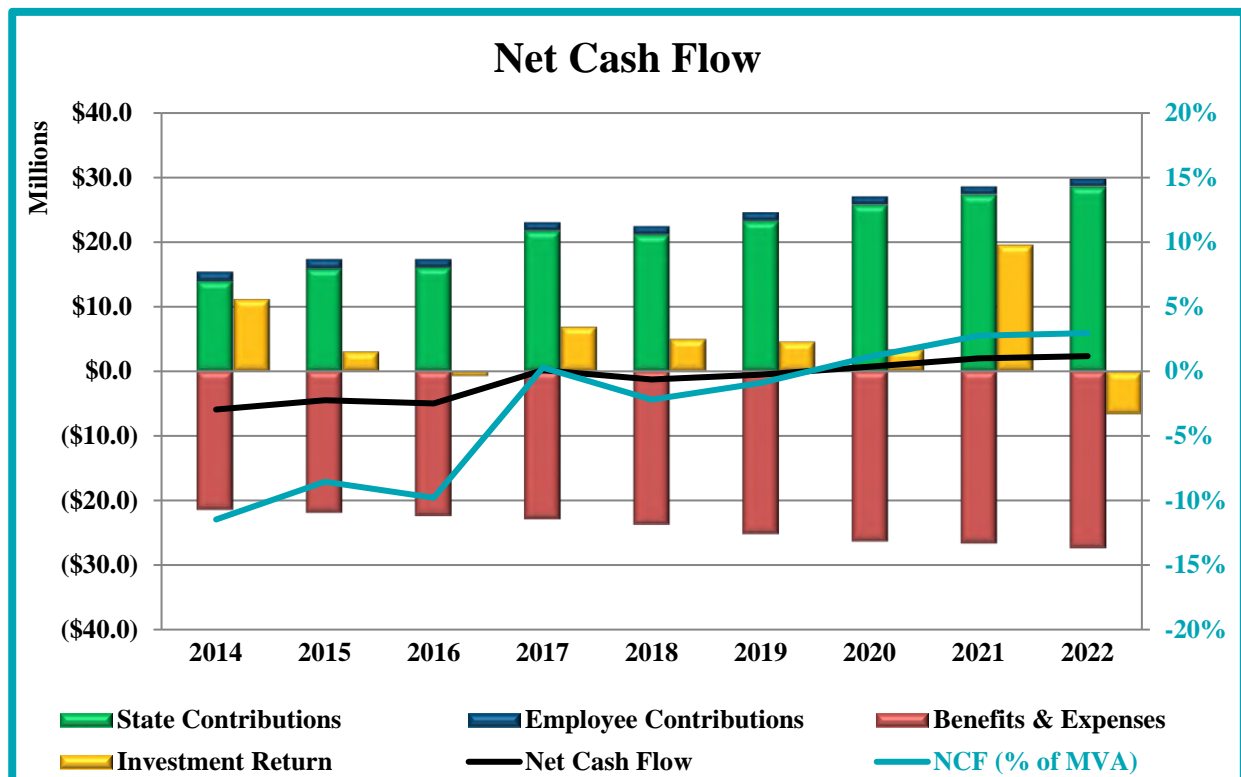
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SECTION V – ANALYSIS OF FUNDING ADEQUACY

Net Cash Flow Analysis

The Plan's net cash flow is defined as State and Member contributions less benefit payments and administrative expenses. The more negative net cash flow is as a percentage of the plan's assets, the more vulnerable the Plan is to market downturns. When a pension plan has more payouts than contributions and suffers an investment loss, it is left with fewer assets to invest and recapture during a recovery.

Looking at the following chart, the net cash flow has been close to zero relative to the size of the System's assets. This measure should continue to be monitored as negative cash flow increases the System's vulnerability to market downturns. The teal line shows net cash flow as a percent of Market Value of Assets on the right-side axis. The greater the negative cash flows are relative to plan assets the more vulnerable a plan is to market downturns. This is because once there is a market downturn, the plan assets lose both on the return and the negative cash flow, leaving it with a lower asset base from which to recover from the loss. The net cash flow has been slightly positive for the prior two years, which means that contributions into the plan has exceeded the benefits and expenses paid out.



Source: Cheiron analysis of funding adequacy.

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STATUS OF RECOMMENDATIONS FROM THE 2021 STATE ACTUARY REPORT

Response to Recommendations in 2021

In the State Actuary's Preliminary Report on the General Assembly Retirement System of Illinois presented December 15, 2021, Cheiron made several recommendations. Below we summarize how these recommendations were reflected in either the System's comments last year or in this year's draft June 30, 2022 Actuarial Valuation.

Recommendations to Retirement System from 2021 State Actuary Report	Status	Comments
1. We continue to recommend that the funding method be changed to fully fund plan benefits. Continuing the practice of inadequate contributions and targeting a funded percentage less than 100% increases the risk of the System becoming unsustainable. Consequently, we recommend that the funding method maintain contributions at a level that is expected to reduce the unfunded actuarial liability each year until the Plan is ultimately 100% funded. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.	Partially Implemented	<p>The System has adopted a funding policy that would provide for annual State contributions, the "Actuarially Determined Contribution", and is used for informational purposes only.</p> <p>GRS continues to include strong language throughout their report recommending the use of an actuarially sound method and stating clearly that the statutory method is not actuarially sound. We find these statements to be appropriate and support their continuation.</p> <p>Recommendation repeated.</p>
2. Because experience studies are performed every three years, we recommend that the phase-in period for the impact of assumption changes be reduced to three years. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.	Not Implemented	Recommendation repeated.
3. We continue to recommend that GRS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns	Implemented	GARS added stress testing in appendices to the final Actuarial Valuation Report in a letter dated December 17, 2021 which adequately assessed the impact of various risks. We anticipate that similar stress testing

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STATUS OF RECOMMENDATIONS FROM THE 2021 STATE ACTUARY REPORT

Recommendations to Retirement System from 2021 State Actuary Report	Status	Comments
and a variety of other stressors (e.g. membership declines, lower salary growth) can have on future State costs. In particular, the tests should illustrate the potential stresses on the System and its contributing sponsors so that an assessment of sustainability can be made. These stress tests should include the impact to the required State contribution of potential reductions in the discount rate. GRS did not include stress testing in this year's valuation report. In 2021, GRS also didn't include stress testing in their initial report which Cheiron reviewed, but they did include stress testing in a final report submitted on December 29, 2021. We recommend that the final 2022 report include the stress testing.		will be included in the final June 30, 2022 Actuarial Valuation. Recommendation removed.
4. Section 3.2 of ASOP 51 requires the actuary to identify risks that "may reasonably be anticipated to significantly affect the plan's future financial condition." [emphasis added]. The risks currently identified appear to largely duplicate the list of examples in ASOP 51 and could apply to almost any pension plan. In future valuations, we recommend that the actuary explain how each risk identified would reasonably be anticipated to significantly affect the specific plan's future financial condition.	Not Implemented	The risks currently identified appear to largely duplicate the list of examples in ASOP 51 and could apply to almost any pension plan. Recommendation repeated.
5. For each risk identified above, Section 3.3 of ASOP 51 requires the actuary to provide an assessment that takes into account	Not Implemented	While, the System noted in its December 9, 2021 response that the ASOP 51 disclosure may be expanded to address many of Cheiron's recommendations, the final 2021

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STATUS OF RECOMMENDATIONS FROM THE 2021 STATE ACTUARY REPORT

Recommendations to Retirement System from 2021 State Actuary Report	Status	Comments
“circumstances specific to the plan.” For some of the identified risks, the actuary has provided a quantitative assessment specific to the plan while for other identified risks, the actuary has only provided a generic statement that could apply to any plan. We recommend that for each identified risk the actuary provide an assessment, preferably quantitative, that considers the specific circumstances of this plan.		Actuarial Valuation Report did not provide the recommended assessments. Recommendation repeated.
6. We recommend the GARS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly.	Implemented	GRS has continued to do this, most recently providing a review in the <i>2021 Actuarial Experience Study</i> report dated April 14, 2022. We will continue to include this recommendation each year. Recommendation continued.

Chapter Six

Preliminary Report on the Chicago Teachers' Pension Fund

In accordance with 40 ILCS 5/17-127(e), Cheiron, the State Actuary, submitted a preliminary report to the Board of Trustees of the Chicago Teachers' Pension

Fund (CTPF) concerning proposed certifications of required State contributions submitted to Cheiron by the Board. The preliminary report was submitted to CTPF on December 1, 2022. The preliminary report was based on Cheiron's review of actuarial assumptions included in CTPF's 2022 Actuarial Valuation Report.

Following is Cheiron's final preliminary report on the Chicago Teachers' Pension Fund. CTPF's written response, provided on December 7, 2022, can be found in Appendix C.

OVERVIEW**CHICAGO TEACHERS' PENSION FUND**

as of June 30, 2022

Actuarial accrued liability	\$25,955,065,711
Actuarial value of assets	\$12,142,214,578
Unfunded liability	\$13,812,851,133
Funded ratio	46.8%

State contribution (FY24)	\$308,147,000
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Active members	31,261
Inactive members	6,861
Current benefit recipients	27,638
Non-vested eligible for refunds	<u>26,630</u>
Total membership	92,390

Interest rate assumption	6.50%
Inflation assumption	2.25%
Actuarial cost method	Projected Unit Credit
Asset valuation method	4-year Smoothing

Executive Director	Carlton Lenoir
Actuarial Firm	Gabriel, Roeder, Smith & Company

Source: June 30, 2022 CTPF actuarial valuation report.

December 15, 2022

Mr. Frank Mautino
Auditor General
740 East Ash Street
Springfield, Illinois 62703

Board of Trustees
Public School Teachers' Pension and Retirement Fund of Chicago
425 S. Financial Place
Suite 1400
Chicago, Illinois 60605-1000

Dear Trustees and Auditor General:

In accordance with Illinois Public Act 100-0465, Cheiron is submitting this preliminary report concerning the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contribution to the Public School Teachers' Pension and Retirement Fund of Chicago (CTPF or System) for Fiscal Year 2024.

In summary, we believe that the assumptions and methods used in the draft June 30, 2022 Actuarial Valuation, which are used to determine the required Fiscal Year 2024 State contribution, are reasonable. We also find that the certified portion of the contribution which the State is responsible for was properly calculated.

We have reviewed the experience analysis covering the 2022 Actuarial Assumption Study performed in recognition of both GRS's and Cheiron's recommendation for additional monitoring and agree with the recommendation of GRS to make no changes to the assumptions.

Section I of this report describes the review process undertaken by Cheiron. Section II summarizes our findings and recommendations. Section III provides the supporting analysis for those findings and presents more details on our assessment of the actuarial assumptions and methods employed in GRS's Actuarial Certification, as well as our assessment of GRS's determination of the required State contribution for Fiscal Year 2024. Section III also includes additional comments relating to our findings and recommendations. Section IV provides some analysis of the projected contributions from the State. Finally, Section V provides an analysis of historical trends.

In preparing this report, we relied on information (some oral and some written) supplied by CTPF and GRS. This information includes actuarial assumptions and methods adopted by the CTPF Board, the results of the 2012 through 2017 experience analysis, the 2022 Actuarial Assumptions Study, plan provisions, the draft June 30, 2022 Actuarial Valuation, and minutes of the 2022 CTPF Board of Trustee meetings during the results presentation. A detailed description of all information provided for this review is contained in Appendix B.

This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys, and our firm does not provide any legal services or advice.

This report was prepared exclusively for the Office of the Auditor General and the Public School Teachers' Pension and Retirement Fund of Chicago for the purpose described herein. Other users of this report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to any other user.

Sincerely,
Cheiron

SIGNED ORIGINAL ON FILE

William R. Hallmark, ASA, EA, MAAA, FCA
Consulting Actuary

SIGNED ORIGINAL ON FILE

Gene Kalwarski, FSA, EA, MAAA, FCA
Principal Consulting Actuary

**THE STATE ACTUARY'S PRELIMINARY REPORT ON THE
PUBLIC SCHOOL TEACHERS' PENSION AND RETIREMENT FUND OF CHICAGO
PURSUANT TO 40 ILCS 5/17-127(e)**

SECTION I – REPORT SCOPE

Illinois Public Act 100-0465 (the Act) amended the Illinois Pension Code (40 ILCS 5/17-127) and requires Cheiron, as the State Actuary, to review the actuarial assumptions and valuation of the Public School Teachers' Pension and Retirement Fund of Chicago (CTPF or System) and to issue to the CTPF Board this preliminary report on the proposed certification prepared by Gabriel, Roeder, Smith & Company (GRS) of the required State contribution for Fiscal Year (FY) 2024. Under the Act, the required State contribution consists of 0.544% of Teacher total capped payroll, plus the employer normal cost, plus an amount pursuant to paragraph (3) of Section 17-142.1 to defray health insurance costs. The purpose of this review is to identify any recommended changes to the actuarial assumptions and methods for the CTPF Board to consider before finalizing its certification of the required State contribution for FY 2024.

In addition to reviewing the Actuarial Certification of the required State contribution to CTPF, we have reviewed the “actuarial practices” of the Board. We have reviewed: (1) the use of a qualified actuary (as defined in the Qualification Standards of the American Academy of Actuaries) to prepare the annual actuarial valuation for determining the required State contribution; and (2) the conduct of periodic formal experience studies to justify the assumptions used in the actuarial valuation. In addition, we have included comments on actuarial communication and compliance with Actuarial Standards of Practice (ASOP) reflected in the June 30, 2022 Actuarial Valuation.

Finally, this report is more limited in scope than the State Actuary reviews for the other Illinois Retirement Systems because the State’s responsibility is limited to the 0.544% of Teacher total capped payroll, the employer Normal Cost, and a subsidy to defray health insurance costs. The State is not responsible for the funding of the unfunded actuarial liability of CTPF or the current and future contributions that may be necessary to achieve the legislative requirement that the City fund the Plan to 90% by 2059. The State is responsible for the funding of the other Illinois Systems, which requires the State Actuary to review and analyze the long-term projections and the State mandated funding method.

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SECTION II – SUMMARY OF RECOMMENDATIONS

This section summarizes recommendations from our review of the actuarial assumptions and methods employed in the draft June 30, 2022 Actuarial Valuation of CTPF as well as the “actuarial practices” of the CTPF Board. Section III of this report provides detailed analysis and rationale for these recommendations.

Proposed Certification of the Required State Contribution

GRS has determined that the FY 2024 required State contribution calculated under the current statutory funding plan is \$308,147,000 pursuant to P.A. 100-0465. This amount represents the two cost components of the States funding obligation which includes the net employer normal cost amount including administrative expenses of \$243,147,000 plus the \$65,000,000 health insurance subsidy. In addition, the State contributes an amount equal to 0.544 percent of pay which is equal to \$14,564,000

We have verified the arithmetic calculations made by GRS to develop this required State contribution except with regard to the adjustment of the total normal cost before expenses from the valuation date to fiscal year 2024 and have reviewed the assumptions on which it was based.

Assessment of Actuarial Assumptions Used in the 2022 Valuation

40 ILCS 5/17-127(e) requires the State Actuary to identify recommended changes in actuarial assumptions that the CTPF Board must consider before finalizing its certification of the required State contribution. In response to the experience study performed by GRS in 2018 the Chicago Public Schools (CPS) took exception to two of the changes involving an expectation of continued decline in the number of active participants and the trend toward retiring early. CPS’s argument is that the experience during this period was in part due to the financial crisis and that the membership behavior was in response to that crisis. They identified that the crisis has passed and that the number of actives and retirement behavior should revert back to what has been the trend. The Board accepted GRS’s assumptions with the CPS’s requested modification.

As recommended, GRS performed additional analysis of the two assumption changes which were deferred to determine if the CPS’s objective were supported by additional experience analysis. In GRS’s 2022 Actuarial Assumptions Study they presented additional experience that supported CPS’s recommendation to not make the assumption changes identified in the 2018 experience study and we agree with their rationale.

Recommended Changes for Future Valuations

1. We recommend that GRS continue to include stress testing of the System within the valuation report, including the impact to the required State contribution of potential reductions in the discount rate.
2. We recommend the CTPF Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly, as they did for this valuation.

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SECTION III – SUPPORTING ANALYSIS

In this section, we provide detailed analysis and supporting rationale for the recommendations that were presented in Section II of this report.

Proposed Certification of the Required State Contribution

As stated in our summary of recommendations in Section II, we have verified the arithmetic calculations made by GRS to develop this State required contribution except with regard to the adjustment of the total normal cost before expenses from the valuation date to fiscal year 2024. The State required contribution is clearly identified in the Executive Summary.

Assessment of Actuarial Assumptions Used in the 2022 Valuation

A. Economic Assumptions

1. The Interest Rate

The interest rate assumption (also called the investment return or discount rate) is the most impactful assumption affecting the contribution requirement of the system. The assumption, which is used to value liabilities for funding purposes, was reduced from 6.75% to 6.50% for the June 30, 2021 Actuarial Valuation and remains at 6.50% for the June 30, 2022 Actuarial Valuation.

After reviewing all the materials (see Appendix B of the report) that were made available, Cheiron concludes that 6.50% for this valuation is reasonable.

We recommend that the CTPF Board continue to annually review the economic assumptions (interest rate and inflation), as was done for this valuation, prior to commencing the valuation work and adjust assumptions accordingly (Recommendation #2).

