

Actuarial Review of the 2024 Accounting Disclosures for the North Carolina Office of the State Auditor

November 2024



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November 1, 2024

Mr. Jacob Taitague, CPA
Assistant State Auditor
Office of the State Auditor
2 S. Salisbury St.
20601 Mail Service Center
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Re: North Carolina Actuarial Review of the 2024 Accounting Disclosures

Dear Mr. Taitague:

Gabriel, Roeder, Smith & Company (GRS) is pleased to present this report of an Actuarial Review of the 2024 Accounting Disclosures related to the North Carolina Retirement System. We are grateful to the Office of the State Auditor for their responsiveness and assistance throughout the actuarial review process. In addition, we wish to thank the consultants of Gallagher Benefit Services ("Gallagher") and The Segal Group ("Segal") for their cooperation and assistance with this project.

This project is separated into two engagements. This is a report covering the work of the first engagement. A report covering the work of the second engagement will be issued in early 2025. The first engagement is described as follows:

Evaluate the actuarial valuations of the following plans used in the State's financial statements for the period ended June 30, 2024:

- The Teachers and State Employees Retirement System of North Carolina (TSERS);
- The Local Governmental Employees Retirement System of North Carolina (LGERS);
- The Register of Deeds Supplemental Pension Fund of North Carolina (RODSPF);
- The North Carolina Retiree Health Benefits Plan (RHB); and
- The Disability Income Plan of North Carolina (DIPNC).

The Contractor will conduct a review of all assumptions, procedures, and methodology utilized by the actuary of the TSERS, LGERS, RODSPF, RHB and DIPNC plans. This review should include:

1. A review of the valuation report and results and how they comply with actuarial standards, and whether such valuation reflects appropriate disclosure information under required reporting.
2. An analysis and benchmarking of the actuarial assumptions, and a review of the actuarial methods used in determining the pension liability for compliance with generally accepted actuarial principles.
3. An analysis of the procedures used to validate the participant data, a test of select test lives from the membership group (active and retired) to validate key components, and a detailed review of the results.

The purpose of this report is to provide the results of our actuarial review, described on the previous page, including:

- An opinion regarding the reasonableness and accuracy of the actuarial assumptions, actuarial cost methods, procedures, and valuation results; and
- Certification that the plans' actuarial valuation was prepared in accordance with pronouncements issued by the Governmental Accounting Standards Board (GASB), principles and practices prescribed by the Actuarial Standards Board, and that the actuarial calculations were performed by qualified actuaries in accordance with accepted actuarial procedures.

This report was prepared at the request of the Office of the State Auditor of North Carolina (OSA) for the purposes stated above. It may not be suitable for other purposes. This report may be shared with parties other than the OSA, but only with the OSA's permission and only in its entirety. GRS is not responsible for unauthorized use of this report.

In our opinion, the assumptions and methods used in the 2024 valuations of the aforementioned plans are reasonable and comply with the Governmental Accounting Standards Board (GASB) Statement Nos. 67 and 74 and comply with practices promulgated by the Actuarial Standards. The intended audience is the OSA. The authors of this report are available to answer questions.

The signing actuaries are independent of the plan sponsor.

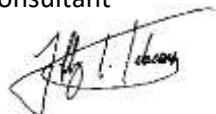
This report was prepared using our proprietary models (valuation model, capital markets model, etc.) and related software which, in our professional judgment, have the capabilities to provide results that are consistent with the purposes of the review and has no material limitations or known weaknesses. We performed tests to ensure that the models reasonably represent that which is intended to be modeled. We have also relied on the GRS actuaries and Internal Software, Training, and Processes Team who developed and maintain the model.

Abra D. Hill and Jeffrey T. Tebeau 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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ADH/JTT:ah



EXECUTIVE SUMMARY

Executive Summary

Background

Gabriel, Roeder, Smith & Company (GRS) was engaged by the Office of the State Auditor to review calculations related to the 2024 disclosures the State will include in its Annual Comprehensive Financial Report.

This report covers the work of the first engagement. A report covering the work of the second engagement will be issued in early 2025. The first engagement is described as follows:

Evaluate the actuarial valuations of the following plans used in the State's financial statements for the period ended June 30, 2024:

- The Teachers and State Employees Retirement System of North Carolina (TSERS);
- The Local Governmental Employees Retirement System of North Carolina (LGERS);
- The Register of Deeds Supplemental Pension Fund of North Carolina (RODSPF);
- The North Carolina Retiree Health Benefits Plan (RHB); and
- The Disability Income Plan of North Carolina (DIPNC).

The Contractor will conduct a review of all assumptions, procedures, and methodology utilized by the actuaries of the TSERS, LGERS, RODSPF, RHB and DIPNC plans. This review should include:

1. A review of the valuation report and results and how they comply with actuarial standards, and whether such valuation reflects appropriate disclosure information under required reporting.
2. An analysis and benchmarking of the actuarial assumptions, and a review of the actuarial methods used in determining the pension liability for compliance with generally accepted actuarial principles.
3. An analysis of the procedures used to validate the participant data, a test of select test lives from the membership group (active and retired) to validate key components, and a detailed review of the results.

The purpose of this report is to provide the results of our actuarial review, described above, including:

- An opinion regarding the reasonableness and accuracy of the actuarial assumptions, actuarial cost methods, procedures, and valuation results; and
- Certification that the plans' actuarial valuation was prepared in accordance with pronouncements issued by the Governmental Accounting Standards Board (GASB), principles and practices prescribed by the Actuarial Standards Board, and that the actuarial calculations were performed by qualified actuaries in accordance with accepted actuarial procedures.

The balance of this report is organized as follows:

Section 1 – Experience Study Review

- Review of Recommended Demographic Assumptions; and
- Review of Recommended Actuarial Methods.

Section 2 – Review of the Economic Assumptions

Section 3 – Review of the Respective Valuation Reports Containing the Underlying Calculations for the GASB Valuations

- Test Lives Exhibits; and
- Comments Regarding Test Lives Review.

Section 4 – Review of the Respective GASB Reports

- Content Review; and
- Calculations Review.

