# Pennsylvania State Employees' Retirement System

## Actuarial Audit Report

December 31, 2023

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July 16, 2025

Pennsylvania State Employees' Retirement System
SERS Audit, Risk and Compliance Committee and
State Employees' Retirement Board

Dear Committee and Board Members:

Gabriel, Roeder, Smith & Company (GRS) is pleased to present this report of an Audit of the December 31, 2023 Actuarial Valuation of the Pennsylvania State Employees' Retirement System (SERS). We are grateful to the SERS Staff for their cooperation throughout the Audit process. In addition, we wish to thank Craig Graby and Erika Mitchell of Korn Ferry (the retained actuary) for their assistance with this project.

The Actuarial Audit has several related objectives:

- Review assumptions and methods used in the valuation;
- Verify the demographic data through independent collection and processing;
- Express an actuarial opinion regarding the reasonableness and/or accuracy of valuation results based upon an independent full replication of the retained actuary's work product; and
- Replicate the shared risk calculation prepared for December 31, 2023 and December 31, 2022.

The Audit was performed under the supervision of Bonita Wurst and Jim Anderson. In our opinion, the retained actuary's work provides a reasonable assessment of the actuarial position of the SERS based upon the assumptions and methods employed. We are pleased to report that we have found no substantial errors or omissions in the retained actuary's work. Our main findings are summarized in Section VI of this report.

Throughout this report, the reader will note items where GRS sees things differently than the retained actuary. Indeed, our mission is to point out such items. In interpreting our recommendations and suggestions, SERS should be aware that while we are pointing out sources of difference, we agree with the retained actuary on the vast majority of items reviewed.

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. To the best of our knowledge, this report is complete and accurate and was made in accordance with standards of practice promulgated by the Actuarial Standards Board.

The undersigned actuaries are independent of the plan sponsor. GRS' work on the audit was independent, unbiased, and in accordance with the Actuarial Code of Professional Conduct, including Precept 7 related to any conflicts of interest.

Bonita J. Wurst and James D. Anderson are Members of the American Academy of Actuaries (MAAA), and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

Respectfully submitted,
Gabriel, Roeder, Smith & Company

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# SECTION I

## INTRODUCTION

# Introduction

The Pennsylvania State Employees' Retirement System (SERS) issued a Request for Proposal (RFP) for an audit of the December 31, 2023 actuarial valuation of SERS performed by Korn Ferry (the retained actuary). Gabriel, Roeder, Smith & Company (GRS) responded to the RFP and was awarded the work. The work commenced on March 14, 2025.

An actuarial audit involves a review of the retained actuary's work by an independent actuarial firm. The purpose of this audit was to provide an evaluation sufficient to allow GRS to express an actuarial opinion regarding the reasonableness and/or accuracy of valuation results, actuarial assumptions, and actuarial methods in accordance with generally recognized and accepted actuarial principles and practices.

The scope of service for this audit was the following:

1. Mathematical modeling audit to replicate the calculation of the complete actuarial funding valuation including the funded ratio.
2. Review the methods of all economic assumptions, including the interest and inflation rates and salary growth assumptions, prior to commencing the replication work.
3. Assess the current practice utilized for phase-in periods for assumption changes that are made.
4. Assess compliance with ASOP 51 (assessment and disclosure of risk) and determine if any recommendations to make disclosures are necessary.
5. Assess the methodology utilized to develop the demographic assumptions, including but not limited to mortality rates, disability rates, salary increases, and termination rates.
6. Examine and calculate the valuation schedules including but not limited to the "Schedules of Active Member Valuation Data", "Solvency Test", "Analysis of Financial Experience", "Schedule of Funding Progress", and "History and Projection of Contribution Rates and Funded Ratios."*
7. Replicate the shared risk calculation prepared for December 31, 2023, and December 31, 2022.
8. Validate that the December 31, 2023, actuarial valuation was in compliance with the parameters set by Actuarial Standards of Practice.
9. Validate that the procedures used by Korn Ferry are reasonable and consistent with all applicable laws, Board policies and generally accepted actuarial principles and practices. Validate that the December 31, 2023, actuarial valuation is in compliance with the ASOP 4 disclosure requirements effective for reports issued on or after February 15, 2023. Specifically, the Plan's investment portfolio risk assessments, disclosures of employer contributions and investment gain/loss analyses.
10. At the completion of the Project, draft a report as to the results of the audit to be reviewed by SERS' management and Korn Ferry. This review will allow SERS' management and/or Korn Ferry to respond to any recommendations that are made. The finalized report is then to be presented to the Audit, Risk and Compliance Committee.

** Note that review of the "History and Projection of Contribution Rates and Funded Ratios" exhibit was removed from the scope of services in an email from SERS dated June 3, 2025.*

In connection with the audit, we requested and received the following items from SERS:

1. Statutes for SERS.
2. Member handbooks.
3. Board policy and rule books (to the extent they interpret how benefits are to be determined).
4. Other documents that may control benefit determinations (such as legal opinions, attorney general rulings, employee contracts, lawsuit decisions, benefit calculation algorithms, or examples that may have been created for SERS' data system, etc.).
5. Descriptions of any special administrative procedures that affect the development of the shared-risk/shared-gain member contributions, in accordance with Act 2010-120 and Act 2017-5.
6. Most recent actuarial audit report.
7. Actuarial valuation presentation materials (if different from the actual valuation reports) presented to the Board (such as handouts or PowerPoint presentations).
8. Most recent projection or risk assessment reports, if any.
9. SERS target asset allocation for each plan and any long-term investment expectations that were developed by SERS asset consultants.
10. The participant data files that were provided to Korn Ferry for the actuarial valuation as of December 31, 2023.
11. A file layout containing the description and location of data items in the participant data files.
12. The financial information that was provided to Korn Ferry for the December 31, 2023 actuarial valuation purposes.

Additionally, we requested and received the following items from Korn Ferry:

1. The final "groomed" data files that were used for the actuarial valuation as of December 31, 2023.
2. Information about the data collection and editing process.
3. A file layout containing the description and location of data items in the "groomed" data files.
4. A description of how part-time employees are handled and valued.
5. An Excel workbook containing a complete listing of the actuarial assumptions used for the actuarial valuations.
6. Information regarding any minor actuarial assumptions not specifically mentioned in the valuation reports, including such items as timing of pay increases and decrements within the year, loads for difficult to value provisions, assumptions regarding missing or improbable data, etc.
7. Descriptions of methods that are not disclosed, approximation techniques and detail for payroll projections and roll-forward calculations.
8. A breakdown of actuarial valuation results by type of decrement corresponding to the December 31, 2023 data.
9. Any intermediate valuation calculations not shown in the report that could aid in the replication valuation.

We also downloaded information from the SERS Website, including actuarial valuation reports and actuarial experience studies.

In order to perform this audit, we used our proprietary actuarial valuation software that is 100% independent of the software that the retained actuary's firm uses.

Users of this report should bear in mind that an actuarial valuation involves a large number of intricate calculations and many individual judgments regarding rather arcane items along the way. Two independently written valuation programs will never agree. For actuarial audit purposes, we generally like to see principal valuation results within 1% to 2% for retired and deferred vested members, and within 5% for active members. For active members, larger differences may be seen for some valuation results. Different valuation systems may allocate costs between the past and the future, and among the various decrements (retirement, disability, turnover, etc.) in a somewhat different manner. In the audit, we concentrate on those differences that we believe are important and do not pursue differences that we believe are the result of minor judgment items.

Although we would perform certain aspects of the actuarial valuation differently than the retained actuary, and would probably arrive at slightly different assumptions and results, we have identified no significant exceptions to the work that we reviewed.

# SECTION II

## REVIEW OF DATA ELEMENTS

# Review of Data Used for Actuarial Valuations

GRS evaluated the data which was used to perform the December 31, 2023 actuarial valuation. The data was independently collected from both SERS and the retained actuary. As is typical with the actuarial valuation process, the retained actuary may "groom" the data into necessary formats for mathematical calculations and make certain adjustments to account for missing or incomplete data. As part of this audit, GRS compared the SERS data with the "groomed" retained actuary data to confirm there were no unexpected or unusual changes in data elements.

From SERS, GRS received three data files: active/inactive member data (labeled "Active Valuation 2023.txt"), retiree member data (labeled "INACTIVE.TXT") and benefit completion plan data (labeled "BCP Payment Data 2023.xlsx"). From the retained actuary, GRS received similar data split between active/inactive members and in-pay (retired) members.

After review of the data, we found that the data supplied by SERS was sufficient to perform the actuarial valuation. The data adjustments GRS observed within the retained actuary's data files were minimal and not unusual for a data set as large as the SERS data. Actuaries commonly adjust data to account for missing or incomplete dates of birth, benefit amounts, etc.