Our rationale for this recommendation:

- In their September 8, 2022 Actuarial Assumptions Study, GRS presented short-term return expectations of 12 selected investment consultants using a 10-year time horizon adjusted for the CTPF inflation assumption. This produced an arithmetic average one-year nominal return of 6.40%. Using the average standard deviation and return expectation GRS concluded that the median 10-year expected geometric return was 5.32% and there is approximately a 39% probability of exceeding 6.50%. This is based on a CTPF assumption of 2.25% as the long-term inflation assumption. GRS notes that because 50% of the actuarial accrued liability as of June 30, 2021, is attributable to benefits that are projected to be paid in the next 10 years it is appropriate to consider a 10-year time horizon when setting the economic assumptions.

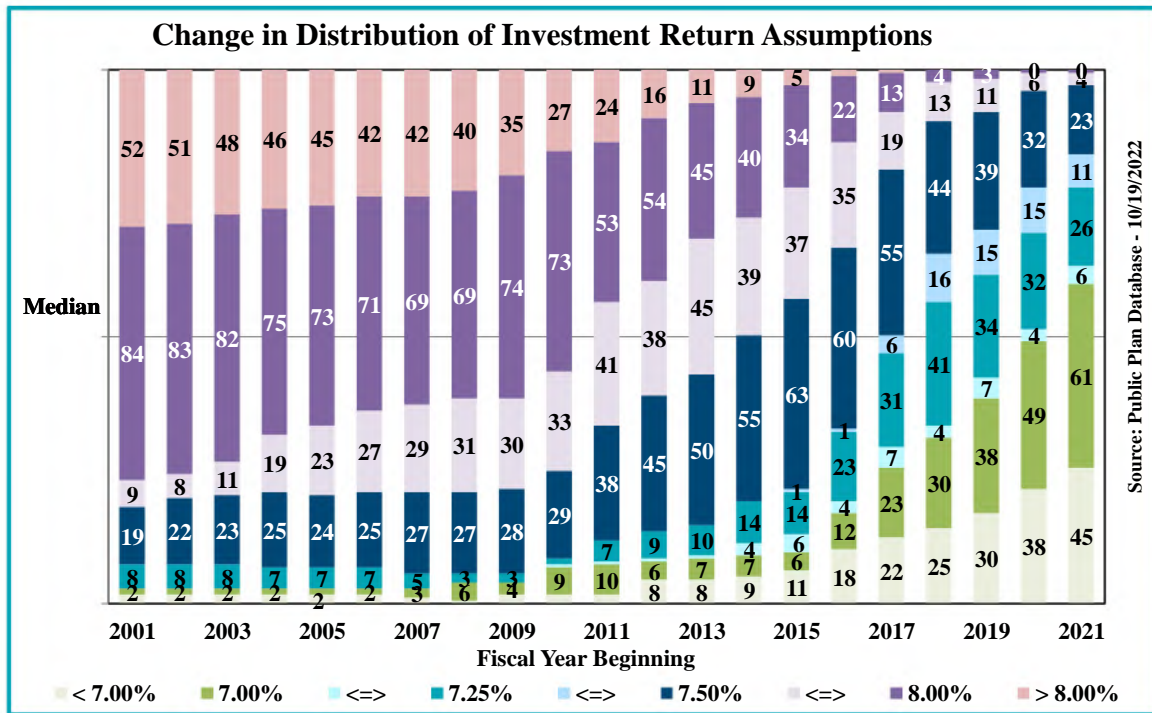
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SECTION III – SUPPORTING ANALYSIS

- Using the average 10-year capital market assumptions in the 2022 Horizon survey, we calculated an expected 10-year geometric return of 6.00% for the CTPF asset allocation and approximately a 45% probability of exceeding 6.50%. While we would prefer an assumption with a greater than 50% probability of being met, a 40% probability is at the high end of a reasonable range.
- While both the GRS analysis and the analysis using capital market assumptions from the Horizon survey indicate that there should be consideration to reduce the discount rate, the economic environment has changed considerably since the beginning of the year when we understand these capital market assumptions were set. Using more recent capital market assumptions from Callan, the system's investment consultant, we understand the 10-year expected geometric return is 6.98%. Consequently, maintaining the current assumption of 6.50% is reasonable.
- While the discount rate assumption should be based on the future expected investment returns for the System's investment portfolio, survey information can provide an important context for evaluating the assumption. The Public Plans Database is maintained by a partnership between the Center for State and Local Government Excellence (SLGE) and the Center for Retirement Research at Boston College with support from the National Association of State Retirement Administrators (NASRA). This database contains historical information on large public pension plans, including key assumptions used in their actuarial valuations. The following chart shows the distribution of investment return assumptions for the 177 plans in the Public Plans Database with consistent information from 2001 through 2021 as of October 19, 2022.

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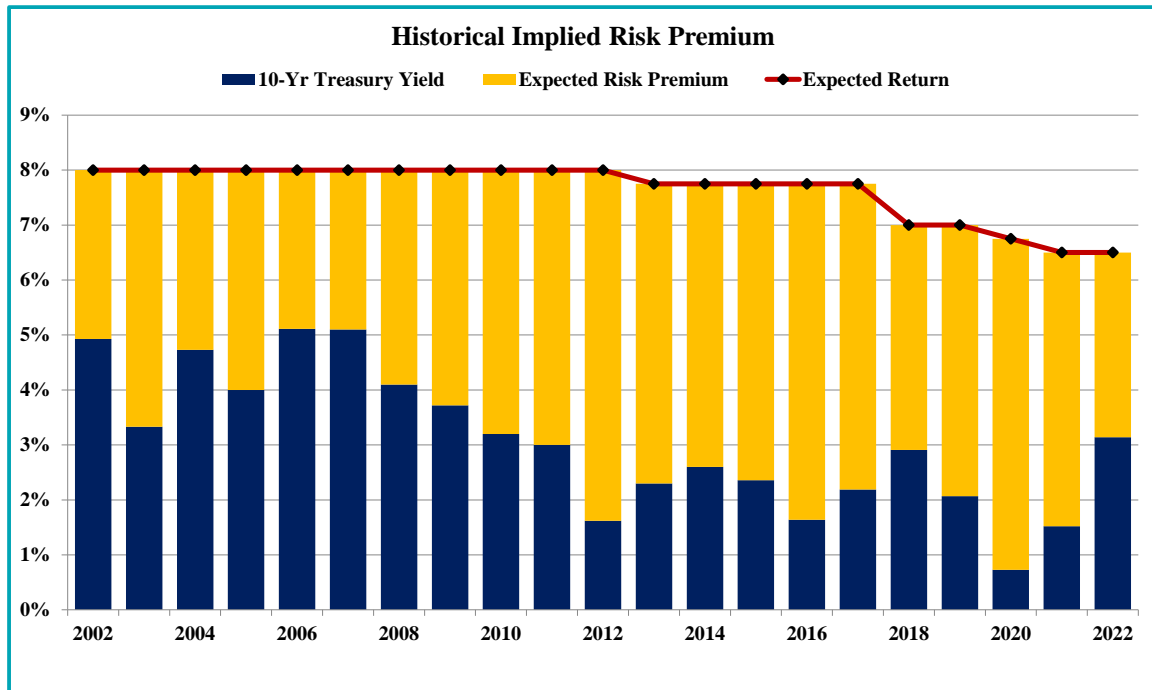


Over the period shown, there continues to be a pattern of reducing discount rates partially reflecting long-term changes in capital markets, interest rates and underlying inflation. Of the 177 plans shown, 113 have reduced their discount rate assumption since 2017. For these 113 plans, the average reduction is 0.44%.

- Over the last two decades, declining interest rates have forced pension plans to either reduce their discount rates, increase their exposure to investment risk, or some combination of the two. For example, as shown in the following chart, in June 2002, the yield on 10-year Treasury bonds (a proxy for a risk-free investments) was 4.9%. To achieve CTPF's then assumed return of 8.00%, the System's investments had to outperform the yield on the 10-year Treasury by 3.1%. In June 2020, the yield on the 10-year Treasury had dropped to 0.7%, and to achieve CTPF's assumed return of 6.75%, the System's investments need to exceed the 10-year Treasury yield by 6.05%. Even though CTPF had reduced its return assumption by 125 basis points over the period, it still had to take more investment risk in 2020 to meet its assumption than it did in 2002. Since 2020, yields on 10-year Treasury bonds have increased, reducing the expected risk premium needed to achieve the System's assumed return. With recent action by the Federal Reserve, 10-year Treasury bond yields have increased rapidly from 1.5% in December 2021 to 3.1% in June 2022 and 4.0% in October 2022. If these higher Treasury bond yields persist, plans may be able to achieve the expected return with less exposure to investment risk. However, if these higher Treasury bond yields prove temporary, plans could quickly find the pressure returning to further reduce discount rates or increase their exposure to investment risk.

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- As is the case with most maturing pension plans, CTPF is experiencing negative cash flows measured as contributions less benefits and expenses. CTPF's negative cash flow is 4.10% of assets. When short-term returns are expected to be lower than the long-term expectations, which is the case with CTPF, a plan with negative cash flows will have actuarial returns (i.e., dollar weighted returns) that are less than "time weighted" returns.

2. Inflation Assumption

As recommended in the GRS September 8, 2022 report on the 2022 Actuarial Assumptions Study, the inflation assumption was maintained at 2.25% in the June 30, 2022 Actuarial Valuation.

We find the 2.25% inflation assumption to be reasonable.

The items we considered and our rationale for concurring with the 2.25% assumption are as follows:

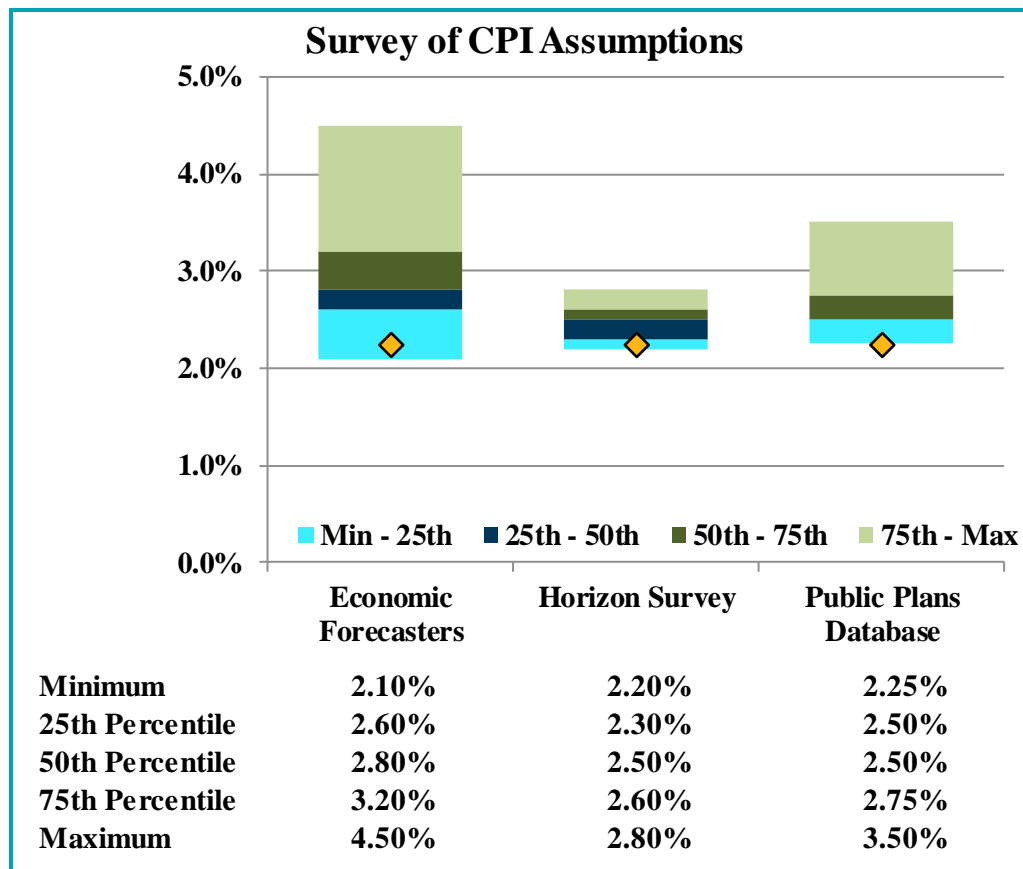
- On Pages B-2 to B-6 of the 2022 Actuarial Assumptions Study, GRS provides significant data on inflation forecasts that all indicate expectations for the current high levels of inflation to decline over the next couple years. While all of the data presented point to slightly higher inflation than the current assumption, the current assumption remains within the reasonable range. However, going forward, should the current levels

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of inflation not decline significantly, strong consideration should be given to increase the current 2.25% assumption.

- The June 2022 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (next 75 years), inflation will average between 1.8% and 3.0% (<http://www.ssa.gov/oact/tr/2022/tr2022.pdf>). Under the intermediate cost projection, the Social Security Administration uses an assumption of 2.4%.
- The following chart shows the distribution of inflation expectations for the Third Quarter 2022 survey of professional economic forecasters published by the Philadelphia Federal Reserve, the 2022 Horizon survey of investment consultant capital market assumptions (20-year), and the 2021 inflation assumptions used by plans in the Public Plans Database compared to the CTPF assumption (indicated by the gold diamonds). The assumption of 2.25% is in the lower quartile of the range projected by professional economic forecasters and investment consultants, and is on the low end of the range used by other public plans.



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SECTION III – SUPPORTING ANALYSIS

3. Salary (Annual Compensation) Increase Assumption

The salary increase assumption is shown in the table below.

Illustrative rates of increase per individual employee per annum, compounded annually:

Age	Annual Increase
20	12.60%
25	7.50%
30	6.00%
35	5.25%
40	4.25%
45	3.50%
50	3.00%
55	2.75%
60	2.75%
65	2.75%
70	2.75%

These increases include the wage inflation assumption of 2.75% comprised of an inflation assumption of 2.25% per annum and 0.50% per annum productivity or real wage growth assumption.

We find the salary increase assumption consistent with information presented in the 2018 Actuarial Experience Study. We reference Section E of that report with the supporting historic trends.

4. Cost of Living for Tier 2 Assumption

For Tier 2 participants, benefits are increased annually equal to 50% of the consumer price index urban rates with a maximum of 3.0%. Therefore, the COLA assumption is 50% of assumed inflation, or 1.125%.

We find the assumption and the basis for setting it reasonable.

5. Tier 2 Capped Pay Assumption

Benefits for members hired after January 1, 2011, are calculated using pay that is capped under 40 ILCS 5/1-160. The pay cap increase assumption is 1.125%.

We find the assumption and the basis for setting it reasonable.

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SECTION III – SUPPORTING ANALYSIS

Demographic Assumptions

Based on the 2018 Actuarial Experience Study, GRS made recommendations to the Board on September 20, 2018 for a number of assumption changes covering mortality rates, retirement, turnover, and disability rates. They also made recommendations to reflect the decline in active membership going forward in response to the trends demonstrated during the study period of 2012 through 2017.

The Chicago Public Schools (CPS) also made a presentation with respect to the recommendations putting forth a position that the active population trends and early retirement trends were a direct reflection during this period of study of the financial crisis and suggested that both these trends will revert back to past trends.

The Board adopted GRS's assumption change recommendations except for the active member reduction assumption and changes to the retirement trends to see if the position of the CPS holds up going forward. GRS committed to monitor these two assumptions and provide information to the Board on experience going forward.

GRS in their 2022 Actuarial Assumption Study provided additional evidence which supported CPS's concerns regarding these two assumptions resulting in GRS making no change to the assumptions

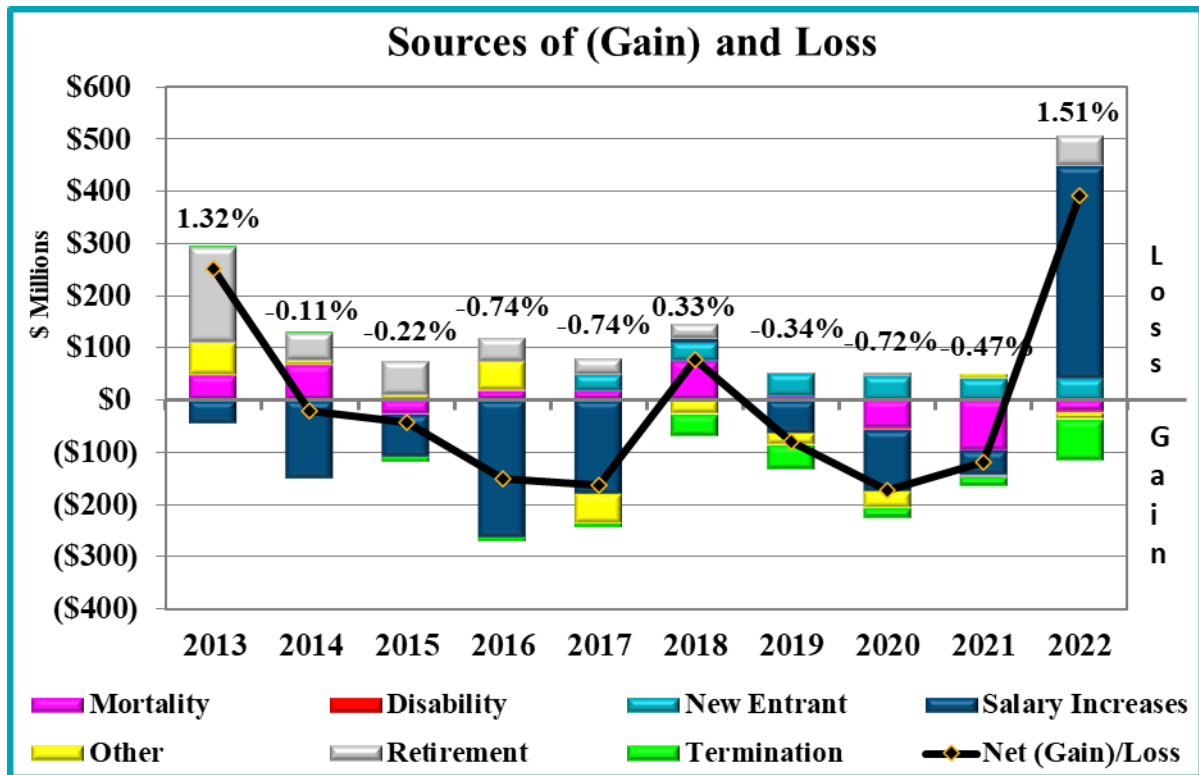
We agree with CTPF's actuary, GRS, that not changing the two assumptions is supported by the 2022 Actuarial Assumption Study and to maintain the assumptions in place prior to the study as suggested by the Chicago Public Schools.