Section 5 – Comments, Conclusions and Recommendations for Future Years

- Comments;
- Prior Year's Recommendations;
- Conclusions; and
- Recommendations for future years.

Conclusion

In our opinion, the assumptions and methods used in the December 31, 2023 valuations of the aforementioned plans are reasonable and comply with the Governmental Accounting Standards Board (GASB) Statement Nos. 67 and 74 and comply with practices promulgated by the Actuarial Standards.

Based on our test lives review and our review of the funding and GASB reports, we certify that the plans' actuarial valuation was prepared in accordance with pronouncements issued by the Governmental Accounting Standards Board (GASB), principles and practices prescribed by the Actuarial Standards Board, and that the actuarial calculations were performed by qualified actuaries in accordance with accepted actuarial procedures.

SECTION 1

EXPERIENCE STUDY REVIEW

Experience Study

The Experience Studies appear to be on a five-year cycle and assumptions have not changed since we reviewed them in our 2021 report. We are therefore incorporating our comments regarding the demographic assumptions from our 2021 report, largely unchanged. Note that the most recent Experience Study was performed by a different actuarial firm than the current firm performing the pension valuations, however the assumptions adopted from the Experience Study are still utilized in the pension valuations. This section reviews the demographic assumptions and actuarial methods, while the next section (II) contains the review of the economic assumptions.

Review of Recommended Demographic Assumptions

TSERS

The TSERS experience study appears to be on a five-year cycle with the next cycle expected to be January 1, 2020 through December 31, 2024. We were provided the most recently completed experience study, dated December 9, 2020, covering the period January 1, 2015 through December 31, 2019. We have reviewed the demographic assumptions recommended from this study that are currently in use for the funding and GASB valuations.

Non-Mortality Demographic Assumptions

The non-mortality demographic assumptions were reviewed in the experience study dated December 9, 2020, and covering the five-year period ending on December 31, 2019. We have reviewed that report and find that the recommended assumptions are reasonable, based on TSERS actual experience (as detailed in that report). When reviewing demographic experience, actuaries are guided by Actuarial Standards of Practice (ASOP) Statement No. 35. ASOP No. 35 provides that non-mortality demographic assumptions should take into consideration historical experience, future expectations, the actuary's professional judgement, the purpose of the measurement and should not result in significant bias (unless a bias is explicitly intended to cover adverse risk or plan provisions that are difficult to model). The experience study report reviewed demonstrates that these guidelines were followed in the development of the recommended assumptions. The proposed non-mortality demographic assumptions were generally set to reflect actual experience during the study period (i.e., the ratio of actual to expected decrements based on the proposed assumptions was very close 1.0).

We find the recommended assumptions (which were in use for the December 31, 2023 funding valuation) to be reasonable for use in the funding and GASB valuations.

Mortality Assumptions

ASOP No. 35 states that the actuary should generally consider at least the following when setting mortality assumptions: pre- and post-mortality; potentially different mortality for different employee classifications (if appropriate); adjustments for mortality improvement that occurs from the period studied (in the experience study) to the measurement period (the date of the valuation); and mortality improvements after the measurement date. The experience study started with nationally published mortality tables and were adjusted based on TSERS actual experience. The common industry convention is, that for any group's actual mortality experience to be given full credibility, there should be enough

covered participants to result in at least 1,000 actual deaths during the five-year period studied. The experience study demonstrates that certain groups/statuses (or a combination thereof) were analyzed together in order to increase credibility (e.g., beneficiaries, non-safety disabled retirees and safety disabled retirees). The report demonstrates that considerations for setting mortality assumptions promulgated in ASOP No. 35 were followed. We noted that for some groups various scaling factors were applied based on age (similar to the previous experience study). While we believe this to be a reasonable adjustment to reflect the System's experience, not enough detail was given to see how the adjustments for each age were calculated.

We find the recommended assumptions (which were in use for the December 31, 2023 funding valuation) to be reasonable for use in the funding and GASB valuations.

LGERS

The LGERS experience study appears to be on a five-year cycle with the next cycle expected to be January 1, 2020 through December 31, 2024. We were provided the most recently completed experience study, dated December 9, 2020, covering the period January 1, 2015 through December 31, 2019. We have reviewed the demographic assumptions recommended from this study that are currently in use for the funding and GASB valuations.

Non-Mortality Demographic Assumptions

The non-mortality demographic assumptions were reviewed in the experience study dated December 9, 2020, and covering the five-year period ending on December 31, 2019. We have reviewed that report and find that the recommended assumptions are reasonable, based on the LGERS actual experience (as detailed in that report). The experience study report reviewed demonstrates that these guidelines were followed in the development of the recommended assumptions. The proposed non-mortality demographic assumptions were generally set to reflect actual experience during the study period (i.e., the ratio of actual to expected decrements based on the proposed assumptions was very close 1.0).

We find the recommended assumptions (which were in use for the December 31, 2023 funding valuation) to be reasonable for use in the funding and GASB valuations.

Mortality Assumptions

The experience study started with nationally published mortality tables and were adjusted based on the LGERS actual experience. As noted under the TSERS section, the report is silent as to the process used to adjust the rates for certain ages. For beneficiaries, the report indicates that beneficiaries from all of the Systems were combined to provide additional credibility. Non-safety disabled retirees were combined and safety disabled retirees were combined for the same reason. In general, the report demonstrates that considerations for setting mortality assumptions promulgated in ASOP No. 35 were followed.

We find the recommended assumptions (which were in use for the December 31, 2023 funding valuation) to be reasonable for use in the funding and GASB valuations.

RODSPF and DIPNC

The RODSPF and DIPNC experience study appears to be on a five-year cycle with the next cycle expected to be January 1, 2020 through December 31, 2024. We were provided the most recently completed experience study, dated December 9, 2020, covering the period January 1, 2015 through December 31, 2019. We have reviewed the demographic assumptions recommended from this study that are currently in use for the funding and GASB valuations.

The demographic experience for the RODSPF is combined with the LGERS in the analysis. Therefore, the demographic assumptions for the RODSPF are the same as those for the LGERS. Please see our aforementioned comments.