GRS also reviewed the data for compliance with Actuarial Standards of Practice (ASOP) No. 23, which provides guidance to actuaries when selecting, reviewing and performing actuarial analyses based upon data. Please note that this standard does not require the actuary to perform an audit of the data. In our judgment, the retained actuary's use of the data meets the requirements of ASOP 23.

The following pages discuss our observations on the data.

## Active and Inactive Member Data Observations

GRS analyzed the following data fields for reasonableness, in addition to comparing data received from SERS to the retained actuary's supplied data:

- Dates of birth
- Years of active service
- Gender
- Annual salary
- Member contributions (with interest)
- Membership status within SERS

There were no significant differences between the two files. However, we note:

- Inc50 (Non-covered compensation for SSI benefit (Age 50)) and Inc60 (Non-covered compensation for SSI benefit (Age 60)) fields were switched in the retained actuaries data. We have discussed this with the retained actuary and they confirmed that the fields did get switched in the data at some point, and noted that "Only judges and pre-March 1, 1974 hires can have this coverage. There are 376 active and inactive members with something in the non-covered earnings field and 235 are already age 60+. Of the remaining 141, over 2/3rds are within 7 years of age 60. We agree that these should be switched. There is currently a slight overstatement of the liability since only judges can still enter into this benefit and they overwhelmingly work past their normal retirement age and have very low turnover and very low early retirements." We agree with the retained actuary that this results in a slight overstatement in liabilities and is not a material audit finding. We recommend that the retained actuary correct this in their next valuation.

## Retiree Member Data Observations

GRS analyzed the following data fields for reasonableness, in addition to comparing to the retained actuary's supplied data:

- Member and Beneficiary Dates of Birth
- Member and Beneficiary Genders
- Pension Type Elected
- Pension Benefits

There were no significant differences between the data supplied by SERS and the data supplied by the retained actuary.

GRS believes the data provided was sufficient for the required calculations and has no recommendations for changes to the retiree data supplied.

# SECTION III

## REVIEW OF INVESTIGATION OF ACTUARIAL EXPERIENCE AND ACTUARIAL ASSUMPTIONS

# Investigation of Actuarial Experience and Actuarial Assumptions

In this section of the report, we present our analysis of the 19th Investigation of Actuarial Experience prepared by the retained actuary. This study is the basis (i.e., rationale) for the actuarial assumptions that are used for annual actuarial valuation purposes. We present our assessment on the appropriateness of the actuarial assumptions and whether they comply with the following Actuarial Standards of Practice in effect for the reports under review:

(1) Actuarial Standards of Practice (ASOP) No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*; and
(2) ASOP No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*.

At the time the Investigation of Actuarial Experience was completed, ASOP No. 27 had an effective date of September 30, 2014. Since the completion of the investigation of actuarial experience, the Actuarial Standards Board has adopted two updates to ASOP No. 27: the first update has an effective date of August 1, 2021 and was applicable to the December 31, 2023 actuarial valuation; the second update, which combines ASOP No. 27 and ASOP No. 35, has an effective date of January 1, 2025. This audit primarily considers the standard in effect for the December 31, 2023 actuarial valuation.

The actuarial assumption setting process is a combination of art and science. An actuary's professional judgment is a key component in the assumption setting process. Different actuarial consulting firms, and different actuaries within the same firm, may have different thoughts on how some assumptions should be developed.

## Economic Assumptions

Generally, economic and demographic assumptions are reviewed together periodically (e.g., every five years for SERS) in an Investigation of Actuarial Experience. The most recently completed investigation of actuarial experience occurred after completion of the December 31, 2019 valuation in a report dated July 29, 2020. Additionally, the 2023 actuarial report states: "To ensure that the investment return assumption remains appropriate for every actuarial valuation, it is reviewed annually by the SERS actuaries and Board." The SERS Board last updated the investment return assumption with the 2022 valuation. Actuarial assumptions are required to be reasonable at each and every valuation date, and we commend the SERS' actuaries and Board in their annual review of the investment return assumption.

Economic assumptions that the retained actuary reviewed include the following:

(1) Price inflation
(2) Investment return (generally used as the discount rate for public plan valuations)
(3) General salary increases (i.e., the across-the-board portion of salary increases)
(4) Career salary increases

Guidance regarding the selection of economic assumptions for measuring pension obligations is provided by ASOP No. 27. The standard requires that the selected economic assumptions be consistent with each other. For example, the selection of the investment return assumption should be consistent with the selection of the price inflation assumption.

ASOP No. 27 (applicable to valuation dates on or after August 1, 2021) defines a reasonable economic assumption as an assumption that has the following characteristics:

a. It is appropriate for the purpose of the measurement;
b. It reflects the actuary's professional judgment;
c. It takes into account current and historical data that is relevant to selecting the assumption for the measurement date, to the extent such relevant data is reasonably available;
d. It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data (if any), or a combination thereof; and
e. It is expected to have no significant bias (i.e., it is not significantly optimistic or pessimistic), except when provisions for adverse deviation or plan provisions that are difficult to measure are included (as discussed in Section 3.5.1) or when alternative assumptions are used for the assessment of risk, in accordance with ASOP No. 51, *assessment and disclosure of risk associated with measuring pension obligations and determining pension plan contributions*.

In selecting economic assumptions, the actuary may rely upon different experts (e.g., investment consultants) for data and analysis. However, as permitted by ASOP No. 27, "When the actuary is responsible for selecting or giving advice on selecting economic assumptions, the actuary may incorporate economic data and analyses from a variety of other sources, including representatives of the plan sponsor and administrator, investment advisors, economists, and other professionals. However, the selection or advice should reflect the actuary's professional judgment."

**Price Inflation**

Price inflation underlies both the salary increases and investment return assumptions. ASOP No. 27 provides the following guidance when selecting an inflation assumption:

> *The actuary should evaluate appropriate inflation data. These data may include consumer price indices, the implicit price deflator, forecasts of inflation, yields on government securities of various maturities, and yields on nominal and inflation-indexed debt.*

In making their recommendation for the price inflation assumption, the retained actuary considered the following sources:

(1) Past experience
(2) Forecasts of inflation from SERS' investment consultant (Callan)
(3) Social Security projections

A strength of the retained actuary's analysis is that multiple sources of inflation data were considered, including historical data, as well as projections from the Social Security Administration (SSA), and the investment consultant (Callan). This is good practice and shows that the assumption isn't based solely on one source, but a range of reasonable inputs. The rationale could be improved by referencing additional forward-looking sources. Considering more than two sources of forward-looking data would result in a more comprehensive understanding of potential future outcomes.

GRS generally considers the following additional sources of data in the analysis of the price inflation assumption:

(1) Inflation expectations of various Federal Reserve Banks (e.g., Cleveland, St. Louis)
(2) Philadelphia Federal Reserve quarterly survey of Society of Professional Forecasters
(3) Comparison of Treasury yields and Treasury Inflation Protected Securities (TIPS)
(4) Future expectations of the plan's investment consultant and other investment firms that GRS monitors

Another strength of the retained actuary's analysis to note is that the rationale explicitly justifies the decision to lower the assumption from 2.60% to 2.50%, providing a clear reasoning based on both historical trends and recent forecasts. This transparency helps stakeholders understand the reasoning behind the adjustment.

We think the rationale and methodology could be strengthened using guideposts from our Price Inflation Analysis, as detailed below.

GRS Price Inflation Analysis:

Presented below are forward-looking price inflation forecasts that GRS monitors to assist in developing the price inflation assumption. This information is presented as of the end of the fourth quarter of 2023, which is consistent with the December 31, 2023 date of the valuation which we have been asked to audit. Although we recognize this information would not have been available to the retained actuary at the time of the Investigation of Actuarial Experience, we note that assumptions must be reasonable as of each valuation.

| Forward-Looking Price Inflation Forecasts[a] | |
|---|---|
| **Congressional Budget Office**[b] | |
| 5-Year Annual Average | 2.83% |
| 10-Year Annual Average | 2.57% |
| **Federal Reserve Bank of Philadelphia**[c] | |
| 5-Year Annual Average | 2.60% |
| 10-Year Annual Average | 2.40% |
| **Federal Reserve Bank of Cleveland**[d] | |
| 10-Year Expectation | 2.28% |
| 20-Year Expectation | 2.33% |
| 30-Year Expectation | 2.39% |
| **Federal Reserve Bank of St. Louis**[e] | |
| 10-Year Breakeven Inflation | 2.18% |
| 20-Year Breakeven Inflation | 2.42% |
| 30-Year Breakeven Inflation | 2.19% |
| **U.S. Department of the Treasury**[f] | |
| 10-Year Breakeven Inflation | 2.09% |
| 20-Year Breakeven Inflation | 2.37% |
| 30-Year Breakeven Inflation | 2.19% |
| 50-Year Breakeven Inflation | 2.29% |
| 100-Year Breakeven Inflation | 2.36% |
| **Social Security Trustees**[g] | |
| Ultimate Intermediate Assumption | 2.40% |

[a] **End of the Fourth Quarter, 2023**. Version 2024-01-25 by Gabriel, Roeder, Smith & Company.