In its annual actuarial valuation reports, CTPF regularly reports sources of liability gains and losses. In the 2022 report, these are shown on pages 26 and 27. In the chart on the following page, we have collected similar data from CTPF's past valuation reports dating back to 2013 and presented a historical review of past demographic and salary increase experience gains and losses.

The following chart on the next page shows the pattern of annual gains and losses attributable to seven different sources as shown in the legend. When the colored bar slices appear above zero on the Y-axis, it represents an experience loss with the value representing the increase in liabilities over what was expected. When the bar is below zero, it represents an experience gain for that year with liabilities less than expected. This net liability (gain)/loss is shown by the black line. This net (gain)/loss as a percent of liability is shown above the bars.

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The percentages shown above the bars refer to net (gain)/loss as a percentage of liability.

Key observations from this chart are as follows:

1. A trend of salary gains appeared in all years except for a minor loss in 2018 and a more significant loss in 2022. The 2022 loss likely reflects the impact of current levels of inflation and may not persist over the long term.
2. Prior to 2019, there were experience losses attributable to retirement. As anticipated by CPS's expectations, the trend appeared to have changed in the last few years but returned in 2022. This assumption should continue to be monitored.
3. Note that prior to 2017, New Entrant liability was not separately reported and is included in the 'Other' category

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Below, we summarize all the demographic assumptions that we reviewed and we have concluded all are reasonable and meet the requirements of ASOP No. 35, Section 3.3.4.

1. Mortality

Pre-Retirement Mortality

The RP-2014 White Collar Employee, sex distinct tables with 98% male adjustment and 113% female adjustment is used.

Post-Retirement Disability Mortality

The RP-2014 Disabled Annuitant, sex distinct tables with 103% male adjustment and 106% female adjustment is used.

Post-Retirement Healthy Mortality

The RP-2014 White Collar Healthy Annuitant, sex distinct tables with 108% male adjustment and 94% female adjustment is used.

Future mortality improvements are reflected by projecting the base mortality tables back from 2014 to 2006 using the Society of Actuaries MP-2014 tables and projecting from 2006 using the MP-2017 projection scale. This assumption provides generational mortality tables and includes a margin for future mortality improvements.

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2. Termination

Service-based termination rates were used. Select rates are as follows:

Termination			
Service (Beginning of Year)	Rate (%)	Service (Beginning of Year)	Rate (%)
0	30.00%	16	2.25%
1	16.00%	17	2.25%
2	13.00%	18	2.25%
3	12.00%	19	2.25%
4	9.00%	20	2.25%
5	9.00%	21	2.25%
6	8.00%	22	2.25%
7	6.00%	23	2.25%
8	5.00%	24	2.25%
9	5.00%	25	2.25%
10	4.00%	26	2.25%
11	3.00%	27	2.25%
12	3.00%	28	2.25%
13	3.00%	29	2.25%
14	3.00%	30	1.75%
15	3.00%	31 +	1.75%

It is assumed that terminated employees will not be rehired. The rates apply only to employees who have not fulfilled the service requirement necessary for retirement at any given age.

3. Disability

Disability rates, based on recent experience of the Fund, were applied to members with at least 10 years of service. All disabilities are assumed to be non-duty disabilities. Sample rates are as follows:

Age	Rate (%)
20	0.04%
25	0.04%
30	0.04%
35	0.05%
40	0.06%
45	0.08%
50	0.19%
55	0.24%
60	0.29%

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4. Retirement

Employees are assumed to retire in accordance with the rates shown below. The rates apply only to employees who have fulfilled the service requirement necessary for retirement at any given age.

Retirement Rates for Tier 1 Employees		
Age	<34 Years of Service Rate (%)	34+ Years of Service Rate (%)
55	5.00%	20.00%
56	5.00%	20.00%
57	5.00%	20.00%
58	5.00%	20.00%
59	7.00%	20.00%
60	9.00%	22.50%
61	11.00%	22.50%
62	12.00%	22.50%
63	13.00%	22.50%
64	14.00%	22.50%
65	15.00%	25.00%
66	16.00%	25.00%
67	17.00%	25.00%
68	18.00%	27.50%
69	19.00%	27.50%
70	20.00%	30.00%
71	20.00%	30.00%
72	20.00%	30.00%
73	20.00%	30.00%
74	20.00%	30.00%
75	100.00%	100.00%

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Retirement Rates for Tier 2 Employees	
Age	Rate (%)
62	40.00%
63	25.00%
64	25.00%
65	30.00%
66	25.00%
67	30.00%
68	20.00%
69	20.00%
70	20.00%
71	20.00%
72	20.00%
73	20.00%
74	20.00%
75	100.00%

5. Active Member Population as of the Valuation Date

The Tier 2 active population as of the actuarial valuation date of June 30, 2022, was increased by 340 members in order to estimate the total expected number of active members that will be working and making contributions in the upcoming fiscal year. Members who retire at the end of the school year have June retirement dates and are already reflected as retirees in the data received as of June 30, but new active members to replace these members are not hired until August or September and are not included in the census data until the following fiscal year. These members are assumed to have a similar demographic profile as new entrants who have been hired in the last three years.

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6. Population Projection

For purposes of determining annual appropriation as a percent of total covered payroll, the size of the active group is assumed to remain level at the number of actives as of the actuarial valuation date including new hires, or 31,601. New entrants are assumed to enter with an average age and an average pay as disclosed below. New entrants are assumed to have a similar demographic profile of recent new entrants to the Fund. The average increase in uncapped payroll for the projection period is 2.75 percent per year.

New Entrant Profile		
Age Group	No.	Salary
Under 20		
20-24	986	\$51,792,162
25-29	1,907	106,715,478
30-34	1,062	62,499,926
35-39	596	36,342,724
40-44	388	23,033,209
45-49	253	14,269,864
50-54	214	12,341,133
55-59	164	8,783,104
60-64	71	3,023,087
65-69	11	462,382
70 & Over		
Total	5,652	\$ 319,263,069
Avg. Salary		\$ 56,487
Avg. Age		32.44
Percent Female		76%

7. Expenses

Administrative expenses included in the normal cost for fiscal year 2022 are based on the budgeted administrative expense of \$24,870,160, as provided by Staff. Future administrative expenses are assumed to increase by 5.75 percent per year for 14 years and then increase at a rate consistent with the increase in projected capped payroll thereafter.

8. Marriage Assumption

75.0 percent of active male participants and 65.0 percent of active female participants are assumed to be married. Actual marital status at benefit commencement is used for retirees.

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9. Spouse's Age

The female spouse is assumed to be two years younger than the male spouse.

10. Total Service at Retirement

A teacher's total service credit at retirement is assumed to be 103.3 percent of the teacher's regular period of service at retirement.

11. Valuation of Inactive Members Eligible for Deferred Vested Pension Benefits

Benefits for inactive deferred vested members were determined by projecting the accumulated contribution balance to retirement (age 62 for members hired before January 1, 2011 and age 67 for members hired on or after January 1, 2011) with interest at the assumed investment rate of return, converted to an annuity, and then loaded by 35 percent.

12. Assumption for Missing Data

Members whose gender was not provided are assumed to be female.

13. Benefit Option

Retirees whose record includes a spouse date of birth are assumed to have the automatic 50% Joint and Survivor benefit. All other retirees are assumed to have a straight life benefit.

14. Contribution Timing

Projected employer contributions are assumed to occur based on the following timing:

1. Additional Board of Education Contribution (0.58 percent of pay) - June 30th (End of Year)
2. Additional State Contribution (0.544 percent of pay) - Monthly (Middle of Year)
3. State Normal Cost Contribution - Monthly (Middle of Year)
4. Board of Education Early Payment of Special Tax Levy - March 1st, annually
 - a. A portion of the prior year's tax levy is assumed to occur each March 1st
 - i. The payments made through March 31 (which are assumed to be paid on March 1 on average) as provided by CTPF is equal to \$279,728,627 for Fiscal Year 2022 and is assumed to increase three percent per year.
5. Remaining Board of Education Contribution - June 30th (End of Year)

15. Decrement Timing

All decrements are assumed to occur during the middle of the year.

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16. Decrement Relativity

Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.

17. Decrement Operation

Turnover decrements do not operate after a member reaches retirement eligibility. Disability decrements do not operate after a member reaches normal retirement eligibility.

18. Eligibility Testing

Eligibility for benefits is determined based upon the age nearest birthday and service on the date the decrement is assumed to occur.

19. Assumptions as a result of Public Act 96-0889

Members hired on or after January 1, 2011, are assumed to make contributions on salary up to the final average compensation cap in a given year.

State contributions, expressed as a percentage of pay, are calculated based upon capped pay.

Capped (pensionable) pay was \$119,892 for fiscal year 2022 and increases at $\frac{1}{2}$ the annual increase in the Consumer Price Index-U thereafter.

The annual increase in the Consumer Price Index-U is assumed to be 2.25 percent for all years.

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C. Funding Methods

Actuarial funding methods consist of three components: (1) the actuarial cost method, which is the attribution of total costs to past, current, and future years; (2) the asset valuation method (i.e., asset smoothing); and (3) the amortization method.

1. Actuarial Cost Method

The System uses the projected unit credit cost method (PUC) to assign costs to years of service, as required under the Pension Code (40 ILCS 5/17). **We have no objections with respect to using the PUC method, although we, as GRS does, would prefer the Entry Age Normal (EAN) cost method as it is more consistent with the requirement in 40 ILCS 5/17-129 for level percent of pay funding.**

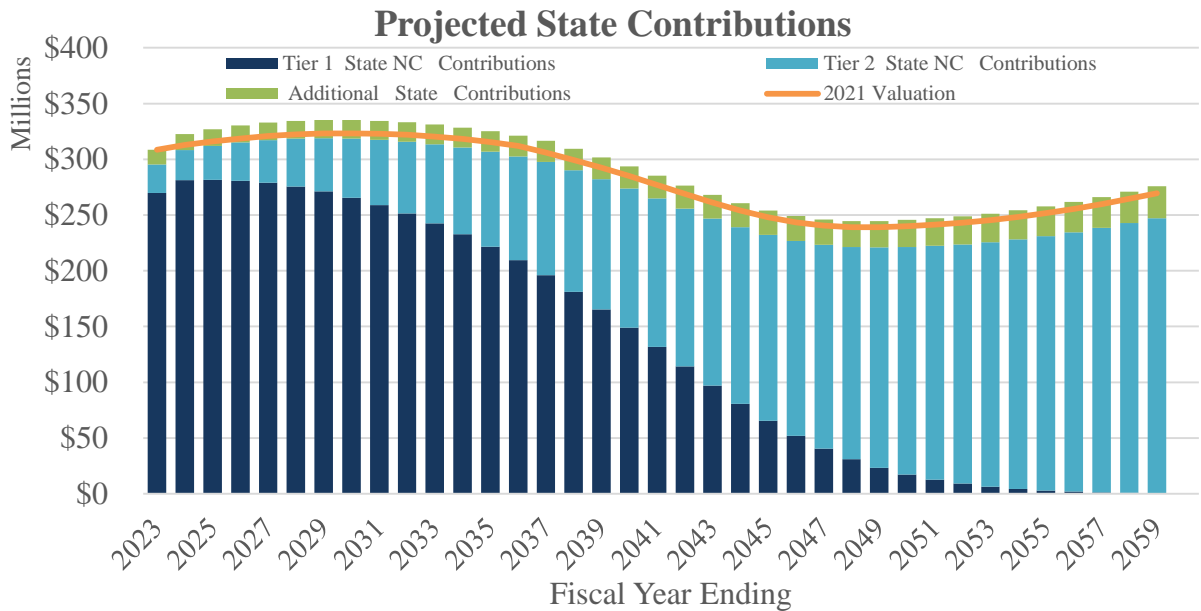
Under the PUC method, which is used by some public sector pension funds, the benefits of active participants are calculated based on their compensation projected with assumed annual increases to ages at which they are assumed to leave the active workforce by any of these causes: retirement, disability, turnover, or death. Only past service (through the valuation date but not beyond) is taken into account in calculating these benefits. The cost of providing benefits based on past service and future compensation is the actuarial accrued liability for a given active participant. Under the PUC cost method, the value of an active participant's benefits tends to increase more sharply over his or her later years of service than over his or her earlier ones. As a result of this pattern of benefit value increasing, while the PUC method is not an unreasonable method, more plans use the EAN cost method to mitigate this effect. It should also be noted that the EAN cost method is the required method to calculate liability for GASB 67 & GASB 68.

While there is concern over the mandated funding method conforming to generally acceptable actuarial principles and practices, the State's obligation to fund CTPF is limited to payment of the future normal cost plus expenses and a health care subsidy. Consequently, we have not reviewed the asset valuation method, the amortization method, or the projection of the unfunded actuarial liability.

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SECTION IV – PROJECTION ANALYSIS

This section reviews the projections of the State's contributions to CTPF. The State's contributions are equal to the employer normal cost, including a health insurance subsidy, plus an additional contribution equal to 0.544 percent of pay. The chart below compares the State's projected contributions contained in the June 30, 2022 Actuarial Valuation of CTPF to the same projections from the prior year.



The dark blue bars represent the projection of the State's normal cost contributions for Tier 1 members, and the teal bars represent the State's normal cost contributions for Tier 2 members. The green bars represent the additional State contribution, and the gold line represents the total projected State contribution from the 2021 actuarial valuation. The contribution is expected to increase gradually for the next several years before declining as Tier 2 members become the dominant portion of active membership. The Tier 2 normal cost under the projected unit credit method rises as the Tier 2 membership matures, ultimately increasing the State's contribution.

The increase in projected State contributions from the prior valuation is primarily due to the higher payroll than previously projected.

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SECTION V – ANALYSIS OF HISTORICAL TRENDS

In this section, we examine the historical trends of the funding for the System, including funded ratio, the sources of changes in the unfunded actuarial liability (UAL), sources of contributions, and net cash flow. Because the State's obligation to fund CTPF is limited to the payment of future normal cost including a health care subsidy and an additional fixed percentage of covered payroll, we have not reviewed the projections or assessed the adequacy of anticipated future contributions. The primary risk to the State is that anticipated future normal costs increase.

Currently the System is 45.3% funded based on the Market Value of Assets. When coupled with the negative cash flow (where benefit payments and expenses exceed the contributions to the fund) of 4.10% of the market asset value, the risk of a declining funded ratio is increased. Even if the expected return on assets of 6.50% is met, only 2.40% of the return will be available to increase the asset value.

Insolvency risk increases if contributions increase to unsustainable levels. The State's current obligation is fixed at the net employer normal cost plus 0.544% of capped payroll and the health insurance subsidy. However, if the contributions required of the Board of Education become unsustainable, there could be additional risk of the State being called on to provide additional funding assistance through legislation. Therefore, it is important that the State understand the risks within the System, and GRS included stress testing of the System within the valuation report which tested the implications that volatile investment returns and the impact of changes in the active population have on the funded ratio and employer contributions. However, the more direct risk to the State is further reductions in the discount rate which will directly increase the State's contribution. Using current capital market assumptions, GRS indicated there is only about a 39% chance of achieving a return equal to or greater than the current discount rate of 6.50%. The Board of Education currently bears the risk for the actual investment returns, but if the discount rate needs to be reduced further, the State contribution would increase. GRS provides a stress test scenario based on the 2021 actuarial valuation showing that a reduction in the discount rate from 6.50% to 6.25% would increase the State contribution by approximately \$25 million per year for the next 25 years and an increasing amount thereafter. **We recommend that GRS continue to include stress testing of the System within the valuation report, including the impact to the required State contribution of potential reductions in the discount rate** (Recommendation #1).

The actuarial valuation report prepared by GRS includes both traditional actuarial measurements, as well as some projections on pages 30 to 35, and stress test scenarios based on the prior valuation in Appendix 1 of the June 30, 2022 Actuarial Valuation report. Given the unique and substantial funding challenges faced by the CTPF and the implications of future reliance on the State for funding, this additional information is quite important and supplements the information we present here on funding adequacy to better inform the legislature and other stakeholders about the adequacy of the System's funding.