Except for rates of disability and recovery or death from disabled status, the demographic assumptions for the DIPNC are the same as those for the TSERS. Please see our aforementioned comments.

The experience study report recommends updated disability and disability claim termination rates for the DIPNC. The report provided to us for review showed neither the details of the current assumptions nor the actual experience. While the process to determine these proposed rates that was described is reasonable and in compliance with ASOPs, there is insufficient detail in the reports to determine if the recommended rates are reasonable. We recommend that future experience studies include the level of detail that compares actual, expected and proposed rates by age so that another actuary can opine on the reasonability of the recommendations.

In addition, for the DIPNC, the experience study recommends projecting the valuation pay to the appropriate period rather than assuming that pay does not increase from disablement.

We find the recommended assumptions (which were in use for the December 31, 2023 funding valuation) to be reasonable for use in the funding and GASB valuations.

RHB

Non-health related demographic assumptions are the same as those used for the pension funding valuations. Specific health related demographic assumptions, such as participation, enrollment and migration assumptions are disclosed in the GASB Statement No. 74 reports. These assumptions are reported to be based on actual experience as well as future plan sponsor expectation as disclosed in the most recent financial report.

We find these assumptions to be reasonable for use in the GASB valuation. Currently, no funding valuation for the RHB is performed.

Review of Recommended Actuarial Methods

TSERS, LGERS, RODSPF

The funding and GASB valuations both use the Entry Age Actuarial Cost method. The asset method is a five-year smoothed market related value with a 20% corridor around the market for funding. The asset method for GASB is market value.

The most recent experience study proposed changes to some of the actuarial methods. The method for calculating the liability attributable to the TSERS and LGERS terminated vested members is based on estimated benefits rather than 200% of each member's contribution balance. For RODSPF, the liability is based on each member's benefit provisions rather than the provisions for pre-2009 hires. In addition, the study recommends implementing direct rate smoothing over a five-year period to mitigate large contribution rate increases.

We find the methods used for the funding valuation to comply with the ASOPs and reasonable for funding. We find the methods used for the GASB valuation to be in accordance with those prescribed by the GASB pronouncements.

DIPNC

The funding uses the Aggregate Actuarial Cost method. The asset method is a five-year smoothed market related value with a 20% corridor around the market for funding. The funding method for the GASB valuation is the Entry Age Actuarial Cost method. The asset method used for the GASB valuation is market value.

We find the methods used for the funding valuation comply with the ASOPs and reasonable for funding. We find the methods used for the GASB valuation to be in accordance with those prescribed by the GASB pronouncements.

RHB

The actuarial cost method for the GASB valuation is the Entry Age Actuarial Cost method. The asset method is the market value.

We find the methods used for the GASB valuation to be in accordance with those prescribed by the GASB pronouncements.

In summary, we find the demographic assumptions and actuarial methods used for the funding and GASB valuations to be reasonable.

SECTION 2

REVIEW OF THE ECONOMIC ASSUMPTIONS

Review of the Economic Assumptions

The key economic assumptions are:

1. **Assumed Rate of Inflation** – The rate of price inflation (as measured by the Consumer Price Index for all Urban consumers) which underlies the remainder of the economic assumptions.
2. **Assumed Rate of Investment Return** – The expected annual rate of return on System assets, net of expenses, over a long-term period. This is also the rate at which projected future benefits under the System are discounted to the present.
3. **Assumed Rate of Increase in Compensation** – The rate at which a member's annual salary is assumed to increase each year, which impacts the level of member benefits.

ASOP No. 27

Actuarial Standards of Practice (ASOP) No. 27, Selection of Economic Assumptions for Measuring Pension Obligations, provides guidance on the selection of economic assumptions for measuring obligations for defined benefit plans. The standard requires that the selected economic assumptions be consistent with each other. That is, the selection of the investment return assumption should be consistent with the selection of the wage inflation and price inflation assumptions.

ASOP No. 27 defines a reasonable economic assumption as an assumption that is:

1. Appropriate for the purpose of the measurement;
2. Reflects the actuary's professional judgment;
3. Takes into account historical and current economic data that is relevant as of the measurement date;
4. Is an estimate of future experience, an observation of the data inherent in market data or a combination thereof; and
5. Has no significant bias (i.e., it is not significantly optimistic or pessimistic) except when provisions for adverse deviation or other factors included and disclosed under Section 3.5.1, or when alternative assumptions are used for the assessment of risk.

However, the standard explicitly advises an actuary not to give undue weight to recent experience.

ASOP No. 27 acknowledges that for any given economic assumption, there is a reasonable range of opinions on that assumption.

Inflation

By "inflation," we mean price inflation, as measured by annual increases in the Consumer Price Index (CPI). This inflation assumption underlies all of the other economic assumptions. It not only impacts investment return, but also salary increases and other inflation linked benefits.