[b] *The Budget and Economic Outlook: 2023 to 2033*, Release Date: February 2023, Consumer Price Index (CPI-U), Percentage Change from Year to Year, 5-Year Annual Average (2023 - 2027), 10-Year Annual Average (2023 - 2032).

[c] *Fourth Quarter 2023 Survey of Professional Forecasters*, Release Date: November 13, 2023, Headline CPI, Annualized Percentage Points, 5-Year Annual Average (2023 - 2027), 10-Year Annual Average (2023 - 2032).

[d] Inflation Expectations, Model output date: December 1, 2023.

[e] The breakeven inflation rate represents a measure of expected inflation derived from X-Year Treasury Constant Maturity Securities and X-Year Treasury Inflation-Indexed Constant Maturity Securities. Observation date: December, 2023.

[f] The Treasury Breakeven Inflation (TBI) Curve, Monthly Average Rates, December, 2023.

[g] *The 2023 Annual Report of The Board of Trustees of The Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds*, March 31, 2023, p. 10, Key Assumptions and Summary Measures for the Last 65 Years of the Long-Range (75-year) Projection Period, Intermediate, Consumer Price Index (CPI-W).

Because GRS is a benefits consulting firm and does not develop or maintain its own capital market expectations, we monitor forward-looking expectations developed by several major investment firms. For the investment firms that provided capital market assumptions over roughly a 10-year horizon (12 firms), the average forward-looking price inflation assumption is 2.39%. For the investment firms that provided capital market assumptions over a 20- to 30-year horizon (8 firms), the average forward-looking price inflation assumption is 2.53%.

GRS finds that the retained actuary's recommended price inflation assumption of 2.50% is reasonable although a lower assumption would also be reasonable, based upon information available at this time.

**Investment Return**

The investment return assumption is the actuarial assumption that has one of the largest effects on actuarial valuation results. As more of the actuarial accrued liabilities are related to non-active members, the nominal (as opposed to real) investment return assumption becomes an increasingly prominent factor. Since one of most public plans' fundamental financial objectives is the receipt of level contributions over time, the discount rate assumption is set equal to the investment return assumption. In making their recommendation for the investment return assumption, the retained actuary considered the following sources:

(1) Future expectations of the plan's investment consultant
(2) Peer system comparison

We believe that the usefulness of a peer system comparison is somewhat limited because it does not adjust for differences in the asset allocations or liability structures of the various systems in the surveys.

Sources of data that GRS generally considers in the analysis of the investment return assumption include:

(1) Future expectations of the plan's investment consultant
(2) Future expectations of other investment firms that GRS monitors

We believe that the most appropriate analysis to consider in setting the investment return assumption is to model the expected returns using forward-looking capital market assumptions for the SERS target asset allocation. For the investment firms that GRS monitors, 12 firms provided capital market assumptions over roughly a 10-year horizon and 8 investment firms provided capital market assumptions over a 20- to 30-year horizon.

We recognize that there is no "right" answer in deciding which time horizon to use in establishing the investment return assumption. Some will argue that since public plans are long-term investors, 20- to 30-year horizons are more appropriate to use than 10-year horizons for setting the investment return assumption. The retained actuary makes this case in its review of the investment return assumption. While GRS does not believe that longer-term horizons should be ignored, we tend to lean towards using the 10-year horizon expectations for at least the following reasons:

(1) While it is true that public plans are long-term investors, most public plans have significant liability commitments coming due in the next 10 to 15 years.
(2) In many instances, we have seen rationale from investment consultants that indicate that their longer-term capital market assumptions assume a resumption of long-term equilibrium relationships between asset classes (i.e., reversion to the mean).
(3) Many investment consulting firms consider 10-year assumptions to be "long-term."
(4) In many instances, it is difficult to rationalize the differences between the 10-year and 20-year capital market assumptions.
(5) A public employee retirement system that fails to meet its return assumptions for a 10-year period is likely to come under severe pressure to reduce benefits, increase contributions, or both with the effective end result being that promises that were made are not kept.

Using GRS' proprietary Capital Market Assumptions Modeler (CMAM), we determined the expected 10-year return resulting from SERS target asset allocation (results are based upon the price inflation assumption of 2.50% and no netting off for administrative expenses). This information is presented in our 2024 CMAM, which typically reflects the firms' expectations at the beginning of the calendar year, consistent with the December 31, 2023 date of the valuation which we have been asked to audit. Although we recognize this information would not have been available to the retained actuary at the time of the Investigation of Actuarial Experience, we note that assumptions must be reasonable as of each valuation.

**GRS 2024 CMAM**

| Capital Market Assumption Set (CMA) | Distribution of 10-Year Average Geometric Net Nominal Return | | | Probability of Exceeding |
|---|---|---|---|---|
| | 40th | 50th | 60th | 6.875% |
| (1) | (2) | (3) | (4) | (5) |
| 1 | 4.75% | 5.83% | 6.92% | 40.38% |
| 2 | 5.47% | 6.54% | 7.62% | 46.85% |
| 3 | 5.54% | 6.62% | 7.72% | 47.68% |
| 4 | 5.95% | 6.97% | 8.01% | 50.96% |
| 5 | 6.10% | 7.05% | 8.01% | 51.85% |
| 6 | 6.07% | 7.06% | 8.06% | 51.92% |
| 7 | 6.22% | 7.15% | 8.09% | 52.96% |
| 8 | 6.22% | 7.26% | 8.31% | 53.72% |
| 9 | 6.25% | 7.27% | 8.30% | 53.89% |
| 10 | 6.40% | 7.46% | 8.53% | 55.54% |
| 11 | 6.66% | 7.67% | 8.69% | 57.87% |
| 12 | 6.83% | 7.79% | 8.76% | 59.51% |
| **Average** | **6.04%** | **7.06%** | **8.09%** | **51.93%** |

We note that the 50th percentile result of 7.06% in our 2024 CMAM (typically reflecting the firms' expectations at the beginning of the calendar year) compares very favorably to the current assumption of 6.875%. Based upon our analysis, GRS would consider the current investment return assumption of 6.875% to be reasonable for the 2023 valuation.

**General Salary Increase Assumption**

The retained actuary recommended a general salary increase assumption of 2.80%. The rationale provided by the retained actuary was that the real salary growth in the prior valuation was 0.30%, and recommended a consistent real salary growth without further justification as to why 0.30% was appropriate. In the future, we suggest that the retained actuary justify the real salary growth without simply referring to the prior assumption.

We believe that the wage growth assumption of 2.80% is reasonable for the 2023 valuation.

**Career Salary Increase Assumption**

We believe that the development of the career salary increase assumption complies with ASOP No. 27. However, the retained actuary should consider a separate analysis for General vs Non-General members in future studies. In our experience, police officers usually have a different pattern of career salary increases compared to general employees.

## Demographic Assumptions

In general, we believe the demographic assumptions developed in the Investigation of Actuarial Experience comply with ASOP No. 27 and ASOP No. 35, as referenced earlier in this report.

The retained actuary performed separate retirement and withdrawal analyses for different employment groups, which is good practice. However, we note that the retained actuary did not perform a separate analysis for the different employment groups when determining rates of death or disability. In our experience, police officers usually have different rates of death or disability compared to general employees. Given the relatively low incidence of total disabilities, it is possible that there is not enough credible experience to create separate rates for State Police. In future investigation of experience, we recommend that the retained actuary consider a separate analysis for State Police death and disability. In future investigations of experience, we also recommend that the retained actuary consider service-related vs non-service-related disabilities.

With the exception of post-retirement mortality experience, the demographic analysis was performed on a head count basis. In future investigations of experience, with the exception of mortality, we recommend the retained actuary perform the demographic analyses both on a head count and liability-weighted basis, with the liability-weighted experience generally given more credibility than the head count weighted results. We believe this is particularly important for the determination of retirement and termination rates. System costs are generally more responsive to liability movements than to head counts.

In its investigation of service purchases, the retained actuary did not provide numeric detail on the actual service purchase experience during the investigation period. Consequently, we were not able to opine on the reasonability of the assumption. In the future, we recommend that the retained actuary provide numeric detail on the actual service purchase experience.

We suggest that the retained actuary include additional disclosure of any credibility procedures used in the demographic assumption setting process as required by ASOP No. 25, Credibility Procedures.

**Mortality**

For pre-retirement mortality, it appears that the retained actuary created their own set of rates. When publishing the Pub-2010 mortality rates (which were used for post-retirement mortality), the Society of Actuaries (SOA) also provided pre-retirement mortality rates. Since almost no individual system has data with sufficient credibility to create an independent assumption, it has become the industry norm, and our preference, to base pre-retirement mortality on the public sector rates published by the SOA, perhaps with a credibility adjustment. In future studies, we recommend the retained actuary consider the rates published by the SOA when recommending a pre-retirement mortality assumption.