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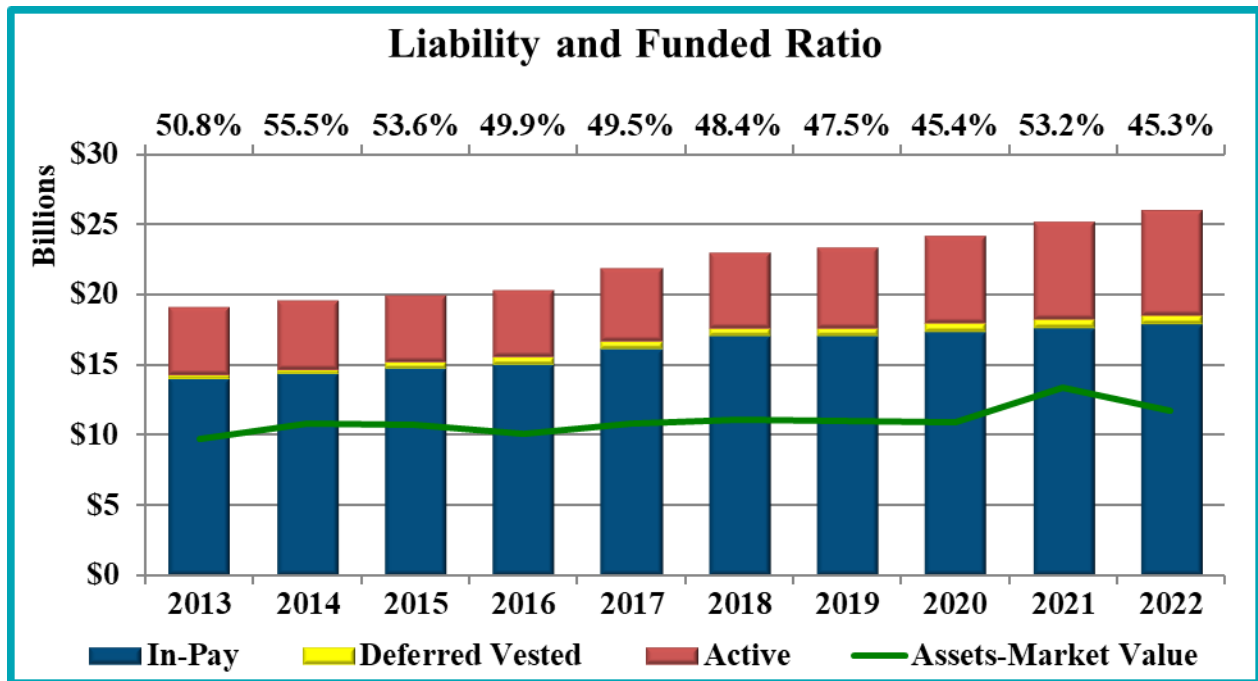
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System Funded Ratio

The first trend measure is the System's funded ratio for the past 10 years which is also included in the GRS report. Funded ratio for this purpose is defined as the ratio of the Market Value of Assets to the actuarial liability. The chart below shows that CTPF's funded ratio has declined from 55.5% in 2014 to 45.3% in 2022, a decline in funded ratio of 10.2%. In addition to showing the funded ratio, this chart also shows the breakdown of the Plan's liabilities by membership status:

- Active liability – the liability (attributable to service already performed) for future payments to members who are currently working in the System,
- Deferred Vested liability – the liability for future payments to members who are no longer working in the system, and
- In-Pay liability – the liability for future payments to retirees and beneficiaries who are currently receiving benefits.

This breakdown shows that today plan assets only cover about 66% of the liabilities for just those members currently in-pay status.



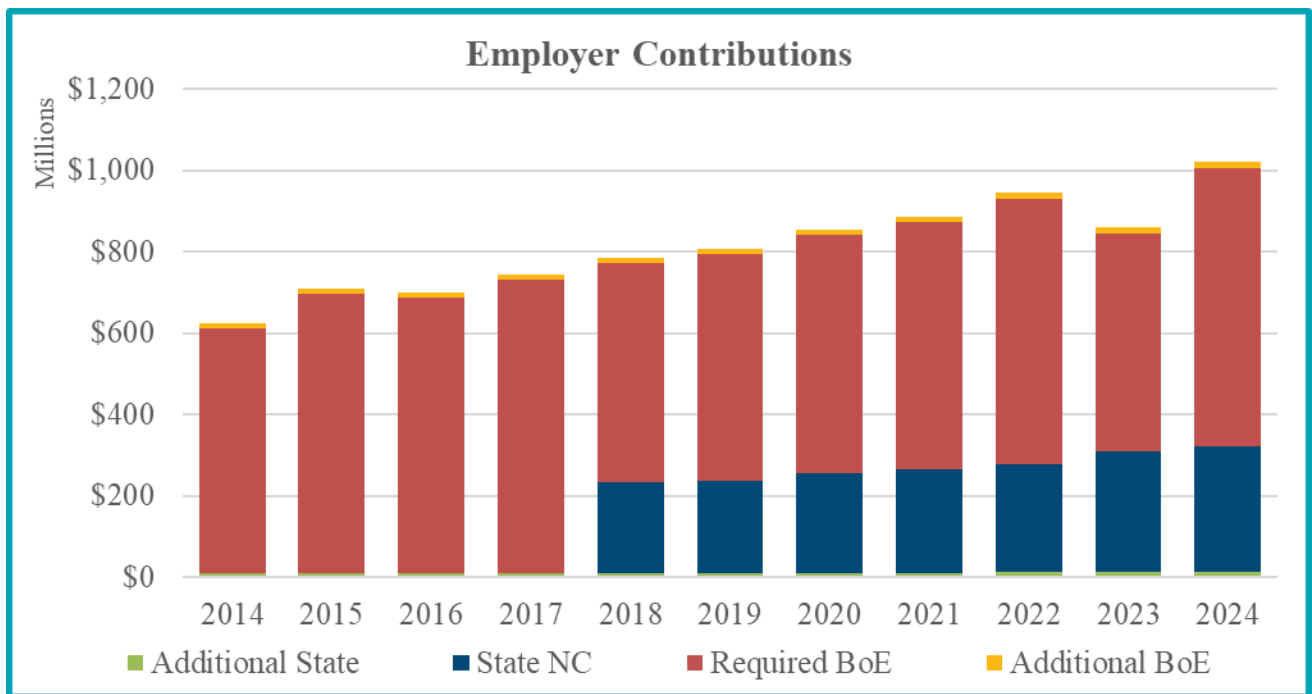
Source: Cheiron analysis of funding adequacy.

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Sources of Contributions

CTPF receives contributions from the Board of Education as well as the State. The chart below shows the source of employer contributions based on the last 10 actuarial valuations. Beginning in fiscal year 2018, the State began contribution the employer normal cost (blue bars). The Board of Education's required contribution toward the unfunded actuarial liability (UAL) has continued to grow until the exceptional investment returns for the 2022 fiscal year reduced the contribution beginning with the 2024 fiscal year. At the same time, reductions in the discount rate have increased the State's contribution for normal cost.



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SECTION V – ANALYSIS OF HISTORICAL TRENDS

Sources of Changes in the UAL

CTPF's UAL has grown from about \$8.0 billion in 2012 to \$13.8 billion in 2022, an increase of \$5.8 billion. To understand how to reverse this trend, it is important to understand the sources contributing to it. To the extent the sources contributing to the growth in UAL indicate a need to change assumptions, they may also indicate potential short-term risk of increased contributions for the State when assumptions are updated.

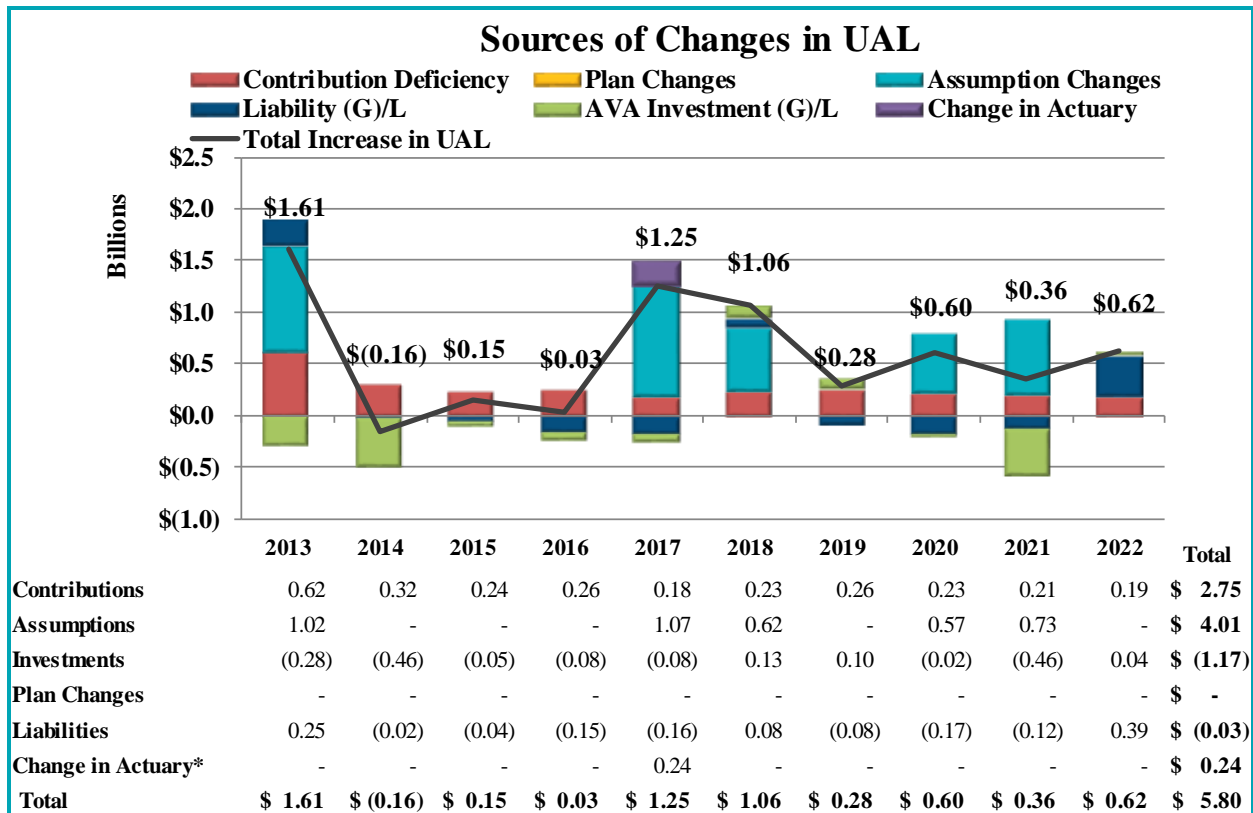
The changes to the UAL from June 30, 2012 to June 30, 2022 can be separated into the following components:

- **Contribution Deficiencies** – Contributions that are less than the tread water contribution cause the UAL to increase. The tread water contribution consists of two components: the normal cost, which is the cost of benefits earned in a given year, and the interest on the unfunded actuarial liability. This sum is referred to as the tread water contribution because it is the contribution necessary so that the UAL will remain constant, or “tread water” (absent experience gains or losses). The difference between actual contributions and the tread water contributions increased the UAL by \$2.8 billion over this period.
- **Assumption Changes** – changes to actuarial assumptions over this period increased the UAL by \$4.0 billion. A positive aspect of the UAL increases due to assumption changes is that they will result in liability measurements that more accurately reflect future expectations. Without the changes a similar UAL increase would show up as experience losses over time.
- **Plan Changes** – modifications to the design of the Plan had no impact over this period as there were no changes affecting prior benefits.
- **Liability (Gain) or Loss** – the changes in the UAL due to liability experience (i.e., mortality, terminations, salary increases, etc.) were generally small and decreased the UAL by \$0.03 billion over this period.
- **AVA (Actuarial Value of Assets) Investment (Gain) or Loss** – the net investment gain or loss due to assets earning more or less than assumed decreased the UAL over this period by \$1.2 billion.

The chart on the next page shows the changes in UAL each year broken into these six components. The sum of all the components (total change in UAL) is shown as the black line. Values of each component as well as total by year are shown in the chart along with the totals for the period.

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* The change in UAL due to the change in actuary for the 7/1/2013 valuation was not reported as a standalone value and is included in the Assumption value.

Source: Cheiron analysis of funding adequacy.

We expect that this chart will help stakeholders understand the sources of growth in the UAL over the past decade and inform discussions about the current funding requirements and adequacy.

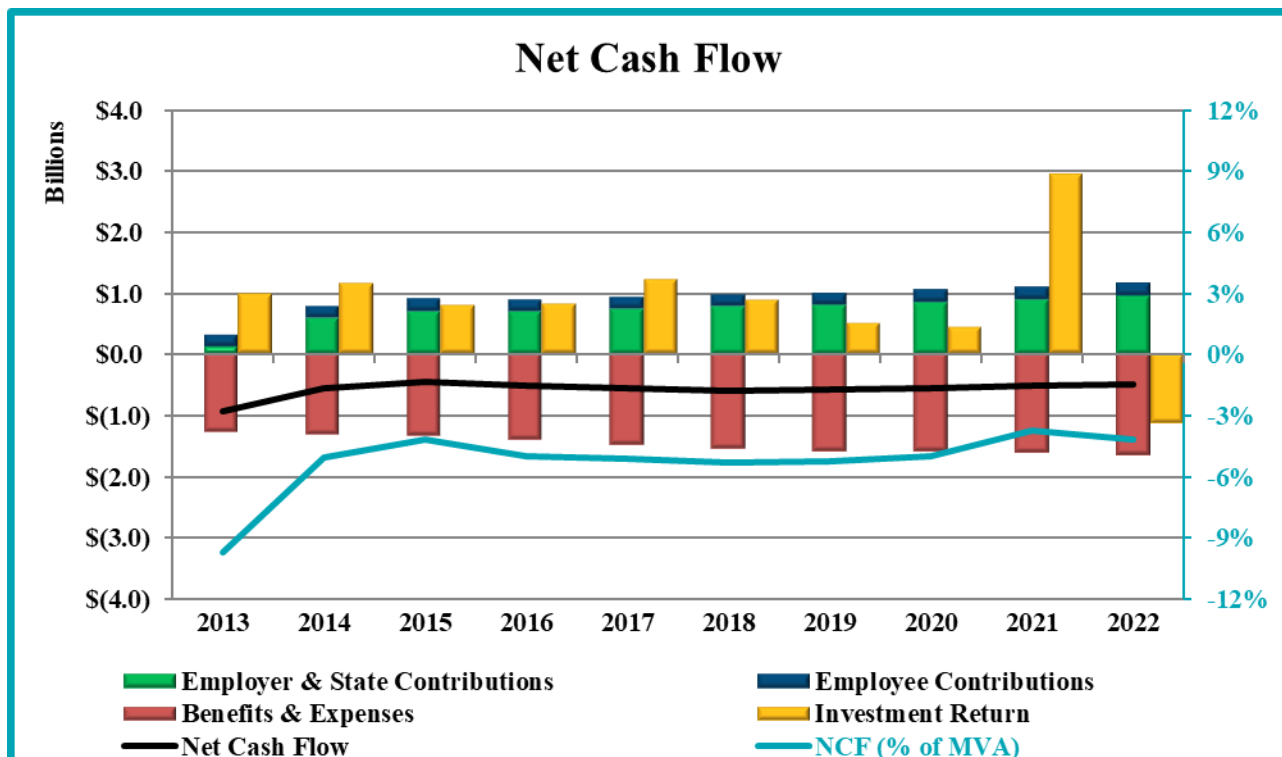
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Net Cash Flow Analysis

The plan's net cash flow (NCF) is defined as State and member contributions less benefit payments and administrative expenses. The more negative net cash flow is as a percentage of the plan's assets, the more vulnerable the Plan is to market downturns. When a pension plan has more payouts than contributions and suffers an investment loss, it is left with fewer assets to invest and recapture during a recovery.

Looking at the chart below, CTPF has a significant negative net cash flow (black line). If contributions increase as quickly as benefit payments, the net cash flow will remain stable. But if contributions do not continue to grow either because the Plan has become better funded or because the expected contributions are not made, negative net cash flow may become even more significant issue, therefore it should continue to be monitored. The teal line shows net cash flow as a percent of Market Value of Assets on the right-side axis. The greater the negative cash flows are relative to plan assets the more vulnerable a plan is to market downturns. This is because once there is a market downturn, the plan assets lose both on the return and the negative cash flow, leaving it with a lower asset base from which to recover from the loss.



Source: Cheiron analysis of funding adequacy.

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STATUS OF RECOMMENDATIONS FROM THE 2021 STATE ACTUARY REPORT

Response to Recommendations in 2021

In the State Actuary's Preliminary Report on the CTPF presented December 16, 2021, Cheiron made several recommendations. Below we summarize how these recommendations were reflected in either the System's comments last year or in this year's draft June 30, 2022 Actuarial Valuation.

Recommendations to Retirement System from 2021 State Actuary Report	Status	Comments
1. We recommend that GRS continue to include stress testing of the System within the valuation report and that future stress testing include the impact to the required State contribution of reductions in the discount rate.	Implemented	GRS included as an Appendix in the June 30, 2022 Actuarial Valuation Report Stress Testing Scenarios based on the June 30, 2021 Actuarial Valuation Results. These scenarios include both static and volatile return scenarios as well as scenarios testing a reduction in discount rate to 6.25% and an annual change in the number of active member of +1% and -1% for each of the next 10 years. The results show the impact on State and Board of Education contributions separately. Recommendation continued.
2. We recommend the CTPF Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly, as they did for this valuation.	Implemented	This recommendation has been addressed in the <i>2022 Actuarial Assumption Study</i> . Recommendation continued.