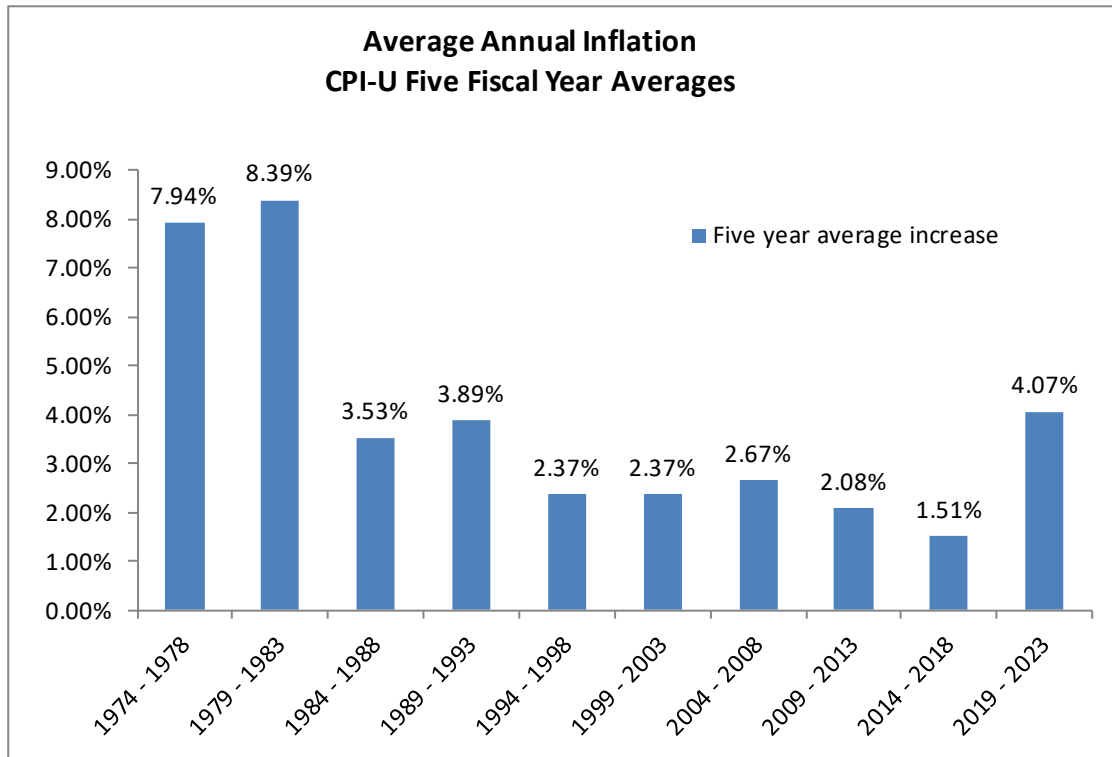
Over the five-year period from 2018 through 2023, the CPI-U has increased at an average rate of 4.07%.

The table on the following page shows the average inflation over various periods ending December 31, 2023.



Fiscal Year	Annual Increase in CPI-U
2019	2.29%
2020	1.36%
2021	7.04%
2022	6.45%
2023	3.35%
3-Year Average	5.60%
5-Year Average	4.07%
10-Year Average	2.79%
20-Year Average	2.58%
25-Year Average	2.54%
30-Year Average	2.51%
40-Year Average	2.81%
50-Year Average	3.86%

The following graph shows the average inflation over five-year periods over the last 50 years:



As the above graph illustrates, recent inflation experience is much different than that of the 1970s and 1980s. The geometric average price inflation was 2.51% per year over the last 30 years, ending December 31, 2023; 2.58% over the last 20 years and 2.79% over the last 10 years.

Future Inflation Expectations

Since price inflation is relatively volatile and is subject to a number of influences not based on recent history, economic assumptions are less reliably based on recent past experience than are the demographic assumptions. Therefore, it is important not to give undue weight to recent experience. We must also consider future expectations for inflation as well.

We surveyed the inflation assumption used by 12 nationally recognized firms (investment consultants, asset managers, and insurance companies) across the country. In our sample of these firms, the short-term inflation assumption ranged from 2.13% to 2.70%, with an average of 2.39%; the long-term inflation assumptions ranged from 2.20% to 2.84%, with an average of 2.53%.

Another point of reference is the Social Security Administration's (SSA) 2024 Trustees Report, in which the Office of the Chief Actuary is projecting a long-term ultimate intermediate annual inflation rate assumption of 2.4%. The Social Security Trustees Report uses the ultimate rates for their 75-year projections, much longer than the longest horizon we can discern from Treasuries and TIPS.

The table on the following page presents a summary of inflation rate forecasts from various professional experts.

Forward-Looking Annual Inflation Forecasts (From Professional Experts in the Field of Forecasting Inflation) ^a	
Congressional Budget Office^b 5-Year Annual Average 10-Year Annual Average	2.44% 2.32%
Federal Reserve Bank of Philadelphia^c 5-Year Annual Average 10-Year Annual Average	2.50% 2.33%
Federal Reserve Bank of Cleveland^d 10-Year Expectation 20-Year Expectation 30-Year Expectation	2.37% 2.41% 2.46%
Federal Reserve Bank of St. Louis^e 10-Year Breakeven Inflation 20-Year Breakeven Inflation 30-Year Breakeven Inflation	2.26% 2.43% 2.27%
U.S. Department of the Treasury^f 10-Year Breakeven Inflation 20-Year Breakeven Inflation 30-Year Breakeven Inflation 50-Year Breakeven Inflation 100-Year Breakeven Inflation	2.19% 2.43% 2.27% 2.36% 2.43%
Social Security Trustees^g Ultimate Intermediate Assumption	2.40%

^aEnd of the Second Quarter, 2024. Version 2024-07-12 by Gabriel, Roeder, Smith & Company

^bAn Update to the Budget and Economic Outlook: 2024 to 2034 , Release Date: June 2024, Consumer Price Index (CPI-U), Percentage Change from Year to Year, 5-Year Annual Average (2024 - 2028), 10-Year Annual Average (2024 - 2033).

^cSecond Quarter 2024 Survey of Professional Forecasters , Release Date: May 10, 2024, Headline CPI, Annualized Percentage Points, 5-Year Annual Average (2024 - 2028), 10-Year Annual Average (2024 - 2033).

^dInflation Expectations, Model output date: June 1, 2024.

^eThe 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: June 2024.

^fThe Treasury Breakeven Inflation (TBI) Curve, Monthly Average Rates, June 2024.

^gThe 2024 Annual Report of The Board of Trustees of The Federal Old-Age And Survivors Insurance and Federal Disability Insurance Trust Funds , May 6, 2024, p. 10, Key Assumptions and Summary Measures for Long-Range (75-year) Projections, Intermediate, Consumer Price Index (CPI-W).

Taking all of this information into consideration, we believe that the 2.5% price inflation assumption currently used in the funding and GASB valuations is reasonable. We believe that a price inflation assumption in the range of 2.25% to 2.75% is supportable by historical experience and future expectations. That being said, price inflation is the starting point for the other economic assumptions, such as the investment rate of return, wage increases, and health trend rates. If a price inflation assumption is too high (low) and it results in an investment rate of return that is also too high (low), the resulting valuations can be too optimistic (pessimistic) and/or contributions that may be too low (high). However, if the investment rate of return assumption is not too high, then a price inflation that is higher than future expectations could actually add a margin for adverse experience when measuring liabilities. In other words, it is important not to just look at this assumption in isolation.