We note that the retained actuaries used benefit-weighted experience when performing its analysis on post-retirement mortality. The use of benefit-weighted experience recognizes that those with higher income have different rates of mortality than those with lower income and is consistent with how the SOA developed the Pub-2010 mortality rates.

In developing the Pub-2010 tables, the SOA provided separate mortality rates based on Public Safety experience vs non-Public Safety experience. The retained actuary only recommended the use of the non-public safety tables in its investigation. Given the relatively large size of State Police in SERS and the separate contribution rates for State Police, we believe that it is appropriate to perform a separate mortality analysis for police officers. In future investigations, we recommend that the retained actuary consider the use of Public Safety mortality tables for public safety employees.

In its investigation, the retained actuary performs significant adjustments to the proposed Pub-2010 tables through the use of age set-forwards. However, the retained actuary has not disclosed any credibility analysis that would justify this level of adjustment to the tables and no specific rationale is given for using a set forward vs a table multiplier. Our preference is to use a mortality credibility procedure (as discussed in the 2017 SOA paper titled “Credibility Educational Resource for Pension Actuaries”). We suggest that in future investigations the retained actuary provide a credibility analysis for the adjustments made to the published mortality tables.

**Actuarial Methods**

Although not discussed in the retained actuary’s investigation of experience, we have included our review of the actuarial methods in this section. In future investigations of actuarial experience, we recommend that the retained actuary discuss the items that follow.

We concur with the decision to use the Entry Age Actuarial Cost Method. This method produces a normal cost that is a level percent of pay and is the most common method used in public employee retirement systems.

When developing the Actuarial Value of Assets (AVA) the retained actuary includes a contribution receivable in the AVA, that is not included in the Market Value of Assets (MVA). Section 3.3(b)(2) of ASOP 44 states that for the AVA “Any differences between the actuarial value of assets and the market value are recognized within a reasonable period of time…”. We recognize that the AVA only includes a half year amortization receivable which would get recognized over half a year, but we are concerned that the AVA and MVA may never match even if all assumptions are met. Although we concur that a contribution

receivable should be considered when calculating the employer contribution, we do not believe it should be included in the AVA, which is used to determine the funded status of the System. Accordingly, we recommend that the retained actuary cease the practice of including the amortization receivable directly in the AVA and only incorporate such contributions in the development of the contribution rates.

Additionally, we recommend that the Board and retained actuary consider the use of a corridor when calculating the AVA to ensure that the actuarial value of assets (before applying a contribution receivable, if any) remains within a certain range from the market value of assets.

With respect to the amortization policy:

- The Board uses 10-year amortization period for benefit changes.
- The amortization period for changes in liability due to experience or assumption changes is 30 years. While we believe that the use of a 30-year level dollar amortization is currently reasonable and agree with the use of level dollar amortization, a period shorter than 30 years would also be reasonable, and in some circles would be preferred.
- When contributions are made based upon a percent of payroll (although calculated as a level dollar amount), it is possible that changes in payroll will result in contribution gains or losses. In order to avoid such losses, we recommend that the retained actuary also calculate a dollar contribution and that the Board consider the dollar contribution as a minimum.

**Miscellaneous Assumptions Not In Investigation**

We recommend that the retained actuary include a discussion of the spouse age difference, and a description of the administrative expense assumption in the next investigation of actuarial experience.

**Actuarial Equivalence Factors**

A review of the assumptions used for actuarial equivalence was outside the scope of this audit. We do agree with the retained actuary that a change in actuarial equivalence factors is not needed following every experience study. We note the retained actuary's statement in its investigation that "… this issue is one that Korn Ferry would like to explore further with SERS in the near future, rather than delay addressing it until the time of the next actuarial experience study." We agree that it would be good practice for the retained actuary and the Board to work together to determine the appropriate path forward.

**Phase-in Periods for Assumption Changes**

We are not aware of any current use of phase-in periods by SERS for assumption changes.

# SECTION IV

## REVIEW OF ANNUAL VALUATION REPORT

# Review of Annual Valuation Report

We believe that the 2023 valuation report is thorough, generally understandable, and the content is appropriate for the intended users. We include some observations based on our current views of the Actuarial Standards of Practice (ASOPs) and trends in the actuarial community. The ASOPs change from time to time. There is a new ASOP in force (ASOP No. 51, Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions) since the last actuarial audit and several of the pension ASOPs are currently under revision. As much as possible, we have restricted our comments about compliance with the ASOPs to the versions in effect as of the valuation date.

## Retained Actuary's Cover Letter

The last paragraph on page 2 of the cover letter states (emphasis added):

> *Based upon the valuation results, it is our opinion that, provided future employer contributions are made in accordance with current law, the Pennsylvania State Employees' Retirement System is, and **will continue to be, adequately funded**, in accordance with generally accepted actuarial principles and procedures. The current funding policy **guarantees** that there are sufficient assets to pay benefits when they come due based on current assumptions.*

We suggest the following changes to this paragraph:

- We believe it would be beneficial to state "… will continue to be, adequately funded **if all assumptions are met (including the employer making contributions in accordance with the funding policy)**."
- We believe the word "guarantee" in this context is too strong. Since the final sentence in this paragraph appears redundant, we suggest its removal.

The second to last paragraph of the cover letter refers to assumptions, "which represent our [retained actuaries] best estimate of anticipated experience under the plan." The ASOPs require assumptions selected by the actuary to be reasonable, but not necessarily best estimates. Best estimate assumptions have specific significance for accounting purposes that may or may not be consistent with the retained actuaries' use of the term. The term "best estimate" also appears on page 68.

We also observe that in the investigation of actuarial experience, the retained actuaries state that, "…a moderately conservative approach – has been used by the SERS Board.", which seems somewhat at odds with the assumptions being the best estimate. Additionally, Section 4.1 l. of ASOP 4 requires "a statement indicating whether, in the actuary's professional judgment, the combined effect of the assumptions … is expected to have no significant bias (i.e., it is not significantly optimistic or pessimistic)…". We suggest the retained actuary include a specific statement stating that the effect of the assumptions is expected to have no significant bias.

Additionally, we suggest that the cover letter define the intended users of the document, the extent to which other may have access to it, and the extent to which others may rely on it, if at all.

## Retained Actuary's Valuation Highlights

Page 1 includes the value of assets and funded status measure, but it does not include the corresponding actuarial accrued liability. We recommend that the retained actuary also disclose the actuarial accrued liability on this page.

Page 12 states that "The current funding policy will eventually restore the funded ratio to 100 percent provided that contributions are made as provided in current law." We recommend that the retained actuary add, "assuming all assumptions are met." to the end of this sentence.

With regard to the participant data, page 14 states that "we have made certain adjustments to the SERS data, including the use of a minimum annual salary assumption of $20,000." ASOP 23 section 4.1 e., requires a disclosure of "…significant steps the actuary has taken to improve the data…". We recommend the retained actuary disclose other steps taken to improve the data. In particular, in our audit, we found that salary is annualized for active members listed with less than (or equal to for certain classes) 1,650 hours of service.

## Retained Actuary's Schedule A – Unfunded Liability and Normal Cost

Row I.A groups Active and Inactive participants. Our preference would be to show Inactive participants in their own category.

Rows I.A1 and VI.A1 of this schedule group the normal retirement and withdrawal liabilities. Our preference would be to see withdrawal separated from normal retirement, either as a line item or combined with refunds.

Row II is labeled as "Present Value of Member and **Employer Contributions**." We suggest the label be clarified, because we believe that employer UAAL contributions are not included.

## Retained Actuary's Schedule D – Development of Shared-Risk/Gain Member Contributions

We have replicated the retained actuary's calculation in both the 2022 and 2023 valuation and we generally find that the retained actuary's disclosures in this section are appropriate. However, when replicating row 8 "Actual July 1, 2024 Impact of 3-Year Investment Period on Employer Contributions" of this schedule, we were unable to replicate the result without first reaching out to the retained actuary for the relevant details. Accordingly, we recommend that the retained actuary include documentation on the calculation of row 8 that would allow another actuary to replicate the calculation by relying only on the information provided in the report.

## Retained Actuary's Schedule E – Analysis of Change in Employer Contribution Rate and Amortization Liability

We have replicated the majority of the retained actuary's calculations in Schedule E, and we find that the information is accurate and the disclosures are appropriate. Note that we are unable to replicate the *Change in Liability Due to Pay increases different than assumptions* without additional member data.

## Retained Actuary's Schedule H – Schedule of Funding Progress

We have reviewed the Schedule of Funding Progress exhibit and generally find the disclosures to be appropriate. The Funding Payroll shown in the exhibit and used to calculate the UAAL as a percentage of payroll is a projected amount. In our judgment, the better divisor would be the annualized covered compensation (i.e., as of the valuation date), which is the more common method in the public sector.