Appendix A

Illinois State Auditing Act (30 ILCS 5/2-8.1)

Sec. 2-8.1. Actuarial Responsibilities.

- (a) The Auditor General shall contract with or hire an actuary to serve as the State Actuary. The State Actuary shall be retained by, serve at the pleasure of, and be under the supervision of the Auditor General and shall be paid from appropriations to the office of the Auditor General. The State Actuary may be selected by the Auditor General without engaging in a competitive procurement process.
- (b) The State Actuary shall:
 - (1) review assumptions and valuations prepared by actuaries retained by the boards of trustees of the State-funded retirement systems;
 - (2) issue preliminary reports to the boards of trustees of the State-funded retirement systems concerning proposed certifications of required State contributions submitted to the State Actuary by those boards;
 - (3) cooperate with the boards of trustees of the State-funded retirement systems to identify recommended changes in actuarial assumptions that the boards must consider before finalizing their certifications of the required State contributions;
 - (4) conduct reviews of the actuarial practices of the boards of trustees of the State-funded retirement systems;
 - (5) make additional reports as directed by joint resolution of the General Assembly; and
 - (6) perform any other duties assigned by the Auditor General, including, but not limited to, reviews of the actuarial practices of other entities.
- (c) On or before January 1, 2013 and each January 1 thereafter, the Auditor General shall submit a written report to the General Assembly and Governor documenting the initial assumptions and valuations prepared by actuaries retained by the boards of trustees of the State-funded retirement systems, any changes recommended by the State Actuary in the actuarial assumptions, and the responses of each board to the State Actuary's recommendations.
- (d) For the purposes of this Section, "State-funded retirement system" means a retirement system established pursuant to Article 2, 14, 15, 16, or 18 of the Illinois Pension Code.

(Source: P.A. 97-694, eff. 6-18-12.)

Appendix B

Materials Reviewed by Cheiron

Following is a listing of information reviewed by Cheiron for each of the retirement systems. This is the information Cheiron relied upon in preparing the preliminary reports of the retirement systems.

Teachers' Retirement System:

- Illinois Law:
 - Illinois Pension Code (40 ILCS 5/) Article 16: Teachers' Retirement System of the State of Illinois
 - Public Act (P.A.) 088-0593, P.A. 093-0002, P.A. 093-0839, P.A. 094-0004, P.A. 096-0043, P.A. 096-0889, P.A. 097-0694, P.A. 099-0232, P.A. 100-0023, P.A. 100-0340, P.A. 100-0587, P.A. 101-0010, P.A. 102-0718
- Files received from the Teachers' Retirement System:
 - RVK 2011-2022 Asset Allocation/Investment Performance Presentations
 - Buck IL TRS 2012-2015 Board Meeting Presentations and Memos
 - Segal IL TRS 2016-2022 Board Meeting Presentations
 - Board Meeting Minutes and Agendas from 2013-2022
 - Buck IL TRS 2007-2015 Valuation Reports
 - Segal IL TRS 2016-2022 Valuation Reports
 - Buck IL TRS 2012-2015 Certifications of Required State Contribution
 - Segal IL TRS 2016-2022 Certifications of Required State Contribution
 - Buck IL TRS Experience Analysis Reports for 2007, 2012, 2015
 - Segal IL TRS Experience Analysis 2016, 2017, 2018, 2021
 - Buck IL TRS spreadsheet with additional details on Section 4 of 2013-2015 AVRs
 - TRS Economic Impact Study of Benefits – May 2015
 - TRS Stress Testing Scenarios
- Other:
 - May 2014 *GFOA Best Practice – Actuarial Audits* published by the Government Finance Officers Association
 - 2021 *National Conference on Public Employees Retirement Systems* (NCPERS) Public Retirement Systems Study issued February 2022
 - June 2022 *Old-Age, Survivors and Disability Insurance Trustees Report* (OASDI)
 - Public Plans Database as of October 2022
 - Survey of Professional Forecasters, Third Quarter 2022, Federal Reserve Bank of Philadelphia
 - Publication H.15 Selected Interest Rates, Board of Governors of the Federal Reserve System
 - CPI-All Urban Consumers, Bureau of Labor Statistics
 - Quarterly Census of Employment and Wages, Bureau of Labor Statistics

- Survey of Capital Market Assumptions, 2021 and 2022 Editions, Horizon Actuarial Services, LLC

State Universities Retirement System

- Illinois Law:
 - Illinois Pension Code (40 ILCS 5/) Article 15: State Universities Retirement System of Illinois
 - Public Act (P.A.) 088-0593, P.A. 093-0002, P.A. 093-0839, P.A. 094-0004, P.A. 096-0043, P.A. 096-0889, P.A. 097-0694, P.A. 099-0232, P.A. 100-0023, P.A. 100-0587
- Files received from the State Universities Retirement System:
 - Board Meeting Minutes and Agendas from 2013-2022
 - GRS IL SURS 2008-2022 Valuation Reports
 - GRS IL SURS 2012 - 2022 Certifications of Required State Contribution
 - GRS IL SURS DRAFT 2014-2022 GASB 67/68 Reports
 - GRS SURS 2015 Economic Assumptions Review Presentation & Report
 - GRS SURS 2018 Experience Review Report
 - GRS SURS 2021 Experience Review Report
 - SURS Asset Liability Study, Economic Assumption Review, and Recommendation Memos
 - Segal IL SURS Full Scope Audit of the June 30, 2015 Actuarial Valuation
 - NEPC IL SURS Asset Class Assumptions and Actions annual presentations
 - SURS Investment Plan Update FY 2012 - FY 2022
 - GRS IL SURS GASB 67 Plan Reporting and Accounting Schedules
- Other:
 - May 2014 *GFOA Best Practice – Actuarial Audits* published by the Government Finance Officers Association
 - *2021 National Conference on Public Employees Retirement Systems* (NCPERS) Public Retirement Systems Study issued February 2022
 - June 2022 *Old-Age, Survivors and Disability Insurance Trustees Report* (OASDI)
 - Public Plans Database as of October 2022
 - Survey of Professional Forecasters, Third Quarter 2022, Federal Reserve Bank of Philadelphia
 - Publication H.15 Selected Interest Rates, Board of Governors of the Federal Reserve System
 - CPI-All Urban Consumers, Bureau of Labor Statistics
 - Quarterly Census of Employment and Wages, Bureau of Labor Statistics
 - Survey of Capital Market Assumptions, 2021 and 2022 Editions, Horizon Actuarial Services, LLC

State Employees' Retirement System

- Illinois Law:
 - Illinois Pension Code (40 ILCS 5/) Article 14: State Employees' Retirement System of Illinois
 - Public Act (P.A.) 088-0593, P.A. 093-0002, P.A. 093-0839, P.A. 094-0004, P.A. 096-0043, P.A. 096-0889, P.A. 097-0694, P.A. 099-0232, P.A. 100-0023, P.A. 100-0587
- Files received from the State Employees' Retirement System:
 - SERS 2018 Experience Review for the Years July 1, 2015 to June 30, 2018
 - SERS 2021 Experience Review for the Years July 1, 2018 to June 30, 2021
 - Board Meeting Minutes and Agendas from 2013-2022
 - GRS IL SERS 2007-2022 Valuation Reports
 - GRS IL SERS 2012-2022 Certifications of Required State Contribution
 - GRS IL SERS spreadsheet with additional details on Tables 4 and 7-10 from 2014 & 2015 Valuation Reports
 - GRS IL SERS DRAFT 2014-2022 GASB 67/68 Reports
 - ISBI Fund Evaluation Reports 2015-2022
- Other:
 - May 2014 *GFOA Best Practice – Actuarial Audits* published by the Government Finance Officers Association
 - 2021 *National Conference on Public Employees Retirement Systems* (NCPERS) Public Retirement Systems Study issued February 2022
 - June 2022 *Old-Age, Survivors and Disability Insurance Trustees Report* (OASDI)
 - Public Plans Database as of October 2022
 - Survey of Professional Forecasters, Third Quarter 2022, Federal Reserve Bank of Philadelphia
 - Publication H.15 Selected Interest Rates, Board of Governors of the Federal Reserve System
 - CPI-All Urban Consumers, Bureau of Labor Statistics
 - Quarterly Census of Employment and Wages, Bureau of Labor Statistics
 - Survey of Capital Market Assumptions, 2021 and 2022 Editions, Horizon Actuarial Services, LLC

Judges' Retirement System

- Illinois Law:
 - Illinois Pension Code (40 ILCS 5/) Article 18: Judges' Retirement System of Illinois
 - Public Act (P.A.) 088-0593, P.A. 093-0002, P.A. 093-0839, P.A. 094-0004, P.A. 096-0043, P.A. 096-0889, P.A. 097-0694, P.A. 099-0232, P.A. 100-0023

- Files received from the Judges' Retirement System:
 - JRS Experience Review for July 1, 2015 to June 30, 2018
 - JRS Experience Review for July 1, 2018 to June 30, 2021
 - Board Meeting Minutes and Agendas from 2013-2022
 - Goldstein & Associates JRS 2006 – 2011 Valuation Reports
 - GRS IL JRS 2012 – 2022 Valuation Reports
 - GRS IL JRS 2012 – 2022 Certifications of Required State Contributions
 - GRS IL JRS 2019-2021 Economic Assumption Update Review
 - GRS IL JRS 2022 Valuation Results presentation
 - GRS IL JRS spreadsheet with additional details on Tables 4 and 7-10 from 2014 & 2015 Valuation Reports
 - GRS IL JRS DRAFT 2015 – 2022 GASB 67/68 Reports
- Other:
 - May 2014 *GFOA Best Practice – Actuarial Audits* published by the Government Finance Officers Association
 - *2021 National Conference on Public Employees Retirement Systems* (NCPERS) Public Retirement Systems Study issued February 2022
 - June 2022 *Old-Age, Survivors and Disability Insurance Trustees Report* (OASDI)
 - Public Plans Database as of October 2022
 - Survey of Professional Forecasters, Third Quarter 2022, Federal Reserve Bank of Philadelphia
 - Publication H.15 Selected Interest Rates, Board of Governors of the Federal Reserve System
 - CPI-All Urban Consumers, Bureau of Labor Statistics
 - Quarterly Census of Employment and Wages, Bureau of Labor Statistics
 - Survey of Capital Market Assumptions, 2021 and 2022 Editions, Horizon Actuarial Services, LLC

General Assembly Retirement System

- Illinois Law:
 - Illinois Pension Code (40 ILCS 5/) Article 2: General Assembly Retirement System of Illinois
 - Public Act (P.A.) 088-0593, P.A. 093-0002, P.A. 093-0839, P.A. 094-0004, P.A. 096-0043, P.A. 096-0889, P.A. 097-0694, P.A. 099-0232, P.A. 100-0023
- Files received from the General Assembly Retirement System:
 - GARS Experience Review for July 1, 2018 to June 30, 2021
 - Board Meeting Minutes and Agendas from 2013 – 2022
 - Goldstein & Associates GARS 2006 – 2011 Valuation Reports
 - GRS IL GARS 2012 – 2022 Valuation Reports
 - GRS IL GARS 2012 – 2022 Certifications of Required State Contributions
 - GRS IL GARS 2019-2020 Economic Assumption Update Review

- GRS IL GARS spreadsheet with additional details on Tables 4 and 7-10 from 2014 – 2021 Valuation Reports
- GRS IL GARS DRAFT 2015 – 2022 GASB 67/68 Reports
- Other:
 - May 2014 *GFOA Best Practice – Actuarial Audits* published by the Government Finance Officers Association
 - 2021 *National Conference on Public Employees Retirement Systems* (NCPERS) Public Retirement Systems Study issued February 2022
 - June 2022 *Old-Age, Survivors and Disability Insurance Trustees Report* (OASDI)
 - Public Plans Database as of October 2022
 - Survey of Professional Forecasters, Third Quarter 2022, Federal Reserve Bank of Philadelphia
 - Publication H.15 Selected Interest Rates, Board of Governors of the Federal Reserve System
 - CPI-All Urban Consumers, Bureau of Labor Statistics
 - Quarterly Census of Employment and Wages, Bureau of Labor Statistics
 - Survey of Capital Market Assumptions, 2021 and 2022 Editions, Horizon Actuarial Services, LLC

Chicago Teachers' Pension Fund

- Illinois Law:
 - Illinois Pension Code (40 ILCS 5/) Article 17: Public School Teachers' Pension and Retirement Fund – Cities of Over 500,000 Inhabitants
 - Public Act (P.A.) 090-0566, P.A. 090-0582, P.A. 091-0357, P.A. 100-0465
- Files received from the Chicago Teachers' Pension Fund:
 - Goldstein & Associates CTPF 2007-2011 Valuation Reports
 - Segal CTPF 2012-2016 Valuation Reports
 - GRS 2017-2022 Valuation Reports
 - 2018 Actuarial Experience Study dated May 25, 2018
 - 2022 Actuarial Experience Review dated September 8, 2022
- Other:
 - May 2014 *GFOA Best Practice – Actuarial Audits* published by the Government Finance Officers Association
 - 2021 *National Conference on Public Employees Retirement Systems* (NCPERS) Public Retirement Systems Study issued February 2022
 - June 2022 *Old-Age, Survivors and Disability Insurance Trustees Report* (OASDI)
 - Public Plans Database as of October 2022
 - Survey of Professional Forecasters, Third Quarter 2022, Federal Reserve Bank of Philadelphia

- Publication H.15 Selected Interest Rates, Board of Governors of the Federal Reserve System
- CPI-All Urban Consumers, Bureau of Labor Statistics
- Quarterly Census of Employment and Wages, Bureau of Labor Statistics
- Survey of Capital Market Assumptions, 2021 and 2022 Editions, Horizon Actuarial Services, LLC

Appendix C

Responses from the Retirement Systems

The responses from the Retirement Systems to the State Actuary's recommendations appear on the following pages:

TRS – pages 258-260

SURS – pages 261-266

SERS – pages 267-272

JRS – pages 273-278

GARS – pages 279-286

CTPF – pages 287-290

**TEACHERS' RETIREMENT SYSTEM OF THE STATE OF ILLINOIS**

2815 W Washington St | PO Box 19253 | Springfield IL 62794-9253

R. Stanley Rupnik, Executive Director & Chief Investment Officer

<http://www.trsil.org>

877-927-5877 (877-9-ASK-TRS) | FAX: 217-753-0964

December 13, 2022

VIA ELECTRONIC MAIL

Mr. Joe Butcher

Office of the Auditor General

740 East Ash Street, First Floor

Springfield, IL 62703

Dear Mr. Butcher:

We reviewed the draft report prepared by the state actuary on the preliminary 2022 actuarial valuation prepared by Segal. TRS and Segal offer the following joint response to Cheiron's recommendations.

The TRS board met on December 6, 2022, to provide final certification to the June 30, 2022 actuarial valuation report and the FY 2024 state funding requirements.

State Mandated Methods

- 1. Cheiron continues to recommend that the funding method be changed to employ a methodology that produces a Reasonable Actuarially Determined Contribution and fully fund plan benefits within a reasonable period. Continuing the practice of inadequate contributions and targeting a funded percentage less than 100% increases the risk of the System becoming unsustainable. Cheiron understands that the funding method is under the jurisdiction of state law, not TRS. (*Recommendation #1*)**

We agree that the current funding methodology does not follow Actuarial Standards of Practice (ASOP). The TRS board consistently expresses concerns over inadequate funding and, in 2012, began certifying alternative state funding requirements that do conform to actuarial standards. Cheiron confirms that the alternative funding method used by the board conforms to a goal of full funding within a reasonable period, though notes that the FY 2024 contribution requirement under this alternative funding method of nearly \$10 billion may not be plausible from a State budgeting standpoint.

- 2. Cheiron recommends the phase-in period for the impact of assumption changes be reduced to three years since experience studies are performed every three years. (*Recommendation #2*)**

We agree that the current phase-in period should be reduced from five years to three years based on the required time period between experience studies. However, the phase-in period is determined in Public Act 100-0023 and is under the jurisdiction of State law rather than TRS.

Recommended Additional Disclosures for the 2022 Valuation

- 3. Cheiron recommends that Segal include a more detailed explanation of how the new entrant assumption was developed. (*Recommendation #3*)**

The new entrant assumption is based upon an analysis of historical salary data for recent new entrants. Segal included an explanation of how the new entrant pay increase assumption was developed in the experience study report dated September 30, 2021. Upon request, we can separately provide additional information to Cheiron.

Recommended Changes for Future Valuations

- 4. Cheiron continues to recommend Segal provide additional information in the valuation report about the new entrant population used in its projection such as the average age and service of the population each year. (*Recommendation #4*)**

Segal added information about the new entrant profile, including average age and service for future years, in the 2021 and 2022 actuarial valuation reports. However, Segal will consider including additional information about the new entrants for future actuarial valuation reports.

- 5. Cheiron recommends that the TRS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly, as they did for this valuation. (*Recommendation #5*)**

Since 2013, the TRS actuaries have reviewed the interest and inflation assumptions and will continue to do so.

The most recent Segal's analysis was based on the Horizon Survey of Capital Market Assumptions (2021 Edition) in addition to the capital market assumptions from RVK, TRS' investment consultant.

Segal will continue to supplement the investment return analysis with RVK's capital market assumptions for future valuations.

- 6. Cheiron recommends future stress testing to include the impact to the required State contribution of potential reductions in the discount rate. (*Recommendation #6*)**

Segal has provided information about additional stress testing related to potential reductions in the discount rate for the 2023 valuation. TRS plans to move forward with this in 2023.