Investment Return

The investment return assumption, also referred to as the valuation interest rate, is one of the principal assumptions in any actuarial valuation. It is used to discount future expected benefit payments back to the valuation date, which ultimately determines the liability (i.e., present value of benefits) of the retirement plan. Even a small change to this assumption can produce significant changes to the liabilities and contribution rates.

For the TSERS, LGERS, RODSPF, and DIPNC, this assumption was adjusted after the 2015-2019 experience study. For the RHB, this assumption is set by the State (and is currently the same as TSERS and LGERS). However, because the RHB is not a funded plan, this assumption is not the discount rate. Rather, the discount rate is based on the Bond Buyer 20-year GO index.

The assumed rate of investment return for the TSERS and LGERS December 31, 2023 funding valuations was 6.5%. Based on the reported asset allocation (and the target allocation shown in the Annual Comprehensive Financial Report) and a 2.50% price inflation assumption, we believe this assumption is reasonable for use as the assumed rate of return for the funding valuations and the expected long-term rate of return for the GASB valuations, based on the information provided for this review. It is important to note that for both the LGERS and TSERS, a large portion (approximately 25%, each) of their asset allocation (as reported in the December 31, 2023 valuations) is in the “other” category. This category is footnoted to indicate it covers real estate, alternatives, inflation and credit. We recommend this category be further subdivided since these categories do not all have the same future expectations. Subdividing this category would allow an auditor (or other user of the report) to perform a more robust analysis to determine if the assumption continues to be appropriate. The RODSPF and DIPNC uses an assumed of investment return of 3.00%. Since these funds are primarily invested in fixed income vehicles, we believe this is a reasonable assumption for funding and for the long-term expected rate of return for GASB, based on a 2.50% inflation assumption.

We have tested this assumption using our 2024 Capital Markets Assumption Model and the reported asset allocation in the December 31, 2023 reports. In 2024, the capital market assumptions used by the consultants who provide that information were relatively stable since 2023. Based on our 2024 model, the 6.5% assumption is just below the 50th percentile return over the next 10 years using the current NCRS asset allocation.

Wage inflation, Payroll Growth and Pay Increases

These items were studied as part of the most recent experience study. These respective experience studies provide enough detail to demonstrate that the recommended assumptions (which were used in the December 31, 2023 funding valuations) are reasonable.

RHB Trend Rates

The trend rates used for the GASB valuation of the RHB are similar to the trend rates that GRS currently uses, but end in an ultimate rate higher than what GRS currently uses. However, we believe they are reasonable. We note the trend rates are consistent with the rates used in the previous valuation.

Summary

In summary, we find the economic assumptions to be reasonable for the funding and GASB valuations.

SECTION 3

**REVIEW OF THE RESPECTIVE VALUATION REPORTS
CONTAINING THE UNDERLYING CALCULATIONS FOR THE
GASB VALUATIONS**

Test Lives Review

TSERS

Actives

GRS requested test life information on 10 active cases. Two members entered terminated vested status during the year; the remaining active cases are shown below:

Test Case	Age	Service	Reported	Sex	Valuation			
			Pay		Result	GRS	Gallagher	% Diff
1 Teacher	57.1107	6.6667	\$ 1,245,316.70	M	EAAL	\$ 1,713,085	\$ 1,730,046	-0.98%
					PVB	2,901,616	3,065,712	-5.35%
					NC	197,826	193,383	2.30%
					PVFS	7,951,959	8,641,039	-7.97%
2 General	62.1189	8.1667	107,368.30	M	EAAL	164,373	162,174	1.36%
					PVB	230,449	236,171	-2.42%
					NC	17,360	16,541	4.95%
					PVFS	417,811	464,815	-10.11%
3 Other	59.7746	22.0000	58,618.51	M	EAAL	240,580	240,434	0.06%
					PVB	265,781	263,419	0.90%
					NC	7,394	6,527	13.28%
					PVFS	198,303	194,654	1.87%
4 General	36.0821	0.4167	19,435.70	M	EAAL	505	(37)	-1,464.86%
					PVB	21,876	55,340	-60.47%
					NC	2,523	5,698	-55.72%
					PVFS	171,876	445,947	-61.46%
5 General	55.75	14.2500	53,714.47	M	EAAL	130,240	133,851	-2.70%
					PVB	175,358	180,201	-2.69%
					NC	7,574	6,927	9.34%
					PVFS	329,483	354,752	-7.12%
6 Teacher	46.9824	24.5000	72,576.10	F	EAAL	410,997	413,171	-0.53%
					PVB	433,398	447,574	-3.17%
					NC	5,402	7,208	-25.06%
					PVFS	307,898	341,252	-9.77%
7 Teacher	54.1189	25.5000	38,208.72	M	EAAL	205,524	202,793	1.35%
					PVB	222,313	221,554	0.34%
					NC	4,468	4,122	8.39%
					PVFS	146,351	169,054	-13.43%
8 Teacher	26.5548	2.2727	55,003.52	F	EAAL	14,712	14,109	4.27%
					PVB	55,279	80,845	-31.62%
					NC	4,609	6,163	-25.21%
					PVFS	498,980	570,362	-12.52%
Total Test Cases					EAAL	2,880,016	2,896,541	-0.57%
					PVB	4,306,070	4,550,816	-5.38%
					NC	247,156	246,569	0.24%
					PVFS	10,022,661	11,181,875	-10.37%

In prior reports, we valued Test Case 1 reflecting the compensation limit under 401(a)(17). Gallagher indicated that they did not apply any salary limits in their valuation and, therefore, our figures in the report do not reflect the salary limit.