## Retained Actuary's Schedule I – Solvency Test

We have reviewed the Solvency Test exhibit and generally find the disclosures to be appropriate. The Solvency Test indicates that less than 100% of the Annuitant and Beneficiary liability, and none of the Active Participant liability is currently covered by reported assets. This is a significant finding, and should be noted in the comments at the beginning of the report.

## Retained Actuary's Schedule J – Actuarial Value of Assets

In Row IV.H) of this section, an adjustment to the calculated Actuarial Value of Assets (AVA) is made to include "Amortization Payment Receivable (January to June)." We understand the reasoning behind including the receivable in the AVA, but we think it would be greatly preferred to calculate the AVA without the receivable and revise the contribution allocation procedure to recognize the existence of the contributions and benefit payments that are expected to be received between the valuation date and the start of the fiscal year. One reason for this is that the inclusion of the receivable produces a biased comparison of assets to liabilities in schedules such as the solvency test in Schedule I. The assets and liabilities are essentially mismatched in time.

The cover letter of the report lists the valuation date as December 31, 2023. Schedule J is the first place in the report where it is made clear that the AVA considers information past the valuation date. Under the current method of calculating the AVA, if this practice is to continue, we recommend that the retained actuary clarify that the AVA includes the "Amortization Payment Receivable" earlier in the report.

Section 4.1.4 of ASOP 44 requires that the actuary must disclose if the AVA "…has significant systematic bias toward understatement or overstatement relative to market value…". Since the current AVA method includes the "Amortization Payment Receivable", the asset valuation method, over time, is more likely to produce an AVA that is greater than the market value of assets than one that is less than market value. Under the current method of calculating the AVA, we recommend that the retained actuary include such a disclosure. "Significant", however, is a matter of opinion. In the 2023 valuation the receivable was less than 2.5% of assets. A commonly accepted corridor around the market value of assets is 20%.

It would also be good practice to calculate the ratio of actuarial value of assets to market value at some place in Schedule J.

## Retained Actuary's Schedule L – Risk Measurements

On page 35, the retained actuary includes a paragraph that states "In general, deviations in plan experience or expectations will have a larger effect on the contribution needs of a more mature plan than a less mature plan…". We feel that this paragraph over generalizes the correlation between contribution risk and plan maturity. For example, a plan with more invested assets is more susceptible to investment risk, regardless of maturity. We believe that the intention of this paragraph could be better communicated by emphasizing the following points:

a. As a plan accumulates more assets, investment risk will have a larger effect on the contribution needs.
b. As a plan matures, and the retiree group grows in size compared to the active population, mortality risk will have a larger effect on the contribution needs.

On page 36, the retained actuary includes a statement that "The likelihood of large changes in the ADC increases as the number of retirees increases", and "As a plan matures, the ADC becomes more sensitive to risks." without further explanation. These statements do not seem intuitively true, and we recommend that the retained actuary provide further explanation.

ASOP 4 Section 3.2i requires the calculation of a Low-Default Risk Obligation Measure (LDROM). Section 3.11 outlines the parameters behind the measure. In particular, ASOP 4 requires the actuary to calculate the LDROM and to provide commentary to help the intended user understand the significance of the LDROM with respect to the funded status of the plan, plan contributions, and the security of participant benefits. The actuary should use professional judgment to determine the appropriate commentary for the intended user.

The final paragraph on page 36 appears to be intended to comply with Section 3.11 of ASOP 4. It reads as follows:

> *If the plan were to reduce its investment risk and invest in low-default-risk investments, the effective interest rate earned would be 5.15% per year using the December 2023 monthly average of the Treasury High Quality Market Corporate Bond Yield Curve. This interest rate would result in an actuarial accrued liability of $66.9 billion and a funded status of 58.0%. By assuming a reasonable amount of risk with its investments, SERS is able to reduce its liability by $11.1 billion through earnings that exceed the corporate bond yields.*

To comply fully with ASOP 4, we recommend that the retained actuary provide the additional commentary described in ASOP 4 Section 3.11 related to plan contributions and the security of participant benefits.

On page 36, with regard to the use of investment risk vs low-default-risk measure, the retained actuary states that "… with its investments, SERS is able to reduce its liability by $11.1 billion...". The liability of the plan is its obligation to plan participants. This obligation is not diminished by investing assets in the general market nor by assuming a higher investment return. We believe that the retained actuary should change "liability" to "calculated actuarial accrued liability."

The retained actuary also states the $11.1 billion reduction occurs through "…earnings that exceed the corporate bond yields." In order to remind the audience of investment risk we recommend that:

a. The retained actuary change "corporate bond yields" to "low-default-risk corporate bond yields."
b. At the end of this statement, we recommend that the retained actuary also state "and assuming future earnings match expectations."

On page 38, it is not clear if the 1% change means an unexpected change or just if assets or liabilities were 1% different from what they are now. We would prefer an illustration with a greater difference, such as 5% or 10%.

Finally, we also suggest adding a measure of the effect of a 1 standard deviation move in the assets.

## Recommended Additional Report Disclosures

Section 4.1 q. of ASOP 4 requires "For funded status measurements … the actuary should accompany this description with each of the following additional disclosures: 1. whether the funded status measure is appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations; 2. whether the funded status measure is appropriate for assessing the need for or the amount of future contributions; and 3. if applicable, a statement that the funded status measure would be different if the measure reflected the market value of assets rather than the actuarial value of assets;". Although we recognize that Schedule J on page 30 of the report implicitly includes some of this information, we recommend the retained actuary include an explicit statement addressing this.

Section 4.1 y. of ASOP 4 requires "an estimate of the period over which the unfunded actuarial accrued liability, if any, is expected to be fully amortized…". Section 4.1.3 a. of ASOP 41 requires a disclosure of "the intended users of the actuarial report". We have found no such statements in the report and we recommend the retained actuary include such statements.

A reconciliation of the market value of assets from the beginning of year to the end of year does not appear in the report. We recommend that the report include such a statement.

We recommend that the report include a schedule which shows the current market value broken out by major investment classes.

Schedule O (Actuarial Assumptions) and Schedule P (Actuarial Methods) are missing several miscellaneous and technical assumptions. We recommend that the retained actuary also include the following disclosures in the report:

a. The determination of administrative expense normal cost contributions.
b. Decrement operation (when are the decrements operable), for example, "the disability decrement is not operable when eligible for superannuation."
c. Assumed decrement timing, for example, "all decrements assumed to occur in the beginning of the year."
d. Eligibility testing, for example, "eligibility is determined based upon the age nearest birthday and rounded service on the date the decrement is assumed to occur."
e. Timing of contributions, for example, "employer contributions assumed to occur on a bi-weekly basis."

f. Pay increase timing, for example, “Pay increases are assumed to occur at the beginning of the year.”
g. Incidence of service vs non-service connected disabilities, for example, “All disabilities are assumed to be non-service connected.”
h. Information on the type of pay reported (W-2, rate, mix).

On page 62 of the report, under “Form of Payment”, the report states “…some form of joint and survivor annuity 26 percent of the time…” without specifically stating which form of joint and survivor annuity is assumed. We recommend that the retained actuary expand on this statement to indicate the form of joint and survivor annuity assumed. For example, “…100% J&S (Option 2) annuity 26 percent of the time…”.

# SECTION V

## REPLICATION VALUATION

# Replication of December 31, 2023 Valuation Results

## Introduction

The goal of a replication audit is to verify that the main valuation results can be independently duplicated to within reasonable tolerances. While valuation systems will tend to produce different results, the differences should generally be minor unless there is an actual error in either the retained actuary's or the auditing actuary's work. Replication of results within 2%-5% depending on the metric being compared are generally viewed as a successful replication.

The table below summarizes tolerances that were used in performing this actuarial audit.

| Category | Active & Inactive Member Tolerance | Retired Member Tolerance | Aggregate Tolerance |
|---|---|---|---|
| Present Value of Future Benefits | 5.0% | 2.0% | 2.5% |
| Actuarial Accrued Liability | N/A | N/A | 2.5% |
| Normal Cost | 5.0% | N/A | 5.0% |
| Computed Contribution Rate | N/A | N/A | 5.0% |

The above tolerances were applied for the total population (i.e., without consideration to the membership class). When applicable (e.g., present value of future benefits), active and inactive in the table above is meant to represent the total for the non-retired population. The computed contribution rate tolerance was applied to the total required contribution rate. Tolerances are applied with professional judgement considering the complexity of the benefits being valued, the limitations of the data, the complexity of the assumptions being applied and the materiality of any observed difference.

It is not uncommon for the differences in actuarial accrued liabilities and normal costs to be in opposite directions (the auditing actuary's accrued liabilities are greater, but the normal costs are lower or vice-versa). This can happen due to minor differences in the way valuation systems allocate the present value of benefits between the past and the future.