- 7. Cheiron recommends that Segal increase the Full-Time future service accrual rate assumption to 1.0 years of service and consider non-full-time member future service accrual rates that reflect recent experience on an individual basis. (*Recommendation #7*)**

As with other assumptions reviewed during the experience study completed in 2021, the proposed future service accrual rate assumption for full-time members was selected to fall between the current assumption rate and the rate shown by experience during the study period. For valuation purposes, full-time refers to members who were reported as either full-time or regular part-time status. Regular part-time members make up less than 1% of the total full-time member group and, thus, were deemed immaterial. However, Segal will review the historic service accrual rates for regular part-time members separately as part of the next experience study to determine whether separate assumptions are warranted.

Segal will also review the service accrual rates of non-full-time members as part of the next experience study and consider whether changing the method to reflect recent experience on an individual basis is warranted.

Thank you for Cheiron's thorough review of Segal's work. We appreciate their focus on the substantial risks caused by inadequate funding. Please let us know if you or Cheiron would like to discuss any of these issues.

Sincerely,

SIGNED ORIGINAL ON FILE

R. Stanley Rupnik
Executive Director and Chief Investment Officer

cc: Amy Reynolds, TRS
Dennis Gibbons, OAG
Heather Powell, BKD
Bill Hallmark, Cheiron
Coralie Taylor, Cheiron
Gene Kalwarski, Cheiron
Jake Libauskas, Cheiron
Christian Benjaminson, Cheiron
Heath Merlak, Cheiron
Matt Wells, Cheiron
Michael Noble, Cheiron
Jana Bowers, Cheiron
Eurika Johnson, Cheiron
Matt Strom, Segal
Tatsiana Dybal, Segal
David Nickerson, Segal
Dan Siblik, Segal



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December 13, 2022

Mr. Frank J. Mautino
Auditor General
740 East Ash Street
Springfield, IL 62703

Re: Response to the State Actuary's Report on the SURS June 30, 2022 Actuarial Valuation

Dear General Mautino:

This is the official response from the State Universities Retirement System of Illinois (SURS) regarding the December 2022 preliminary report issued by Cheiron – The State Actuary's Preliminary Report on the State Universities Retirement System of Illinois Pursuant to 30 ILCS 5/2-8.1

What follows is a summary response to each of the recommendations. We have also enclosed a detailed response letter from our actuary, Gabriel Roeder Smith & Company (GRS).

Proposed Certification of the Required State Contribution

The State Actuary accepts the preliminary proposed certification of \$2,134,1020,000 for the fiscal year 2024 SURS required state contribution.

Assessment of Actuarial Assumptions Used in the 2022 Valuation

The December 2022 report issued by the State Actuary, Cheiron, indicates that they believe that the assumptions used in the June 30, 2022, Actuarial Valuation are reasonable.

State Mandated Funding Method

- 1. The State Actuary expressed their concern regarding the Statutory funding method and recommends that the Statutory funding method be changed to employ a methodology that produces a Reasonable Actuarially Determined Contribution (ADC) and fully funds plan benefits within a reasonable period.**

Response: The funding policy is established by the legislature and is not under the control of the Board. Please note that prior annual valuation reports and the certification letters sent to the State have addressed this concern and we plan to do so again in this year's communication.

- 2. Public Act 100-0023 (P.A. 100-0023), effective July 6, 2017, modified the State's funding policy to require that the contribution impact of all assumptions changes be phased-in over a five-year period. Because experience studies are performed every three year, the State Actuary recommends that the phase-in period of the impact of assumption changes be reduced to three years.**

Response: The funding policy is established by the legislature and is not under the control of the Board. GRS recommends eliminating the phase-in period.

Recommended Changes for Future Valuations

3. **Cheiron recommended that in future valuations these stress tests should include the impact to the required State contribution of potential reductions in the discount rate. This was a carry over recommendation from prior year.**

Response: GRS included the following information on page 17 of the June 30, 2022 actuarial valuation report, therefore, addressing the recommendation:

“Based on the recommendation from the State Actuary in their 2021 report, we are providing an estimate to the change in the statutory contribution of potential reductions in the discount rate. Public Act 100-0023 requires any change in an actuarial assumption that increases or decreases the required State contribution to be implemented in equal annual amounts over a five-year period beginning in the State fiscal year in which the change first applies to the required State contribution. A 50-basis point decrease in the investment return assumption/discount rate from 6.50% to 6.00% is estimated to increase the statutory contribution by about 2% for the first year of the five-year phase in. The statutory contribution will continue to increase as the full impact of the assumption change is phased in.”

4. **As it relates to Actuarial Standard of Practice (ASOP) No. 51, Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions: Cheiron recommends that in future valuations the actuary explain how each risk identified would reasonably be anticipated to significantly affect the specific plan's future financial condition.**

Response: GRS will consider the recommendations from Cheiron and make changes to the fiscal year 2023 actuarial valuation report as appropriate.

5. **As it relates to Actuarial Standard of Practice (ASOP) No. 51, Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions: Cheiron recommends that for each identified risk the actuary provide as assessment, preferably quantitative, that considers the specific circumstances of this plan.**

Response: GRS will consider the recommendations from Cheiron and make changes to the fiscal year 2023 actuarial valuation report as appropriate.

6. **Cheiron recommends that the Board continue to annually review the economic assumptions (interest rate and inflation) each year prior to commencing the valuation work and adjust assumptions accordingly, as they did for this valuation.**

Response: GRS performed an experience study using the June 30, 2017 – June 30, 2020 data and presented their findings to the Board at the March 2021 and June 2021 Board meetings. The updated assumptions were implemented in the June 30, 2021 actuarial valuation. GRS also performed a review of the inflation and investment return assumptions prior to the June 30, 2022 actuarial valuation, in addition to inflation sensitivity projections.

Please do not hesitate to contact me with any questions or concerns about our response.

Sincerely yours,

SIGNED ORIGINAL ON FILE

Suzanne M. Mayer
Executive Director

Encl: Gabriel Roeder Smith & Company Response to State Actuary Report of 2022
Actuarial Valuation Report Fiscal Year 2022 (Final)

cc: Michael Noble, Cheiron
Joe Butcher, Office of the Auditor General
Heather Powell, FORVIS, LLP



December 2, 2022

Board of Trustees
State Universities Retirement System of Illinois
1901 Fox Drive
Champaign, Illinois 61820

Re: Response to State Actuary's Preliminary Report on the SURS June 30, 2022 Actuarial Valuation

Dear Members of the Board:

At your request, we have reviewed the report issued by Cheiron dated December 1, 2022 – The State Actuary's Preliminary Report on the State Universities Retirement System of Illinois ("SURS") Pursuant to 30 ILCS 5/2-8.1. This report consists of a review of the June 30, 2022 actuarial valuation of SURS prepared by Gabriel, Roeder, Smith & Company ("GRS").

Assessment of Actuarial Assumptions and Methods Used in the 2022 Valuation

This report issued by the State Actuary, Cheiron, indicates that **"In summary, we believe that the assumptions and methods used in the June 30, 2022 Actuarial Valuation, which are used to determine the required Fiscal Year 2024 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, were properly calculated in accordance with State law."**

Proposed Certification of the Required State Contribution

In this section, the State Actuary notes that they have verified the arithmetic accuracy of the required State contribution calculated by GRS and the assumptions on which it was based, and accepted the GRS projections of future payroll, total normal costs, employee contributions, combined benefit payments and expenses, and total contributions.

State Mandated Funding Method

In this section, the State Actuary opines on their concern regarding the Statutory funding method and recommends that the Statutory funding method be changed to employ a methodology that produces a Reasonable Actuarially Determined Contribution (ADC) and fully funds plan benefits within a reasonable period. In addition, they state "The State Mandated Method is entering a period in which the contribution amount it produces may be reasonable even though the overall methodology is not. This period offers an opportunity to change the methodology to one that is consistent with actuarial standards for a Reasonable Actuarially Determined Contribution (ADC) without significantly affecting the immediate contribution amount." **(Recommendation #1)**

The funding method used in the June 30, 2022 actuarial valuation of SURS is prescribed in accordance with Article 15 of the Illinois Pension Code (as noted by Cheiron) and is not under the actuary or the Board's control; therefore, no action is required in the actuarial valuation report.

Board of Trustees
State Universities Retirement System of Illinois
Page 2

However, with the Board and Staff's concurrence, GRS can prepare projections under multiple alternate funding policies in order to illustrate potential policies that better manage volatility and may not produce contribution requirements that differ significantly from the current Statutory policy. In addition, we encourage Cheiron, in their role as the State Actuary, to also address this issue directly with the State of Illinois.

Conformance to Statutory Funding Changes of Public Act 100-0023

In this section, the State Actuary recommends that the phase-in of the contribution impact of assumption changes be reduced from five years to no longer than three years (since experience studies are performed every three years). (**Recommendation #2**)

The funding method used in the June 30, 2022 actuarial valuation of SURS is prescribed in accordance with Article 15 of the Illinois Pension Code (as noted by Cheiron) and is not under the actuary or the Board's control; therefore, no action is required. In our annual actuarial valuation reports, we have recommended eliminating the phase-in of the contribution impact of assumption changes.

Cheiron describes the additional provisions from Public Act 100-0023 (optional hybrid plan and contributions in excess of the Governor's pay). With regard to contributions in excess of the Governor's pay, Cheiron states, "We have verified that GRS has reflected these additional employer contributions in the development of the net State Contribution."

Conformance to Statutory Funding Changes of Public Act 100-0587

Cheiron describes the provisions from Public Act 100-0587 (accelerated pension benefit payment option). They do not note any recommendations in this section. Regarding the assumption used in the June 30, 2022 actuarial valuation of no participants electing the accelerated pension benefit payment option they state, "We believe this approach is reasonable."

Assessment of Actuarial Assumptions Used in the 2022 Valuation

Cheiron states, "We have reviewed all the actuarial assumptions used in the draft June 30, 2022 Actuarial Valuation and conclude that the recommended assumptions are reasonable in general, based on the evidence provided to us."

Recommended Changes for Future Valuations

Recommendation #3 is "We recommend that future stress testing include the impact to the required State contribution of potential reductions in the discount rate."

The following information was included on page 17 of the final June 30, 2022 actuarial valuation report and, therefore, addresses this recommendation:

"Based on the recommendation from the State Actuary in their 2021 report, we are providing an estimate to the change in the statutory contribution of potential reductions in the discount rate. Public Act 100-0023 requires any change in an actuarial assumption that increases or decreases the required State contribution to be implemented in equal annual amounts over a five-year period beginning in the State fiscal year in which the change first applies to the required State contribution. A 50 basis point decrease in the investment return assumption/discount rate from 6.50% to 6.00% is estimated to increase the statutory contribution by about 2% for the first year of the five-year phase in. The statutory contribution will continue to increase as the full impact of the assumption change is phased in."

Board of Trustees
 State Universities Retirement System of Illinois
 Page 3

Recommendations #4 and #5 relate to Actuarial Standard of Practice (ASOP) No. 51, Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions.

Recommendation #4 Cheiron notes "In future valuations, we recommend that the actuary explain how each risk identified would reasonably be anticipated to significantly affect the specific plan's future financial condition."

Recommendation #5 Cheiron notes "We recommend that for each identified risk the actuary provide an assessment, preferably quantitative, that considers the specific circumstances of this plan."

Recommendation #6 is that the Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly.

We performed a review of the inflation and investment return assumptions prior to the June 30, 2022 actuarial valuation, in addition to inflation sensitivity projections.

GRS will consider the recommendations from Cheiron and make changes to the 2023 actuarial valuation report, as appropriate.

GASB Statement Nos. 67 and 68

Cheiron indicates, "We find that the assumptions and methods used to prepare the 2022 SURS GASB 67 and 68 schedules are reasonable based on the evidence provided to us."

Sincerely,

Gabriel, Roeder, Smith & Company

SIGNED ORIGINAL ON FILE

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

SIGNED ORIGINAL ON FILE

Amy Williams, ASA, FCA, MAAA
 Senior Consultant

BBM/AW:rl

cc: Suzanne Mayer, SURS
 Tara Myers, SURS
 Kristen Brundirks, GRS
 Kevin Noelke, GRS



December 9, 2022

Mr. Joe Butcher
Office of the Auditor General
740 East Ash Street, First Floor
Springfield, IL 62703

Dear Mr. Butcher,

The management of the State Employees' Retirement System (SERS) has reviewed the State Actuary's preliminary report on the draft SERS June 30, 2022 Actuarial Valuation, prepared by Gabriel, Roeder, Smith and Company (GRS). The report notes the State Actuary (Cheiron) believes **"the assumptions and methods used in the draft June 30, 2022 Actuarial Valuation, which are used to determine the required Fiscal Year 2024 State contribution, are reasonable."** In addition, Cheiron found **"the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, were properly calculated in accordance with State law."**

Cheiron also comments regarding the statutory funding plan that they **"agree with GRS that the statutory mandated minimum funding requirements have been and continue to be inadequate. In addition, the past inadequate funding has resulted in current and future contribution levels, measured as a percent of payroll, to be among the highest in the country. Making adequate contributions in the future to fully fund the system will be challenging."**

Listed are Cheiron's recommendations and SERS management's responses to those recommendations. In addition, attached are the GRS responses to the recommendations.

State Mandated Funding Method

- 1. We recommend that the funding method be changed to employ a methodology that produces a Reasonable Actuarially Determined Contribution and fully funds plan benefits within a reasonable period. The State Mandated Method is entering a period in which the contribution amount it produces may be reasonable even though the overall methodology is not. This period offers an opportunity to change the methodology to one that is consistent with actuarial standards for a Reasonable Actuarially Determined Contribution (ADC) without significantly affecting the immediate contribution amount. Such a method would set contributions at a level that is expected to prevent the unfunded liability from growing and remain high enough to reduce the unfunded actuarial liability each year until the plan is ultimately 100% funded within a reasonable period. While the State Mandated Method is inadequate, it will also produce more volatile contribution levels as the remaining period to achieve 90% funding shortens. Consequently, we recommend that the funding method be changed to one that produces**

more stable contribution requirements while targeting 100% funding within a reasonable period and meets the actuarial standards for a Reasonable ADC. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

Response: The SERS Board of Trustees agrees with the recommendation and in 2015 adopted a funding policy that provides for annual State contributions equal to the projected normal cost of benefits earned in a year plus an amount to amortize the unfunded liabilities over 25 years as a level percent of payroll. This amount is considered the "Actuarially Determined Contribution" (ADC) and for informational purposes is included in the actuarial valuation and the annual certifications of the required State contribution.

- 2. Because experience studies are performed every three years, we recommend that the phase-in period for the impact of assumption changes be reduced to no longer than three years. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.**

Response: The SERS Board of Trustees agrees with the recommendation.

Recommended Additional Disclosures for 2022 Valuation

- 3. For 9 of the last 10 years, there have been actuarial liability losses attributable to the retirement decrement assumption. We recommend that GRS provide an explanation of the causes for consistent losses from this assumption**

Response: SERS staff will defer to GRS to respond to this recommendation.

- 4. For the actuarial liability (gain)/loss for 2022, there was \$119 million gain noted as "Other" on page 26 of the actuarial report. We recommend GRS explain the cause of this gain.**

Response: SERS staff will defer to GRS to respond to this recommendation.

Recommended Changes for Future Valuations

- 5. Section 3.2 of ASOP 51 requires the actuary to identify risks that "may reasonably be anticipated to significantly affect the plan's future financial condition." The risks currently identified appear to largely duplicate the list of examples in ASOP 51 and could apply to almost any pension plan. In future valuations, we recommend that the actuary explain how each risk identified would reasonably be anticipated to significantly affect the specific plan's future financial condition.**

Response: SERS staff will defer to GRS to respond to this recommendation.

- 6. For each risk identified above, Section 3.3 of ASOP 51 requires the actuary to provide an assessment that takes into account "circumstances specific to the plan." For some of the**

identified risks, the actuary has provided a quantitative assessment specific to the plan while for other identified risks, the actuary has only provided a generic statement that could apply to any plan. We recommend that for each identified risk the actuary provide an assessment, preferably quantitative, that considers the specific circumstances of the plan.

Response: SERS staff will defer to GRS to respond to this recommendation.

7. **We recommend GRS provide explanation and justification for selecting the Below-Median Income subset for the base mortality table assumptions used in the valuation for retirees and provide justification for selecting the headcount weighted instead of a salary weighted for pre-retirement.**

Response: SERS and GRS will consider providing more comments and mortality assumptions for the next valuation report.

8. **We recommend the SERS Board will continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly, as they did for this valuation.**

Response: The Board of Trustees will continue to annually review the economic assumptions in a timely manner so adjustments to the assumptions will be included in the next valuation.

Please let me know if you would like to further discuss your recommendations or our responses.

Sincerely,

SIGNED ORIGINAL ON FILE

Timothy B. Blair, Executive Secretary
State Employees' Retirement System



December 9, 2022

Board of Trustees
State Employees' Retirement System of Illinois
2101 South Veterans Parkway
P.O. Box 19255
Springfield, IL 62794-9255

Re: Response to State Actuary Report of 2022 — SERS

Dear Members of the Board:

At your request we have reviewed the report issued by Cheiron – The State Actuary's Preliminary Report on the State Employees' Retirement System of Illinois ("SERS") Pursuant to 30 ILCS 5/2-8.1. This report contains a review of the June 30, 2022, actuarial valuation for SERS.