TSERS

Retirees

GRS requested test life information on 18 retiree cases. One retiree died during the year; the remaining retiree cases are shown below:

Test Case	Age	Option Code	Current Monthly Benefit	Sex	Valuation Result	GRS	Gallagher	% Diff
1 - Law Enf. (beneficiary)	84.3250	OPT3	\$ 525.90	F	EAAL/PVB	\$ 35,499	\$ 36,041	-1.50%
2 - General	78.0472	MAX	281.00	F	EAAL/PVB	27,120	27,171	-0.19%
3 - Teacher	66.4917	MAX	3,499.43	F	EAAL/PVB	490,156	494,841	-0.95%
4 - General	80.6639	OPT62	718.35	F	EAAL/PVB	79,141	79,417	-0.35%
5 - General	69.9000	MAX	365.78	F	EAAL/PVB	46,205	46,098	0.23%
6 - General (beneficiary)	59.6278	OPT62	1,621.65	F	EAAL/PVB	244,913	228,346	7.26%
7 - Other	72.4056	MAX	1,476.94	M	EAAL/PVB	159,446	161,390	-1.20%
8 - Other	70.2583	OPT62	1,795.69	M	EAAL/PVB	249,607	250,790	-0.47%
9 - General (disabled)	63.9083	OPT2	1,656.99	F	EAAL/PVB	248,306	247,870	0.18%
10 - Teacher (disabled)	71.0361	OPT62	1,231.57	M	EAAL/PVB	160,372	161,445	-0.66%
11 - General (disabled)	60.8167	MAX	1,349.73	M	EAAL/PVB	151,671	151,274	0.26%
12 - Other	60.7778	MAX	778.77	F	EAAL/PVB	117,079	116,747	0.28%
13 - General	70.9722	OPT62	2,966.47	F	EAAL/PVB	519,470	520,727	-0.24%
14 - General (disabled)	63.9833	OPT2	970.95	F	EAAL/PVB	137,035	136,960	0.05%
15 - Teacher (disabled)	63.6056	MAX	2,079.58	F	EAAL/PVB	260,326	259,107	0.47%
16 - Other	70.2056	MAX	487.05	F	EAAL/PVB	61,077	61,381	-0.50%
17 - General (disabled)	68.0583	MAX	2,049.06	M	EAAL/PVB	199,384	199,632	-0.12%
Total Test Cases					EAAL/PVB	3,186,807	3,179,237	0.24%

TSERS

Terminated Vested

GRS requested test life information on 12 terminated cases. The two active members that terminated during year are also included. The terminated vested and non-vested cases, are shown below:

Test Case	Age	Service	Contributions	Sex	Result	GRS	Gallagher	% Diff
1 - Teacher [#]	26.7555	3.0000	\$ 4,314.25	F	EAAL/PVB	\$ 4,314	\$ 4,314	0.00%
2 - General	65.2159	14.1667	43,803.17	M	EAAL/PVB	65,902	79,904	-17.52%
3 - Teacher*	42.3470	9.7727	36,213.56	M	EAAL/PVB	36,214	36,214	0.00%
4 - General	52.1886	8.9166	45,227.49	F	EAAL/PVB	57,629	58,834	-2.05%
5 - Other	61.4906	11.5833	78,396.84	M	EAAL/PVB	117,942	125,202	-5.80%
6 - Teacher	55.649	5.8636	12,839.26	F	EAAL/PVB	17,754	18,530	-4.19%
7 - General	55.1831	16.2500	72,143.97	M	EAAL/PVB	74,912	76,924	-2.62%
8 - Other	48.5246	16.0000	129,004.27	F	EAAL/PVB	140,891	186,381	-24.41%
9 - Teacher*	43.1381	11.8455	41,114.66	F	EAAL/PVB	41,115	41,115	0.00%
10 - Teacher*	42.1995	5.0122	16,113.06	F	EAAL/PVB	16,113	16,113	0.00%
11 - Other [#]	64.3157	2.2727	2,128.47	F	EAAL/PVB	2,128	2,128	0.00%
12 - Teacher*	35.4045	5.0000	15,586.93	F	EAAL/PVB	15,587	15,587	0.00%
13 - Other [^]	44.6831	21.5833	93,513.12	F	EAAL/PVB	121,315	118,414	2.45%
14 - Teacher [^]	43.3267	12.0833	35,774.74	F	EAAL/PVB	43,513	44,906	-3.10%
Total Test Cases					EAAL/PVB	755,329	824,566	-8.40%

* GRS Present Value of deferred benefits were lower than the contribution balances.

Values are equal to contribution balances for members with less than 5 years of service.

[^] Originally requested on active listing (became terminated vested during the year).

Total TSERS

(Actives, Retirees, and Terminated Vested)

Valuation	GRS	Gallagher	% Diff
Result			
EAAL	\$6,822,152	\$6,900,344	-1.13%
PVB	8,248,206	8,554,619	-3.58%



LGERS

Actives

GRS requested test life information on 10 active cases. One member entered terminated vested status during the year; the remaining active cases are shown below:

Test Case	Age	Service	Reported Pay	Sex	Valuation Result	GRS	Gallagher	% Diff
1 Law Enforcement	37.7132	16.4167	\$77,119.95	M	EAAL	\$ 257,108	\$ 257,711	-0.23%
					PVB	341,919	355,817	-3.91%
					NC	9,301	10,117	-8.07%
					PVFS	733,394	742,176	-1.18%
2 Fire & Rescue	96.1627	27.5833	53,495.61	M	EAAL	129,204	96,259	34.23%
					PVB	129,204	96,259	34.23%
					NC	0	0	
					PVFS	0	0	
3 Fire & Rescue	43.3854	17.7500	88,226.18	F	EAAL	294,285	312,986	-5.98%
					PVB	395,381	404,385	-2.23%
					NC	11,617	10,489	10.75%
					PVFS	799,662	759,825	5.24%
4 Fire & Rescue	49.4127	29.4167	61,670.23	M	EAAL	456,137	554,497	-17.74%
					PVB	464,523	568,422	-18.28%
					NC	4,526	7,221	-37.32%
					PVFS	87,393	89,145	-1.97%
5 Fire & Rescue	58.8321	24.0833	62,445.04	M	EAAL	314,995	309,580	1.75%
					PVB	339,976	335,092	1.46%
					NC	8,447	8,763	-3.61%
					PVFS	191,967	178,258	7.69%
6 Fire & Rescue	39.3799	13.6667	96,340.42	M	EAAL	221,177	240,732	-8.12%
					PVB	346,286	353,028	-1.91%
					NC	12,205	10,933	11.63%
					PVFS	1,033,310	975,336	5.94%
7 General	63.7187	18.4167	39,621.56	F	EAAL	147,160	140,269	4.91%
					PVB	163,079	158,213	3.08%
					NC	5,315	5,701	-6.77%
					PVFS	116,185	115,937	0.21%
8 Law Enforcement	48.2214	24.5000	92,914.12	M	EAAL	583,638	526,342	10.89%
					PVB	583,638	574,986	1.50%
					NC	13,318	11,643	14.39%
					PVFS	467,397	385,014	21.40%
9 General	33.9386	2.0833	64,954.90	F	EAAL	14,673	16,664	-11.95%
					PVB	82,921	93,883	-11.68%
					NC	6,603	7,265	-9.11%
					PVFS	695,444	662,422	4.99%
Total Test Cases					EAAL	2,418,377	2,455,040	-1.49%
					PVB	2,846,927	2,940,085	-3.17%
					NC	71,332	72,132	-1.11%
					PVFS	4,124,752	3,908,113	5.54%