The following pages provide an overview of the principal valuation results. Note that some numbers may not add due to rounding.

## Principal Valuation Results

| SYSTEM MEMBERSHIP - TOTAL | Retained Actuary | GRS | +/- Diff | % Diff |
|---|---|---|---|---|
| Active Membership | | | | |
| Number of Members | 98,115 | 98,114 | -1 | -0.0% |
| Average Age | 46.3 | 46.3 | -0.0 | -0.1% |
| Average Years of Service | 10.9 | 11.0 | +0.1 | +0.8% |
| Average annualized covered compensation | $ 69,870 | $ 69,874 | +$4 | +0.0% |
| Total annualized covered compensation | $6,855M | $6,856M | +$0M | +0.0% |
| Funding payroll[1] | $7,169M | $7,203M | +$35M | +0.5% |
| Inactive & Retiree Membership | | | | |
| Number not In Pay Status | 7,077 | 7,059 | -18 | -0.3% |
| Number of Retirees/Beneficiaries | 136,972 | 136,972 | - | - |
| Total Annual Pension | $3,499M | $3,499M | -$0 | -0.0% |

| ASSETS AND LIABILITIES - TOTAL | Retained Actuary | GRS | +/- Diff | % Diff |
|---|---|---|---|---|
| Net Assets | | | | |
| Market Value of Assets (MVA) | $36,415M | $36,415M | - | - |
| Actuarial Value of Assets (AVA) | $38,793M | $37,961M | -$832M | -2.1% |
| Present Value of Future Benefits | | | | |
| Retired Members | $34,725M | $34,792M | +$67M | +0.2% |
| Active and Inactive Members | $29,743M | $28,294M | -$1,449M | -4.9% |
| Total PVFB | $64,467M | $63,086M | -$1,382M | -2.1% |
| Actuarial Accrued Liability | $55,778M | $54,831M | -$947M | -1.7% |
| Unfunded Actuarial Accrued Liability | $16,984M | $16,870M | -$115M | |
| Funded Ratio | | | | |
| AVA / AAL | 69.6% | 69.2% | -0.4% | |
| MVA / AAL | 65.3% | 66.4% | +1.1% | |

| SYSTEM CONTRIBUTIONS FOR FISCAL YEAR 2025 (% OF PAY) | Retained Actuary | GRS | +/- Diff |
|---|---|---|---|
| Employer Contribution Rate | 33.60% | 32.94% | -0.66% |
| Employee Contribution Rate | 5.98% | 6.24% | +0.26% |
| Total Actuarial Contribution Rate | 39.58% | 39.18% | -0.40% |

| Shared-Risk/Gain Effective July 1, 2023 & 2024 | Retained Actuary | GRS | +/- Diff |
|---|---|---|---|
| A-3/A-4 Shared Risk Rate Effective July 1, 2023 | 0.00% | 0.00% | - |
| A-5/A-6 Shared Risk Rate Effective July 1, 2023 | 0.00% | 0.00% | - |
| A-3/A-4 Shared Risk Rate Effective July 1, 2024 | 0.00% | 0.00% | - |
| A-5/A-6 Shared Risk Rate Effective July 1, 2024 | 0.00% | 0.00% | - |

[1] *Funding payroll is the sum of the anticipated DB + DC payroll for the 2025 Fiscal Year. GRS calculated this amount by increasing the DB + DC payroll as of the valuation date by 2.8% for the 2024 calendar year pay and another 2.8% for the 2025 calendar year pay. GRS then took the average of those two values.*

## Principal Valuation Results (Discussion)

In aggregate, GRS replicated the retained actuary's principal valuation results to within acceptable tolerances.

### Present Value of Future Benefits (PVFB)

GRS replicated the December 31, 2023 Actuarial Valuation total PVFB to within $1.4 billion out of $64.5 billion (or a 2.1% difference). As is typically expected, accuracy was higher for retired members (0.2% difference in PVFB) compared to active and inactive members (4.9% difference).

### Actuarial Accrued Liability (AAL) & Unfunded Actuarial Accrued Liability (UAAL)

The GRS Actuarial Accrued Liability in total was within 1.7% of the retained actuary's figure. Taking the Actuarial Accrued Liability and subtracting off System assets results in the Unfunded Actuarial Accrued Liability. Since this measure is the net difference between two large values, there is no tolerance test as a percentage. In dollars, GRS matched the UAAL calculation to within $115 million out of $17.0 billion.

### Projected Payroll

The retained actuary reports both the total annualized covered compensation and the projected funding payroll that is used as a divisor when converting dollar amounts into percentages of payroll. In 2022 and 2023, these figures were:

| | 2023 | 2022 | % Change |
|---|---|---|---|
| Total Annualized Covered Compensation | $6,855,295,000 | $6,547,630,000 | 4.70% |
| Funding Payroll | $7,168,727,000 | $6,832,806,000 | 4.92% |
| Projection Ratio | 4.57% | 4.36% | |

The December 2023 valuation determines the contribution rate for Fiscal 2025 (July 1 to June 30). Consequently, the Annual Covered Compensation for Calendar 2023 must be projected 1.5 years into the future. The assumed general salary increase is 2.80%, as shown in the actuarial report on page 63. Based upon the inflation assumption of 2.50%, we agree that it is reasonable to assume a long-term general salary increase rate of 2.80%. Additionally, we understand that the Funding Payroll includes DB and DC plan pay while the Total Annualized Covered Compensation only shows DB plan pay. On the prior page, GRS calculated the Funding Payroll by increasing the DB + DC payroll as of the valuation date by 2.8% for the 2024 calendar year pay and another 2.8% for the 2025 calendar year pay. GRS then took the average of those two values. The retained actuaries calculation yields a similar result. The retained actuary projects the funding payroll considering all assumptions, not just the general salary increase assumption, so some difference is to be expected. Therefore, the funding payroll calculation appears to be reasonable.

In the schedule of funding progress on page 25, and in the maturity measures on page 35, the retained actuary calculates ratios of asset and liabilities as of the valuation date to the funding payroll, which is projected 1.5 years into the future. This is a minor issue, but in our judgement the better divisor would be the annualized covered compensation (i.e., as of the valuation date), which is the more common method in the public sector.

## Computed Contribution Rates

The computed employee contribution rate was similar to the retained actuary calculation. The rate shown is a blended rate for all benefit groups, most of which have different employee contribution rates. The difference in the blended rate shown may be a result of differences in projected anticipated individual group sizes. This is common for Plans that have a mix of open groups and closed groups.

The computed total employer Actuarial Contribution Rate was similar to the retained actuary calculation, 33.60% versus 32.94%. A comparison of the contribution rate by group is shown below:

**Adjusted Contribution Rate - Sched. C, Column 6 (% of pay)**

| | Retained Actuary | GRS | +/- Diff |
|---|---|---|---|
| Adjusted Contribution Rate | | | |
| Class A-5 Age 67 | 16.79% | 16.81% | +0.02% |
| Class A-6 Age 67 | 17.04% | 17.06% | +0.02% |
| DC Plan Only | 15.54% | 15.56% | +0.02% |
| Class A-3 and A-4 Age 65 | 27.03% | 26.77% | -0.27% |
| Class AA Age 60 | 40.28% | 40.27% | -0.01% |
| Class A Age 60 | 31.69% | 31.29% | -0.39% |
| Class A-3 and A-4 Age 55 | 30.60% | 29.91% | -0.69% |
| Class AA Age 50 | 45.06% | 45.10% | +0.04% |
| Class A Age 50 | 35.61% | 34.46% | -1.14% |
| Class A-3 and A-4 Park Range & Cap Pol | 28.11% | 29.14% | +1.03% |
| Class AA Park Range & Cap Pol | 41.18% | 43.62% | +2.44% |
| Class A Park Range & Cap Pol | 33.84% | 34.12% | +0.28% |
| Class A-3 and A-4 State Pol | 51.92% | 53.08% | +1.16% |
| State Pol Other | 58.47% | 58.34% | -0.13% |
| Class D4 | 48.53% | 52.43% | +3.90% |
| Class E | 52.52% | 55.02% | +2.50% |
| Total | 33.60% | 32.94% | -0.66% |

## Shared-Risk/Gain Calculation

An additional review was conducted to confirm the retained actuary's computation of the Shared-Risk/Gain rates was consistent with the relevant statutes. We believe the methodology applied for computation of the July 1, 2023 and 2024 Shared-Risk/Gain Rates were consistent with the appropriate statues. We concur with the retained actuaries' calculations. Our only recommendation is for the retained actuary to provide more detail regarding the calculation of the "Impact of 3-Year Investment Period on Employer Contributions" in Schedule D of the valuation report.