Assessment of Actuarial Assumptions and Methods Used in the 2022 Valuation

The report issued by the State Actuary, Cheiron, indicates that **"In summary, we believe that the assumptions and methods used in the draft June 30, 2022 Actuarial Valuation, which are used to determine the required Fiscal Year 2024 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, were properly calculated in accordance with State law."**

Page 1 of the transmittal letter of the draft GRS Actuarial Valuation report states:

The System's current contribution rate determined under the statutory funding policy may not conform to the Actuarial Standards of Practice. Therefore, the Board adopted an actuarial funding policy to be used to calculate the Actuarially Determined Contribution ("ADC") under GASB Statement Nos. 67 and 68 for financial reporting purposes.

Although the statutory contribution requirements were met, the statutory funding method generates a contribution requirement that is less than a reasonable actuarially determined contribution. Meeting the statutory requirement does not mean that the undersigned agree that adequate actuarial funding has been achieved. We recommend the adherence to a funding policy, such as the Board policy used to calculate the ADC under GASB Statement Nos. 67 and 68, that funds the normal cost of the plan as well as an amortization payment that seeks to pay off any unfunded accrued liability over a closed-period of 25 years.

Board of Trustees
State Employees' Retirement System of Illinois
December 9, 2022
Page 2

State Mandated Funding Method

In **item 1**, the State Actuary recommends that: "funding method be changed to employ a methodology that produces a Reasonable Actuarially Determined Contribution and fully funds plan benefits within a reasonable period. The State Mandated Method is entering a period in which the contribution amount it produces may be reasonable even though the overall methodology is not. This period offers an opportunity to change the methodology to one that is consistent with actuarial standards for a Reasonable Actuarially Determined Contribution (ADC) without significantly affecting the immediate contribution amount. Such a method would set contributions at a level that is expected to prevent the unfunded actuarial liability from growing and remain high enough to reduce the unfunded actuarial liability each year until the plan is ultimately 100% funded within a reasonable period. While the State Mandated Method is inadequate, it will also produce more volatile contribution levels as the remaining period to achieve 90% funding shortens. Consequently, we recommend that the funding method be changed to one that produces more stable contribution requirements while targeting 100% funding within a reasonable period and meets the actuarial standards for a Reasonable ADC. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System."

We agree with the State Actuary's comment on strengthening SERS funding policy. As stated above, a funding policy that finances the normal cost plus the unfunded actuarial liability over a 25-year closed-period would, in our opinion, strengthen the funded status of SERS. However, a change in the funding method and funding policy would require a statutory change.

In **item 2**, the State Actuary recommends that the phase-in period for the impact of assumption changes be reduced to three years since experience studies are performed every three years.

The funding method used in the June 30, 2022, actuarial valuation is prescribed in accordance with Public Act 100-0023 and is not under the actuary or the Board's control; therefore, no action is required. However, we agree with the State Actuary's recommendation.

Recommended Additional Disclosures for the 2022 Valuations

In **item 3**, the State Actuary recommends that GRS explain the causes for consistent losses (9 of the last 10 years) in the retirement decrement assumption.

The retirement experience in Table 3 of the report includes new retirees who were not included in the active member data in the prior year, which results in overall losses. We will move these data losses to a new line item in the 2022 actuarial valuation report.

In **item 4**, the State Actuary recommends that GRS explain the cause of the \$119 million gain noted as "Other" on page 26 of the actuarial report.

The "Other" line item includes gains and losses as a result of non-recurring items such as data changes and differences in payment timing amongst other things. We will consider breaking out the \$119 million gain into additional line items in the 2022 actuarial report.

Board of Trustees
State Employees' Retirement System of Illinois
December 9, 2022
Page 3

Recommended Changes for Future Valuations

In **item 5**, the State Actuary recommends that GRS "explain how each risk identified would reasonably be anticipated to significantly affect the specific plan's future financial condition."

We will consider recommendations from the State Actuary and make changes to the 2023 actuarial valuation report, as appropriate.

In **item 6**, the State Actuary recommends that for each risk that is identified in item 5, GRS provide an assessment, preferably quantitative, that considers the specific circumstances of the plan.

We will consider recommendations from the State Actuary and make changes to the 2023 actuarial valuation report, as appropriate.

In **item 7**, the State Actuary recommends that GRS provide explanation and justification for selecting the Below-Median Income subset for the base mortality table assumptions used in the valuation for retirees and provide justification for selecting the headcount weighted instead of a salary weighted for pre-retirement.

SERS mortality experience matches well with the Below-Median base mortality tables. Please see a detailed review of the mortality assumption in the 2021 Actuarial Experience Study dated July 15, 2022. We will provide more details on our rationale for the assumptions.

In **item 8**, the State Actuary recommends that SERS annually review the economic assumptions prior to commencing the valuation work, and adjust assumptions accordingly.

We agree with the State Actuary's recommendation and will continue to provide the SERS Board, on an annual basis, with information necessary to evaluate all economic assumptions, prior to commencing the valuation process.

Respectfully submitted,

Gabriel, Roeder, Smith & Company

SIGNED ORIGINAL ON FILE

Alex Rivera, FSA, EA, MAAA, FCA
Senior Consultant

SIGNED ORIGINAL ON FILE

Heidi Barry, ASA, MAAA, FCA
Senior Consultant



December 8, 2022

Mr. Joe Butcher
Office of the Auditor General
740 East Ash Street, First Floor
Springfield, IL 62703

Dear Mr. Butcher,

The management of the Judges' Retirement System (JRS) has reviewed the State Actuary's preliminary report on the draft JRS June 30, 2022 Actuarial Valuation, prepared by Gabriel, Roeder, Smith and Company (GRS). The report notes the State Actuary (Cheiron) believes **"the assumptions and methods used in the draft June 30, 2022 Actuarial Valuation, which are used to determine the required Fiscal Year 2024 State contribution, are reasonable."** In addition, Cheiron found **"the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, were properly calculated in accordance with State law."**

Cheiron also comments regarding the statutory funding plan that they **"agree with GRS that the statutory mandated minimum funding requirements have been and continue to be inadequate. In addition, the past inadequate funding has resulted in current and future contribution levels, measured as a percent of payroll, to be among the highest in the country. Making adequate contributions in the future to fully fund the system will be challenging."**

Listed are Cheiron's recommendations and JRS management's responses to those recommendations. In addition, attached are the GRS responses to the recommendations.

State Mandated Funding Method

- 1. We recommend that the funding method be changed to employ a methodology that produces a Reasonable Actuarially Determined Contribution and fully funds plan benefits within a reasonable period. The State Mandated Method is entering a period in which the contribution amount it produces may be reasonable even though the overall methodology is not. This period offers an opportunity to change the methodology to one that is consistent with actuarial standards for a Reasonable Actuarially Determined Contribution (ADC) without significantly affecting the immediate contribution amount. Such a method would set contributions at a level that is expected to prevent the unfunded liability from growing and remain high enough to reduce the unfunded actuarial liability each year until the plan is ultimately 100% funded within a reasonable period. While the State Mandated Method is inadequate, it will also produce more volatile contribution levels as the remaining period to achieve 90% funding shortens. Consequently, we recommend that the funding method be changed to one that produces**

more stable contribution requirements while targeting 100% funding within a reasonable period and meets the actuarial standards for a Reasonable ADC. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

Response: The JRS Board of Trustees agrees with recommendation and in 2015 adopted a funding policy that provides for annual State contributions equal to the projected normal cost of benefits earned in a year plus an amount to amortize the unfunded liabilities over 25 years as a level percent of payroll. This amount is considered the "Actuarially Determined Contribution" (ADC) and for informational purposes is included in the actuarial valuation and the annual certifications of the required State contribution.

- 2. Because experience studies are performed every three years, we recommend that the phase-in period for the impact of assumption changes be reduced to no longer than three years. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.**

Response: The JRS Board of Trustees agrees with the recommendation.

Recommended Additional Disclosures for 2022 Valuation

- 3. We continue to recommend that GRS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g. membership declines, lower salary growth) can have on future State costs. In particular, the tests should illustrate the potential stresses on the System and its contributing sponsors so that an assessment of sustainability can be made. These stress tests should include the impact to the required State contribution of potential reductions in the discount rate. GRS did not include stress testing in this year's valuation report. In 2021, GRS also didn't include stress testing in their initial report which Cheiron reviewed, but they did include stress testing in a final report submitted on December 21, 2021. We recommend that the final 2022 report include the stress testing.**

Response: Stress testing will be included in the final FY 22 valuation.

Recommended Changes for Future Valuations

- 4. Section 3.2 of ASOP 51 requires the actuary to identify risks that "may reasonably be anticipated to significantly affect the plan's future financial condition." The risks currently identified appear to largely duplicate the list of examples in ASOP 51 and could apply to almost any pension plan. In future valuations, we recommend that the actuary explain how each risk identified would reasonably be anticipated to significantly affect the specific plan's future financial condition.**

Response: JRS staff will defer to GRS to respond to this recommendation.

5. **For each risk identified above, Section 3.3 of ASOP 51 requires the actuary to provide an assessment that takes into account “circumstances specific to the plan.” For some of the identified risks, the actuary has provided a quantitative assessment specific to the plan while for other identified risks, the actuary has only provided a generic statement that could apply to any plan. We recommend that for each identified risk the actuary provide an assessment, preferably quantitative, that considers the specific circumstances of this plan.**

Response: JRS staff will defer to GRS to respond to this recommendation.

6. **We recommend the JRS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly, as they did for this valuation.**

Response: The Board of Trustees will continue to annually review the economic assumptions in a timely manner so adjustments to the assumptions will be included in the next valuation.

Please let me know if you would like to further discuss your recommendations or our responses.

Sincerely,

SIGNED ORIGINAL ON FILE

Timothy B. Blair, Executive Secretary
Judges' Retirement System



December 8, 2022

Board of Trustees
Judges' Retirement System of Illinois
2101 South Veterans Parkway
P.O. Box 19255
Springfield, Illinois 62794-9255

Re: Response to State Actuary Report of 2022 — JRS

Dear Members of the Board:

At your request, we have reviewed the report issued by Cheiron – The State Actuary's Preliminary Report on the Judges' Retirement System of Illinois ("JRS") Pursuant to 30 ILCS 5/2-8. This report contains a review of the June 30, 2022, actuarial valuation for JRS.

Assessment of Actuarial Assumptions and Methods Used in the 2022 Valuation

The report issued by the State Actuary, Cheiron, indicates that **"In summary, we believe that the assumptions and methods used in the draft June 30, 2022 Actuarial Valuation, which are used to determine the required Fiscal Year 2024 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, were properly calculated in accordance with State law."**

Page 1 of the transmittal letter of the draft GRS Actuarial Valuation report states:

The System's current contribution rate determined under the statutory funding policy may not conform to the Actuarial Standards of Practice. Therefore, the Board adopted an actuarial funding policy to be used to calculate the Actuarially Determined Contribution ("ADC") under GASB Statement Nos. 67 and 68 for financial reporting purposes.

Although the statutory contribution requirements were met, the statutory funding method generates a contribution requirement that is less than a reasonable actuarially determined contribution. Meeting the statutory requirement does not mean that the undersigned agree that adequate actuarial funding has been achieved. We recommend the adherence to a funding policy, such as the Board policy used to calculate the ADC under GASB Statement Nos. 67 and 68, that funds the normal cost of the plan as well as an amortization payment that seeks to pay off any unfunded accrued liability over a closed-period of 25 years.

Board of Trustees
Judges' Retirement System of Illinois
December 8, 2022
Page 2

State Mandated Funding Method

In **item 1**, the State Actuary recommends that: "the funding method be changed to employ a methodology that produces a Reasonable Actuarially Determined Contribution and fully funds plan benefits within a reasonable period. The State Mandated Method is entering a period in which the contribution amount it produces may be reasonable even though the overall methodology is not. This period offers an opportunity to change the methodology to one that is consistent with actuarial standards for a Reasonable Actuarially Determined Contribution (ADC) without significantly affecting the immediate contribution amount. Such a method would set contributions at a level that is expected to prevent the unfunded actuarial liability from growing and remain high enough to reduce the unfunded actuarial liability each year until the plan is ultimately 100% While the State Mandated Method is inadequate, it will also produce more volatile contribution levels as the remaining period to achieve 90% funding shortens. Consequently, we recommend that the funding method be changed to one that produces more stable contribution requirements while targeting 100% funding within a reasonable period and meets the actuarial standards for a Reasonable ADC. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System."

We agree with the State Actuary's comment on strengthening JRS funding policy. As stated above, a funding policy that finances the normal cost plus the unfunded actuarial liability over a 25-year closed-period would, in our opinion, strengthen the funded status of JRS. However, a change in the funding method and funding policy would require a statutory change.

In **item 2**, the State Actuary recommends that the phase-in period for the impact of assumption changes be reduced to three years since experience studies are performed every three years.

The funding method used in the June 30, 2022, actuarial valuation is prescribed in accordance with Public Act 100-0023 and is not under the actuary or the Board's control; therefore, no action is required. However, we agree with the State Actuary's recommendation.

Recommended Additional Disclosures for the 2022 Valuation

In **item 3**, the State Actuary recommends that the actuarial valuation report include a section with stress testing information.

Stress testing for JRS will be performed prior to the completion of the final valuation report. The stress testing analysis includes scenarios with significant market downturn or significant volatility in investment returns and volatility in future System participation. Stress testing, if done completely and properly, can provide useful information on the level of statutory contributions and funded position of the System under adverse economic conditions. The Stress Test letter will be included in the appendix of the final June 30, 2022, actuarial valuation report.

Board of Trustees
Judges' Retirement System of Illinois
December 8, 2022
Page 3

Recommended Changes for Future Valuations

In **item 4**, the State Actuary recommends that GRS "explain how each risk identified would reasonably be anticipated to significantly affect the specific plan's future financial condition."

We will consider recommendations from the State Actuary make changes to the 2023 actuarial valuation report, as appropriate.

In **item 5**, the State Actuary recommends that for each risk that is identified in item 4, GRS provide an assessment, preferably quantitative, that considers the specific circumstances of the plan.

We will consider recommendations from the State Actuary make changes to the 2023 actuarial valuation report, as appropriate.

In **item 6**, the State Actuary recommends that JRS annually review the economic assumptions prior to commencing the valuation work, and adjust assumptions accordingly.

We agree with the State Actuary's recommendation and will continue to provide the GARS Board, on an annual basis, with information necessary to evaluate all economic assumptions, prior to commencing the valuation process.

Respectfully submitted,

Gabriel, Roeder, Smith & Company

SIGNED ORIGINAL ON FILE

Alex Rivera, FSA, EA, FCA, MAAA
Senior Consultant

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Heidi G. Barry, ASA, FCA, MAAA
Senior Consultant

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Jeffrey T. Tebeau, FSA, EA, FCA, MAAA
Consultant



December 6, 2022

Mr. Joe Butcher
Office of the Auditor General
740 East Ash Street, First Floor
Springfield, IL 62703

Dear Mr. Butcher,

The management of the General Assembly Retirement System (GARS) has reviewed the State Actuary's preliminary report on the draft GARS June 30, 2022 Actuarial Valuation, prepared by Gabriel, Roeder, Smith and Company (GRS). The report notes the State Actuary (Cheiron) believes **"the assumptions and methods used in the draft June 30, 2022 Actuarial Valuation, which are used to determine the required Fiscal Year 2024 State contribution, are reasonable."** In addition, Cheiron found **"the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, were properly calculated in accordance with State law."**

Cheiron also comments regarding the statutory funding plan that they **"agree with GRS that the statutory mandated minimum funding requirements have been inadequate. In addition, the past inadequate funding has resulted in current and future contribution levels, measured as a percent of payroll, to be among the highest in the country."**

Listed are Cheiron's recommendations and GARS management's responses to those recommendations. In addition, attached are the GRS responses to the recommendations.

State Mandated Funding Method

- 1. We recommend that the funding method be changed to employ a methodology that produces a Reasonable Actuarially Determined Contribution and fully funds plan benefits within a reasonable period. The State Mandated Method is entering a period in which the contribution amount it produces may be reasonable even though the overall methodology is not. This period offers an opportunity to change the methodology to one that is consistent with actuarial standards for a Reasonable Actuarially Determined Contribution (ADC) without significantly affecting the immediate contribution amount. Such a method would set contributions at a level that is expected to prevent the unfunded liability from growing and remain high enough to reduce the unfunded actuarial liability each year until the plan is ultimately 100% funded within a reasonable period. While the State Mandated Method is inadequate, it will also produce more volatile contribution levels as the remaining period to achieve 90% funding shortens. Consequently, we recommend that the funding method be changed to one that produces more stable contribution requirements while targeting 100% funding within a reasonable**

period and meets the actuarial standards for a Reasonable ADC. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.

Response: The GARS Board of Trustees agrees with recommendation and in 2015 adopted a funding policy that provides for annual State contributions equal to the projected normal cost of benefits earned in a year plus an amount to amortize the unfunded liabilities over 20 years as a level percent of payroll. This amount is considered the “Actuarially Determined Contribution” (ADC) and for informational purposes is included in the actuarial valuation and the annual certifications of the required State contribution.

- 2. Because experience studies are performed every three years, we recommend that the phase-in period for the impact of assumption changes be reduced to no longer than three years. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.**

Response: The GARS Board of Trustees agrees with the recommendation.