## Present Value of Future Benefits

| Grand Total | | | | |
|---|---|---|---|---|
| ($'s in Millions) | Retained Actuary | GRS | +/- Diff | % Diff |
| Active and Inactive Members | | | | |
| Superannuation and Withdrawal | $28,033 | $26,584 | -$1,449 | -5.2% |
| Disability | 803 | 912 | 109 | +13.6% |
| Death | 794 | 684 | -110 | -13.8% |
| Refunds | 113 | 114 | 0 | +0.2% |
| Total | $29,743 | $28,294 | -$1,449 | -4.9% |
| Annuitants and Beneficiaries | 34,725 | 34,792 | 67 | +0.2% |
| **Total Present Value of Future Benefits** | **$64,467** | **$63,086** | **-$1,382** | **-2.1%** |

## Present Value of Future Benefits (Discussion)

While the Present Value of Future Benefits in total matched the retained actuary's value to within 2.1%, the individual decrement by decrement breakdown resulted in more variance in ancillary death and disability benefits, which represent approximately 6% of the total Present Value of Future Benefits for active and inactive members. Accordingly, we believe the results to be within reasonable tolerances.

### Active Member Liabilities by Decrement

Results when broken down by individual decrement (i.e., by retirement, death, termination and disability benefits) experienced more variance than when observed in total.

We believe this occurred as a result of differing methods of decrement application from actuary to actuary. There is no one right answer for application of actuarial assumptions. For example, GRS classifies a non-vested active member death as a termination benefit, meanwhile the retained actuary could be classifying this as a death benefit. Another potential source of difference is that the methodology for applying decrements may differ. This difference in application can lead to liabilities being categorized differently. Since the differences by decrement type between the retained actuary and GRS offset one another and in aggregate are close, we do not believe this is a cause for concern and believe the computed Present Value of Future Benefits as of December 31, 2023 to be reasonable.

## Development of Unfunded Actuarial Accrued Liability

| Grand Total | | | | |
|---|---|---|---|---|
| ($'s in Millions) | Retained Actuary | GRS | +/- Diff | % Diff |
| 1. Present Value of Future Benefits | $64,467 | $63,086 | -$1,382 | -2.1% |
| 2. Present Value of Future Normal Costs | 8,690 | 8,255 | -435 | -5.0% |
| 3. Actuarial Accrued Liability (1) - (2) | $55,778 | $54,831 | -$947 | -1.7% |
| 4. Actuarial Value of Assets | $38,793 | $37,961 | -$832 | -2.1% |
| 5. Unfunded Actuarial Accrued Liability (3) - (4) | $16,984 | $16,870 | -$115 | |
| 6. Funded Ratio (4) / (3) | 69.6% | 69.2% | -0.4% | |

## Development of Unfunded Actuarial Accrued Liability (Discussion)

The next step after computing the Present Value of Future Benefits is to compute the split between the Actuarial Accrued Liabilities and the Present Value of Future Normal Costs (i.e., Normal Cost for short when referring to the cost of active members for one year).

### Present Value of Future Normal Cost

Although the GRS normal cost as a percent of pay was higher than the retained actuary's value, the GRS computation of the Present Value of Future Normal Costs was 5% lower than that of the retained actuary. This may be a result of differing methodologies in timing of Normal Cost computations.

### Actuarial Accrued Liability

Since the Actuarial Accrued Liability is the difference between Present Value of Future Benefits and the Present Value of Future Normal Cost, GRS estimates of the Actuarial Accrued Liabilities were slightly lower than the retained actuary calculation. The estimates are within the 5% tolerance range for Actuarial Accrued Liability.

### Actuarial Value of Assets

We note that the Actuarial Value of Assets utilized by the retained actuary includes the value of a contribution receivable. GRS's preference is to exclude contribution receivables from the Actuarial Value of Assets.

### Funded Ratio

GRS matched the retained actuary's computation of the System's funded ratio to within 1%.

## Analysis of Contribution Rates

| Grand Total (% of pay) | Retained Actuary | GRS | +/- Diff |
|---|---|---|---|
| 1. Normal Cost Rate | | | |
| a. Superannuation and Withdrawal | 12.19% | 12.87% | +0.68% |
| b. Disability | 0.56% | 0.75% | +0.19% |
| c. Death | 0.41% | 0.40% | -0.01% |
| d. Refunds | 0.41% | 0.42% | +0.01% |
| e. Administrative | 0.35% | 0.35% | +0.00% |
| f. Total | 13.92% | 14.79% | +0.87% |
| 2. Employee Contribution Rate | 5.98% | 6.24% | +0.26% |
| 3. Employee Contribution Rate | 25.66% | 24.39% | -1.27% |
| 4. Total Employer Contribution - Net BCP* (1. - 2. + 3.) | 33.60% | 32.94% | -0.66% |

| Amortization of the Unfunded Actuarial Accrued Liability (UAAL) ($'s in Millions) | Retained Actuary | GRS | +/- Diff | % Diff |
|---|---|---|---|---|
| **December 31, 2023 UAAL Calculation** | | | | |
| AAL | $55,778 | $54,831 | -$947 | -1.7% |
| AVA, net Receivable | $37,961 | $37,961 | $0 | +0.0% |
| Receivable | $832 | n/a | | |
| **UAAL** | **$16,984** | **$16,870** | -$115 | -0.7% |
| **Calculation of Amortization Amount as of December 31, 2023** | | | | |
| UAAL | $16,984 | $16,870 | -$115 | -0.7% |
| 1/1/2024 to 6/30/2024 Amortization Payment PV[1] | n/a | $933 | | |
| Amortization Amount | $16,984 | $15,936 | -$1,048 | -6.2% |
| December 31, 2023 Valuation Payroll | $6,855 | $6,856 | $0 | +0.0% |
| FY 2025 Funding Payroll | $7,169 | $7,203 | $35 | +0.5% |
| FYE 2025 Employer Contribution Rate (% of pay) | 33.60% | 32.94% | | |
| FYE 2025 Employee Contribution Rate (% of pay) | 5.98% | 6.24% | | |
| FYE 2025 Total Contribution Rate (% of pay) | 39.58% | 39.18% | | |
| Projected FYE 2025 Employer Contributions | $2,409 | $2,373 | -$36 | -1.5% |

[1] *GRS calculated this amount by taking the difference of the total FY2024 employer contribution rate as calculated in the 2022 valuation and then subtracting off the employer normal cost rate as determined in the 2023 valuation in order to calculate the anticipated remaining FY2024 employer contribution rate that will go towards the UAAL. GRS then multiplied this rate by the remaining FY 2024 covered payroll from the 2023 valuation data and took the present value.*

## Analysis of Contribution Rates (Discussion)

The replication of employee and employer contribution rates was based upon the Actuarial Accrued Liabilities and Normal Costs computed by GRS. Therefore, the results are expected to differ from those of the retained actuary.

### Contribution Rate

The GRS computation of normal cost was 87 basis points higher than the retained actuary's figure. Normal Cost is particularly sensitive to differences in the way valuation systems allocate the present value of benefits between the past and the future. This difference was offset by a lower UAL Contribution by 127 basis points. In aggregate, GRS replicated the retained actuary's Actuarial Contribution Rate for Fiscal Year 2025 to within 66 basis points (33.60% versus 32.94%).

# SECTION VI

## SUMMARY OF RECOMMENDATIONS

# Summary of Recommendations

The principal results of this audit are:

- The actuarial assumptions are reasonable;
- The actuarial work is mathematically correct; and
- The actuarial report fairly presents the actuarial condition of the Retirement System.

However, two actuaries will never agree completely on all of the ingredients that go into an actuarial valuation. Also, different actuaries can draw different conclusions from the same set of facts, because they have been exposed to different experiences.

This section summarizes the recommendations we have made throughout the report. We have classified as *recommendations* those items which in our judgement have the potential of resulting in a meaningful improvement in the valuation process. Our *suggestions* in the body of the report are much more minor items that may result in minor improvements in clarity for the non-expert user or technical compliance with actuarial standards. It is unlikely that the many suggestions would affect end results in any material way.

## Recommendations Regarding Data

We recommend that the retained actuary correct the data fields Inc50 (Non-covered compensation for SSI benefit (Age 50)) and Inc60 (Non-covered compensation for SSI benefit (Age 60)), which were switched, in their next valuation.

## Recommendations Regarding the Investigation of Actuarial Experience and Actuarial Assumptions

In future investigations of experience, we recommend that the retained actuary consider a separate analysis for State Police death and disability.

With the exception of mortality, we recommend the retained actuary perform the demographic analyses both on a head count and liability-weighted basis, with the liability-weighted experience generally given more credibility than the head count weighted results. We believe this is particularly important for the determination of retirement and termination rates.

We recommend that the retained actuary provide numeric detail on the actual service purchase experience.

We recommend the retained actuary consider the rates published by the SOA when recommending a pre-retirement mortality assumption.

Given the relatively large size of State Police in SERS and the separate contribution rates for State Police, we believe that it is appropriate to perform a separate mortality analysis for police officers. In future investigations, we recommend that the retained actuary consider the use of Public Safety mortality tables for public safety employees.

We recommend that the retained actuary review the continued applicability of valuation methods, amortization periods, etc. in future experience studies.

We recommend that the retained actuary cease the practice of including the amortization receivable directly in the AVA and only incorporate such contributions in the development of the contribution rates.

## Recommendations Regarding the Actuarial Valuation Reports

Page 1 includes the value of assets and funded status measure, but it does not include the corresponding actuarial accrued liability. We recommend that the retained actuary also disclose the actuarial accrued liability on this page.

With regard to the participant data, we recommend the retained actuary disclose all significant steps taken to improve the data.

Section 4.1.4 of ASOP 44 requires that the Actuary disclose if the AVA "…has significant systematic bias toward understatement or overstatement relative to market value…". Since the current AVA method includes the "Amortization Payment Receivable", the asset valuation method, over time, is more likely to produce an AVA that is greater than the market value of assets than one that is less than market value. Under the current method of calculating the AVA, we recommend that the retained actuary include such a disclosure. "Significant", however, is a matter of opinion. In the 2023 valuation the receivable was less than 2.5% of assets. A commonly accepted corridor around the market value of assets is 20%.

In the Shared Risk/Gain calculation, we recommend that the retained actuary include documentation on the calculation of row 8 of Schedule D that would allow another actuary to replicate the calculation by relying only on the information provided in the report.

Section 4.1 q. of ASOP 4 requires "For funded status measurements … the actuary should accompany this description with each of the following additional disclosures: 1. whether the funded status measure is appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations; 2. whether the funded status measure is appropriate for assessing the need for or the amount of future contributions; and 3. if applicable, a statement that the funded status measure would be different if the measure reflected the market value of assets rather than the actuarial value of assets;". Although we recognize that Schedule J on page 30 of the report implicitly includes some of this information, we recommend the retained actuary include an explicit statement addressing this.

Section 4.1 y. of ASOP 4 requires "an estimate of the period over which the unfunded actuarial accrued liability, if any, is expected to be fully amortized…". Section 4.1.3 a. of ASOP 41 requires a disclosure of "the intended users of the actuarial report." We have found no such statements in the report and we recommend the retained actuary include such statements.

A reconciliation of the market value of assets from the beginning of year to the end of year does not appear in the report. We recommend that the report include such a statement.

We recommend that the report include a schedule which shows the current market value broken out by major investment classes.

# SECTION VII

## FORMAL OPINION AND CONCLUDING REMARKS

# Formal Opinion and Concluding Remarks

The auditing actuarial firm, Gabriel, Roeder, Smith & Company, is independent of the retained actuarial firm, Korn Ferry. The auditing firm employed its proprietary actuarial software for this actuarial audit. The auditing firm's software is completely independent of the retained actuary's software. The auditing actuaries are not aware of any conflict of interest that would impair the objectivity of this work.

In the opinion of the auditing actuaries, the work of the retained actuaries reasonably represents the actuarial position of the Retirement System based upon the assumptions and methods employed. In particular:

- The actuarial assumptions and methods are reasonable and comply with generally accepted actuarial principles.
- With a minor exception, the retained actuary is processing the data correctly.
- In aggregate, GRS replicated the retained actuary's principal valuation results to within acceptable tolerances.

We have presented many suggestions for areas where we believe the actuarial work product can be improved. Of course, the retained actuary has access to information and a long history of experience with the SERS that we do not have. We understand that the retained actuary may agree with some of our recommendations, while rejecting others. We ask that the retained actuary and the Board consider our recommendations carefully. We hope that the SERS and the retained actuary find these suggestions useful.

We appreciate the opportunity to work on this assignment.

# SECTION VIII

## ATTESTATION OF INDEPENDENCE

800.521.0498 | P: 248.799.9000 | www.grsconsulting.com

July 16, 2025

Mr. Ryan McCoy, CIA
Internal Audit Director
Pennsylvania State Employees' Retirement System
30 North 3rd Street, Suite 150
Harrisburg, PA 17101

**Re: GRS Audit of the Pennsylvania State Employees' Retirement System**

Dear Mr. McCoy:

This letter is in response to your request for Gabriel, Roeder, Smith & Company (GRS) to attest to our independence with regard to our recent actuarial audit of the Pennsylvania State Employees' Retirement System (SERS).

GRS was selected to audit the work of the actuaries employed by the Korn Ferry organization. An actuarial audit involves a review of the retained actuary's work by an independent actuarial firm. In accordance with the Request for Proposal for actuarial auditing services issued by SERS, the purpose of this audit was to provide an evaluation sufficient to allow GRS to express an actuarial opinion regarding the reasonableness and/or accuracy of valuation results, actuarial assumptions, and actuarial methods in accordance with generally recognized and accepted actuarial principles and practices. As you are now aware, GRS and the Korn Ferry organization (KF) have entered into an agreement to transition the pension actuarial work from KF to GRS. A timeline of events for the actuarial audit project and the agreement between GRS and KF follows:

**Timeline of Events – Audit Work**

| | |
|---|---|
| 2024-02-09 | Proposals due to SERS |
| 2024-06-04 | SERS notifies GRS about bid protest |
| 2024-10-24 | SERS provides Notice of Selection of GRS/Contract Negotiations |
| 2024-10-31 | SERS provides initial draft contract |
| 2024-12-11 | SERS states that project will start in February 2025 |
| 2025-01-14 | President of GRS (myself) signs contract provided by SERS |
| 2025-02-25 | Final executed contract received (effective March 1, 2025) |
| 2025-03-17 | Data requests sent |
| 2025-04-07 | Data file received from KF actuary |
| 2025-04-07 | GRS audit team members begin work on the replication |
| **2025-07-11** | **Draft audit report delivered to SERS and KF** |
| **2025-07-16** | **Final draft of audit report delivered** |

**Timeline of Events – Korn Ferry Assignment to GRS**

| | |
|---|---|
| 2025-04-17 | Mutual NDA signed between senior level management of KF /GRS |
| 2025-05-20 | NDA for other essential GRS/KF employees (only) signed |
| 2025-06-11 | Agreement finalized between KF and GRS |
| 2025-06-25 | GRS/KF contact SERS and legal counsel of GRS/SERS/KF agree on transfer terms. |
| **2025-07-17** | **Assignment date GRS/KF/SERS** |

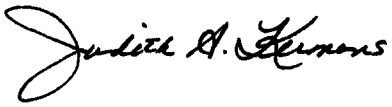
Based on these timelines and other known facts, GRS attests to the following:

a) Only those GRS representatives that signed the mutual NDA between Korn Ferry and GRS were privy to the assignment discussions. None of the GRS employees who participated in the SERS audit, including the auditing actuaries (Wurst and Anderson) signed the NDA.
b) The GRS auditing actuaries (Wurst and Anderson) had **no** knowledge of any negotiations or other transactions between GRS and KF until they were informed by default through an email from Mr. McCoy on July 14, 2025.
c) Two former KF employees (Michael Spadaro and Kris Seets) were hired after the SERS audit was awarded to GRS but were not involved **in any way** with the SERS audit project.
d) One additional KF employee (Craig Graby) will be joining GRS as part of the agreement on July 17, 2025.
e) Once the June 11, 2025 agreement was finalized, GRS called SERS (Joe Torta) to ensure him that internal confidentiality will be maintained until the audit draft was delivered to SERS.
f) The final transition of PA SERS work from KF to GRS is expected to occur immediately after the completion of the final audit on July 17, 2025;
**g) The SERS audit was conducted in a completely independent and unbiased way with the same diligence and care as every other actuarial audit that GRS has conducted in its entire history since 1938.**

GRS has a long-standing history as the premier provider of independent actuarial consulting services to public sector pension plan and has likely performed more actuarial audits of public sector plans than any firm in the country. As such, audits can often occur over a period of many months and, it is not unusual to have changes in staff or clientele during this period. As similar situations have occurred over the years, GRS management was able to ensure that the auditing work for PA SERS was not compromised.

GRS is a firm comprised mostly of actuaries. We are not attorneys, accountants or auditors and cannot, therefore, attest to any legal issues or non-actuarial auditing or accounting functions. However, based on our reading of Government Accountability Office's Generally Accepted Auditing Standards (GAGAS) Section 3.30 threats to independence framework, including those related to self-interest and self-review, it is our professional judgement that we have not compromised the independence of the PA SERS audit in any way whatsoever. We further attest that there was no financial or other interest that would inappropriately influence the GRS actuarial auditor's judgment or behavior.

Sincerely,
Gabriel, Roeder, Smith & Company



Judith A. Kermans
President and CEO

JAK/vmb

cc: Mr. Joe Torta