Recommended Additional Disclosures for 2022 Valuation

- 3. We continue to recommend that GRS include stress testing of the System within the valuation report and include a thorough explanation of the implications that volatile investment returns and a variety of other stressors (e.g. membership declines, lower salary growth) can have on future State costs. In particular, the tests should illustrate the potential stresses on the System and its contributing sponsors so that an assessment of sustainability can be made. GRS did not include stress testing in this year’s draft valuation report. In the past few years, GRS also didn’t include stress testing in their initial report which Cheiron reviewed, but they did include stress testing in the final report. We recommend that the final 2022 report include the stress testing.**

Response: Stress testing will be included in the final FY 22 valuation.

- 4. We recommend that GRS disclose the retirement age assumption for deferred vested members.**

Response: GARS staff will defer to GRS to respond to this recommendation.

- 5. We recommend GRS disclose whether members who leave active employment are assumed to elect a deferred annuity or a refund of contributions.**

Response: GARS staff will defer to GRS to respond to this recommendation.

Recommended Changes for Future Valuations

- 6. Section 3.2 of ASOP 51 requires the actuary to identify risks that “may reasonably be anticipated to significantly affect the plan’s future financial condition.” The risks currently identified appear to largely duplicate the list of examples in ASOP 51 and could**

apply to almost any pension plan. In future valuations, we recommend that the actuary explain how each risk identified would reasonably be anticipated to significantly affect the specific plan's future financial condition.

Response: GARS staff will defer to GRS to respond to this recommendation.

- 7. For each risk identified above, Section 3.3 of ASOP 51 requires the actuary to provide an assessment that takes into account "circumstances specific to the plan." For some of the identified risks, the actuary has provided a quantitative assessment specific to the plan while for other identified risks, the actuary has only provided a generic statement that could apply to any plan. We recommend that for each identified risk the actuary provide an assessment, preferably quantitative, that considers the specific circumstances of this plan.**

Response: GARS staff will defer to GRS to respond to this recommendation.

- 8. We recommend that GRS consider the number of general assembly members that are in the defined contribution plan when projecting the ultimate number of active members in GARS. Since there are 177 members of the Illinois general assembly (59 state senators and 118 state representatives), we would anticipate an ultimate GARS active population of 97, based on GRS' assumption that 55% of new members elect the defined benefit plan and 45% elect the defined contribution plan. In addition, we recommend that GRS include annual opt-out data in the Active Membership table shown on page 11 of the Actuarial Valuation.**

Response: GARS staff will defer to GRS to respond to this recommendation.

- 9. We recommend GRS expand the participation data section to include average pay and service for active members and information on inactive members owed a benefit in the future. In addition, a reconciliation of changes in member status from the prior year to the current year would improve the user's understanding of membership changes.**

Response: GARS staff will defer to GRS to respond to this recommendation.

- 10. We recommend that GRS consider the average retirement age when reviewing the retirement assumption in the next experience study. The average retirement age in the 2021 experience study was 64.4 and it was 65.5 in the 2018 experience study. The recommended retirement rates in the 2021 experience study would have resulted in an average retirement age of 68.1.**

Response: GARS staff will defer to GRS to respond to this recommendation.

- 11. We recommend that GRS review the retirement age experience for deferred vested members in the next experience study.**

Response: GARS staff will defer to GRS to respond to this recommendation.

- 12. We recommend the GARS Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly, as they did for this valuation.**

Response: The Board of Trustees will continue to annually review the economic assumptions in a timely manner so adjustments to the assumptions will be included in the next valuation.

Please let me know if you would like to further discuss your recommendations or our responses.

Sincerely,

SIGNED ORIGINAL ON FILE

Timothy B. Blair, Executive Secretary
General Assembly Retirement System



December 8, 2022

Board of Trustees
General Assembly Retirement System of Illinois
2101 South Veterans Parkway
P.O. Box 19255
Springfield, IL 62794-9255

Re: Response to State Actuary Report of 2022 — GARS

Dear Members of the Board:

At your request, we have reviewed the report issued by Cheiron – The State Actuary's Preliminary Report on the General Assembly Retirement System of Illinois ("GARS") Pursuant to 30 ILCS 5/2-8.1. This report contains a review of the June 30, 2022, actuarial valuation for GARS.

Assessment of Actuarial Assumptions and Methods Used in the 2022 Valuation

This report issued by the State Actuary, Cheiron, indicates that **"In summary, we believe that the assumptions and methods used in the draft June 30, 2022 Actuarial Valuation, which are used to determine the required Fiscal Year 2024 State contribution, are reasonable. We also find that the certified contributions, notwithstanding the inadequate State funding requirements that do not conform to generally accepted actuarial principles and practices, were properly calculated in accordance with State law."**

Page 1 of the transmittal letter of the draft GRS Actuarial Valuation report states:

The System's current contribution rate determined under the statutory funding policy may not conform to the Actuarial Standards of Practice. Therefore, the Board adopted an actuarial funding policy to be used to calculate the Actuarially Determined Contribution ("ADC") under GASB Statement Nos. 67 and 68 for financial reporting purposes.

Although the statutory contribution requirements were met, the statutory funding method generates a contribution requirement that is less than a reasonable actuarially determined contribution. Meeting the statutory requirement does not mean that the undersigned agree that adequate actuarial funding has been achieved. We recommend the adherence to a funding policy, such as the Board policy used to calculate the ADC under GASB Statement Nos. 67 and 68, that funds the normal cost of the plan as well as an amortization payment that seeks to pay off any unfunded accrued liability over a closed period of 20 years.

Board of Trustees
General Assembly Retirement System of Illinois
December 8, 2022
Page 2

State Mandated Funding Method

In **item 1**, the State Actuary recommends that: “the funding method be changed to employ a methodology that produces a Reasonable Actuarially Determined Contribution and fully funds plan benefits within a reasonable period. The State Mandated Method is entering a period in which the contribution amount it produces may be reasonable even though the overall methodology is not. This period offers an opportunity to change the methodology to one that is consistent with actuarial standards for a Reasonable Actuarially Determined Contribution (ADC) without significantly affecting the immediate contribution amount. Such a method would set contributions at a level that is expected to prevent the unfunded actuarial liability from growing and remain high enough to reduce the unfunded actuarial liability each year until the plan is ultimately 100% funded within a reasonable period. While the State Mandated Method is inadequate, it will also produce more volatile contribution levels as the remaining period to achieve 90% funding shortens. Consequently, we recommend that the funding method be changed to one that produces more stable contribution requirements while targeting 100% funding within a reasonable period and meets the actuarial standards for a Reasonable ADC. However, we understand that changing the funding method is under the jurisdiction of State law and not the Retirement System.”

We agree with the State Actuary's comment on strengthening GARS funding policy. As stated above, a funding policy that finances the normal cost plus the unfunded actuarial liability over a 20-year closed period would, in our opinion, strengthen the funded status of GARS. However, a change in the funding method and funding policy would require a statutory change.

In **item 2**, the State Actuary recommends that the phase-in period for the impact of assumption changes be reduced to three years since experience studies are performed every three years.

The funding method used in the June 30, 2022, actuarial valuation is prescribed in accordance with Public Act 100-0023 and is not under the actuary or the Board's control; therefore, no action is required. However, we agree with the State Actuary's recommendation.

Recommended Additional Disclosures for the 2022 Valuation

In **item 3**, the State Actuary recommends that the actuarial valuation report include a section with stress testing information.

Stress testing for GARS will be performed prior to the completion of the final valuation report. The stress testing analysis includes scenarios with significant market downturn or significant volatility in investment returns and volatility in future System participation. Stress testing, if done completely and properly, can provide useful information on the level of statutory contributions and funded position of the System under adverse economic conditions. The Stress Test letter will be included in the appendix of the final June 30, 2022, actuarial valuation report.

Board of Trustees
General Assembly Retirement System of Illinois
December 8, 2022
Page 3

In **item 4**, the State Actuary recommends that GRS disclose the retirement age assumption for deferred vested members.

We will disclose the retirement age assumption for deferred vested members in the final June 30, 2022 report.

In **item 5**, the State Actuary recommends that GRS disclose whether members who leave active employment are assumed to elect a deferred annuity or a refund of contributions.

We will disclose our assumption regarding whether members who leave active employment are assumed to elect a deferred annuity or a refund of contributions in the final June 30, 2022 report.

Recommended Changes for Future Valuations

In **item 6**, the State Actuary recommends that GRS “explain how each risk identified would reasonably be anticipated to significantly affect the specific plan’s future financial condition.”

We will consider recommendations from the State Actuary and make changes to the 2023 actuarial valuation report, as appropriate.

In **item 7**, the State Actuary recommends that for each risk that is identified in item 6, GRS provide an assessment, preferably quantitative, that considers the specific circumstances of the plan.

We will consider recommendations from the State Actuary and make changes to the 2023 actuarial valuation report, as appropriate.

In **item 8**, the State Actuary recommends that “GRS consider the number of general assembly members that are in the defined contribution plan when projecting the ultimate number of active members in GARS. Since there are 177 members of the Illinois general assembly (59 state senators and 118 state representatives), we would anticipate an ultimate GARS active population of 97, based on GRS’ assumption that 55% of new members elect the defined benefit plan and 45% elect the defined contribution plan. In addition, we recommend that GRS include annual opt-out data in the Active Membership table shown on page 11 of the Actuarial Valuation.”

This assumption deals strictly with individuals entering the legislature or a statewide office prospectively, and such percentage rate is set at the enrollment rate that GARS is currently experiencing. Although the State (Central Management Services) administers a deferred compensation plan/457B plan, which legislators and Statewide elected officials are eligible to participate in, that plan is separate from GARS. The System contends that the utilization of that program by such individuals who are otherwise eligible for GARS would have no impact on the assumed and actual enrollment in GARS.

Board of Trustees
General Assembly Retirement System of Illinois
December 8, 2022
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In **item 9**, the State Actuary recommends that GRS expand the participant data section to include average pay and service for active members and information on inactive members owed a benefit in the future. In addition, a reconciliation of changes in member status from the prior year to the current year would improve the user's understanding of membership changes.

We will consider recommendations from the State Actuary and make changes to the 2023 actuarial valuation report, as appropriate.

In **item 10**, the State Actuary recommends that GRS consider the average retirement age when reviewing the retirement assumption in the next experience study.

We will consider recommendations from the State Actuary and review and make changes in the next regularly scheduled experience study covering the period from July 1, 2021 through June 30, 2024, as appropriate.

In **item 11**, the State Actuary recommends that GRS review the retirement age experience for deferred vested members in the next experience study.

We will consider recommendations from the State Actuary and review and make changes in the next regularly scheduled experience study covering the period from July 1, 2021 through June 30, 2024, as appropriate.

In **item 12**, the State Actuary recommends that GARS annually review the economic assumptions prior to commencing the valuation work, and adjust assumptions accordingly.

We agree with the State Actuary's recommendation and will continue to provide the GARS Board, on an annual basis, with information necessary to evaluate all economic assumptions, prior to commencing the valuation process.

Respectfully submitted,

Gabriel, Roeder, Smith & Company

SIGNED ORIGINAL ON FILE

Alex Rivera, FSA, EA, MAAA, FCA
Senior Consultant

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Heidi Barry, ASA, MAAA, FCA
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Jeff Tebeau, FSA, EA, MAAA
Consultant



425 S. Financial Place, Suite 1400 | Chicago, IL 60605-1000

December 7, 2022

Mr. Frank Mautino
Auditor General
740 East Ash Street
Springfield, Illinois 62703-3154

Mr. Joe Butcher
Audit Manager
Illinois Office of the Auditor General
740 E. Ash Street-3154
Springfield, Illinois 62703

Mr. Gene Kalwarski
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200 West Monroe Street, Suite 1800
Chicago, Illinois 60606

Mr. Mike Noble
Principal Consulting Actuary
Cheiron, Inc.
200 West Monroe, Suite 1800
Chicago, Illinois 60606

RE: Response to the State Actuary's Draft Preliminary Report on the Public School Teachers' Pension and Retirement Fund of Chicago Pursuant to Illinois Public Act 100-0465 Regarding Gabriel, Roeder, Smith & Company's Draft June 30, 2022 Actuarial Valuation

This letter and attachment from Gabriel, Roeder, Smith & Company ("GRS") serves as formal notice of the response of the Public School Teachers' Pension and Retirement Fund of Chicago ("CTPF" or the "Fund") to the State Actuary's Draft "Preliminary Report on the Public School Teachers' Pension and Retirement Fund of Chicago Pursuant to Illinois Public Act 100-0465 Regarding Gabriel, Roeder, Smith & Company's Draft June 30, 2022 Actuarial Valuation.

The State Actuary's Recommendations and Report Comment are set out, below:

1. We recommend that GRS continue to include stress testing of the System within the valuation report and that future stress testing include the impact to the required State contribution of reductions in the discount rate.
2. We recommend the CTPF Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly, as they did for this valuation

Report Comment for CTPF Consideration:

1. Actuarial Cost Method

The System uses the projected unit credit cost method (PUC) to assign costs to years of service, as required under the Pension Code (40 ILCS 5/17). **We have no objections with respect to using the PUC method, although we, as GRS does, would prefer the Entry Age Normal (EAN) cost method as it is more consistent with the requirement in 40 ILCS 5/17-129 for level percent of pay funding.**

Under the PUC method, which is used by some public sector pension funds, the benefits of active participants are calculated based on their compensation projected with assumed annual increases to ages at which they are assumed to leave the active workforce by any of these causes: retirement, disability, turnover, or death. Only past service (through the valuation date but not beyond) is taken into account in calculating these benefits. The cost of providing benefits based on past service and future compensation is the actuarial accrued liability for a given active participant. Under the PUC cost method, the value of an active participant's benefits tends to increase more sharply over his or her later years of service than over his or her earlier ones. As a result of this pattern of benefit value increasing, while the PUC method is not an unreasonable method, more plans use the EAN cost method to mitigate this effect. It should also be noted that the EAN cost method is the required method to calculate liability for GASB 67 & GASB 68.

While there is concern over the mandated funding method conforming to generally acceptable actuarial principles and practices, the State's obligation to fund CTPF is limited to payment of the future normal cost plus expenses and a health care subsidy. Consequently, we have not reviewed the asset valuation method, the amortization method, or the projection of the unfunded actuarial liability.

The two report recommendations will be approved by the CTPF Board of Trustees at the December 15, 2022, Board of Trustees meeting. GRS will be directed by CTPF to continue in future stress testing to present separately the impact to the required State contribution and any potential for additional funding subsidies from the State. The Board and GRS will continue to annually review the economic assumptions (interest rate and inflation) utilized in the valuation report prior to the preparation of the report and adjust them accordingly. In addition, as to the Report Comment, the CTPF Board appreciates and supports the effort by the State Actuary to improve the financial condition of the Fund as demonstrated by the call for using a more appropriate statutory actuarial cost method.

If you have any questions, please do not hesitate to contact me at 312-332-3338.

Best regards,

SIGNED ORIGINAL ON FILE

Carlton W. Lenoir Sr.
Executive Director

Enclosure
Cc: (with enclosure)

Lance Weiss – GRS, CTPF Actuary
Alise White – CTPF, Chief Financial Officer
Daniel Hurtado – CTPF, Chief Legal Officer



December 2, 2022

Board of Trustees
Public School Teachers' Pension and Retirement Fund of Chicago
425 South Financial Place, Suite 1400
Chicago, Illinois 60605

Re: Response to 2022 State Actuary Preliminary Report

Dear Members of the Board:

In accordance with your request, we have reviewed the State Actuary's Preliminary Report (dated December 1, 2022) on the Public School Teachers' Pension and Retirement Fund of Chicago ("CTPF"), pursuant to Illinois Public Act 100-0465. This preliminary report consists of a review of the June 30, 2022 actuarial valuation prepared by Gabriel, Roeder, Smith & Company ("GRS").

We are very pleased that this report, issued by the State Actuary, Cheiron, states **"In summary, we believe that the assumptions and methods used in the draft June 30, 2022 Actuarial Valuation, which are used to determine the required Fiscal Year 2024 State contribution, are reasonable. We also find that the certified portion of the contribution which the State is responsible for was properly calculated."**

Cheiron had the following two recommendations:

Recommended Changes for Future Valuations

1. We recommend that GRS continue to include stress testing of the System within the valuation report, including the impact to the required State contribution of potential reductions in the discount rate.

GRS RESPONSE: GRS performed stress testing of the State and Board of Education contributions and funded ratio. Such stress testing was included in the June 30, 2022 actuarial report.

GRS believes this recommendation is reasonable and, with the Board's concurrence, we will continue to perform stress testing of the System and include it in the valuation report.

2. We recommend the CTPF Board continue to annually review the economic assumptions (interest rate and inflation) prior to commencing the valuation work and adjust assumptions accordingly, as they did for this valuation.

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GRS RESPONSE: GRS prepared a 2022 Actuarial Assumptions Study in September of 2022 that reviewed the following assumptions:

- Price inflation;
- Investment return;
- Retirement; and
- Projected future active members.

GRS believes this recommendation is reasonable and, with the Board's concurrence, we will continue to work with the Board to annually review these same assumptions prior to commencing the valuation work.

Sincerely,

Gabriel, Roeder, Smith & Company

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Lance J. Weiss, EA, FCA, MAAA
Senior Consultant and Team Leader

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Amy Williams, ASA, FCA, MAAA
Senior Consultant

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Cassie Rapoport, ASA, MAAA
Senior Analyst

LJW/AW/CR:dj

cc: Kristen Brundirks, Gabriel, Roeder, Smith & Company