LGERS

Retirees

GRS requested test life information on 12 retiree cases. The retiree cases are shown below:

Test Case	Age	Option Code	Current Monthly Benefit	Sex	Valuation Result	GRS	Gallagher	% Diff
1 - Law Enforcement	73.59	MAX	\$1,129.62	M	EAAL/PVB	\$ 113,698	\$ 112,697	0.89%
2 - General	76.08	OPT62	2,451.86	F	EAAL/PVB	314,330	319,654	-1.67%
3 - General	74.22	MAX	1,279.95	F	EAAL/PVB	143,324	144,954	-1.12%
4 - General	76.90	OPT62	861.66	F	EAAL/PVB	101,671	102,132	-0.45%
5 - General	85.76	MAX	1,943.90	F	EAAL/PVB	129,905	129,324	0.45%
6 - General	70.13	MAX	360.39	F	EAAL/PVB	45,327	45,655	-0.72%
7 - Law Enforcement	62.38	OPT63	2,943.97	M	EAAL/PVB	443,590	446,507	-0.65%
8 - General	73.95	MAX	1,101.97	F	EAAL/PVB	124,393	124,798	-0.32%
9 - General	60.24	OPT4	3,029.60	M	EAAL/PVB	273,495	278,625	-1.84%
10 - Law Enforcement	58.13	OPT62	4,792.63	M	EAAL/PVB	794,110	797,418	-0.41%
11 - Fire (Beneficiary)	66.89	OPT2	1,319.25	F	EAAL/PVB	165,225	165,559	-0.20%
12 - General	78.13	MAX	1,442.55	F	EAAL/PVB	140,304	141,782	-1.04%
Total Test Cases					EAAL/PVB	2,789,373	2,809,105	-0.70%

LGERS

Terminated Vested

GRS requested test life information on 10 Terminated Vested cases. In addition, 1 active member entered terminated vested status during the year. The terminated vested cases are shown below:

Test Case	Age	Service	Accumulated Contributions	Sex	Valuation Result	GRS	Gallagher	% Diff
1 - General*	35.8415	7.4998	\$26,591.38	M	EAAL/PVB	\$ 26,591	\$ 26,591	0.00%
2 - Fire & Rescue	62.2719	18.4166	102,663.20	M	EAAL/PVB	204,140	228,705	-10.74%
3 - Fire & Rescue*	43.4605	7.7500	25,622.32	M	EAAL/PVB	25,622	25,622	0.00%
4 - Fire & Rescue*	40.2801	8.3333	36,789.24	M	EAAL/PVB	36,789	36,789	0.00%
5 - Fire & Rescue*	42.4127	7.4166	30,273.01	F	EAAL/PVB	30,273	30,273	0.00%
6 - Fire & Rescue	69.0411	10.5000	39,657.43	M	EAAL/PVB	51,770	61,945	-16.43%
7 - General*	46.1025	7.4167	19,048.05	F	EAAL/PVB	19,048	19,048	0.00%
8 - General	56.3799	10.3332	40,909.97	F	EAAL/PVB	60,862	68,528	-11.19%
9 - General*	64.358	8.2500	38,384.11	M	EAAL/PVB	38,384	38,402	-0.05%
10 - Fire & Rescue	57.7351	12.0000	61,319.96	F	EAAL/PVB	92,921	110,606	-15.99%
11 - Law Enforcement*	37.0821	6.0000	18,913.13	M	EAAL/PVB	18,913	18,913	0.00%
Total Test Cases					EAAL/PVB	605,313	665,422	-9.03%

* GRS Present Value of deferred benefits were lower than the contribution balances.

Total LGERS

(Actives, Retirees, and Terminated Vested)

Valuation Result	GRS	Gallagher	% Diff
EAAL	\$5,813,063	\$5,929,567	-1.96%
PVB	6,241,613	6,414,612	-2.70%



RODSPF

Actives

GRS requested test life information on 10 active cases. The active cases are shown below:

Test Case	Age	Service	Reported	Sex	Valuation			
			Pay		Result	GRS	Gallagher	% Diff
1	45.9659	18.9167	\$79,196.00	F	EAAL	\$ 110,829	\$ 95,950	15.51%
					PVB	204,802	214,693	-4.61%
					NC	7,376	11,315	-34.81%
					PVFS	1,041,917	829,979	25.54%
2	60.3212	23.5833	102,423.12	F	EAAL	215,288	233,502	-7.80%
					PVB	264,711	286,510	-7.61%
					NC	11,969	14,658	-18.34%
					PVFS	423,374	330,364	28.15%
3	54.4879	20.3333	89,551.94	F	EAAL	128,391	161,168	-20.34%
					PVB	216,755	262,976	-17.58%
					NC	10,111	13,059	-22.57%
					PVFS	809,577	700,959	15.50%
4	42.0548	7.0833	58,451.00	F	EAAL	69,304	62,525	10.84%
					PVB	158,810	161,112	-1.43%
					NC	6,404	6,609	-3.10%
					PVFS	847,576	880,613	-3.75%
5	69.0329	19.0833	54,604.51	M	EAAL	129,080	141,807	-8.97%
					PVB	164,777	180,235	-8.58%
					NC	9,164	10,553	-13.16%
					PVFS	195,708	182,877	7.02%
6	66.9495	16.1667	50,581.01	F	EAAL	167,935	178,610	-5.98%
					PVB	226,951	229,862	-1.27%
					NC	15,176	13,170	15.23%
					PVFS	182,443	176,779	3.20%
7	40.6831	12.4167	111,465.00	M	EAAL	110,935	95,670	15.96%
					PVB	192,859	184,242	4.68%
					NC	6,753	6,157	9.68%
					PVFS	1,396,222	1,610,355	-13.30%
8	59.6804	5.0833	89,775.47	F	EAAL	91,752	75,799	21.05%
					PVB	173,542	164,014	5.81%
					NC	11,380	11,074	2.76%
					PVFS	676,913	729,724	-7.24%
9	56.1655	3.0833	152,586.39	F	EAAL	35,495	37,122	-4.38%
					PVB	114,124	132,450	-13.84%
					NC	9,163	9,730	-5.83%
					PVFS	1,349,325	1,476,032	-8.58%
10	68.4304	18.3333	82,183.00	F	EAAL	156,966	146,226	7.34%
					PVB	211,404	200,967	5.19%
					NC	14,186	13,454	5.44%
					PVFS	291,405	334,729	-12.94%
Total Test Cases					EAAL	1,215,975	1,228,379	-1.01%
					PVB	1,928,735	2,017,061	-4.38%
					NC	101,682	109,779	-7.38%
					PVFS	7,214,460	7,252,411	-0.52%



RODSPF

Retirees

GRS requested test life information on 11 retiree cases. The retiree cases are shown below:

Test Case	Age	Option Code*	Current** Monthly Benefit	Sex	Valuation Result #	GRS	Gallagher	% Diff
1	78.1222	OPT62	\$1,903.46	F	EAAL/PVB	\$ 183,344	\$ 183,462	-0.06%
2	70.2639	MAX	5,145.26	M	EAAL/PVB	218,172	218,241	-0.03%
3	76.4222	MAX	4,499.86	F	EAAL/PVB	201,500	201,608	-0.05%
4	75.5528	OPT63	1,645.20	F	EAAL/PVB	201,500	201,608	-0.05%
5	69.9000	MAX	794.63	F	EAAL/PVB	255,423	255,510	-0.03%
6	66.6000	MAX	2,811.35	F	EAAL/PVB	281,197	281,276	-0.03%
7	81.7444	MAX	4,357.65	M	EAAL/PVB	117,018	117,154	-0.12%
8	65.7194	OPT63	3,954.55	F	EAAL/PVB	289,529	289,606	-0.03%
9	65.2583	MAX	0.00	M	EAAL/PVB	260,745	260,801	-0.02%
10	57.1222	OPT4	3,664.02	F	EAAL/PVB	357,675	357,735	-0.02%
11	82.7028	MAX	3,795.76	F	EAAL/PVB	139,342	139,498	-0.11%
Total Test Cases					EAAL/PVB	2,505,446	2,506,499	-0.04%

* ROD benefits are paid for the life of the member only (MAX), regardless of beneficiary/option election for benefits paid from other plans.

** Benefit listed is LGERS benefit; RODSPF benefits are valued at \$1,500 monthly.

Nearest integer ages used for valuation results, in accordance with the method described in Gallagher's report.

Terminated Vested

GRS requested test life information for four terminated vested cases. These cases were not valued.

Total RODSPF

(Actives, Retirees, and Terminated Vested)

Valuation Result	GRS	Gallagher	% Diff
EAAL	\$3,721,421	\$3,734,878	-0.36%
PVB	4,434,181	4,523,560	-1.98%



DIPNC

Actives

GRS requested test life information on 11 active cases. Three members entered terminated vested status during the year; the remaining active cases are shown below:

			Reported		Valuation			
Test Case	Age	Service	Pay	Sex	Result	GRS	Gallagher	% Diff
1	53.2159	24.12	\$ 22,822.78	F	EAAL	\$ (40)	\$ 108	-137.04%
					PVB	254	302	-15.89%
					NC	50	44	13.64%
					PVFS	132,743	125,855	5.47%
2	57.3157	18.56	49,052.36	F	EAAL	(384)	138	-378.26%
					PVB	876	716	22.35%
					NC	175	136	28.68%
					PVFS	349,755	248,143	40.95%
3	39.7406	14.85	62,610.72	F	EAAL	867	573	51.31%
					PVB	1,783	1,331	33.96%
					NC	82	67	22.39%
					PVFS	687,741	753,823	-8.77%
4	51.9550	21.45	77,041.45	M	EAAL	120	201	-40.30%
					PVB	1,155	1,113	3.77%
					NC	117	146	-19.86%
					PVFS	676,638	664,038	1.90%
5	71.2433	13.75	35,483.18	M	EAAL	0	0	
					PVB	0	0	
					NC	0	0	
					PVFS	79,726	82,701	-3.60%
6	64.2746	15.83	94,181.30	F	EAAL	0	0	
					PVB	0	0	
					NC	0	0	
					PVFS	272,284	300,008	-9.24%
7	29.5465	2.18	21,952.47	F	EAAL	111	65	70.77%
					PVB	635	428	48.36%
					NC	39	27	44.44%
					PVFS	284,558	280,510	1.44%
8	56.7500	14.25	56,342.18	M	EAAL	300	538	-44.24%
					PVB	1,630	1,365	19.41%
					NC	151	142	6.34%
					PVFS	493,121	397,276	24.13%
Total Test Cases					EAAL	974	1,623	-39.99%
					PVB	6,333	5,255	20.51%
					NC	614	562	9.25%
					PVFS	2,976,566	2,852,354	4.35%

DIPNC

Retirees

GRS requested test life information on 10 retiree cases (of which not all were receiving disability benefits). The retiree cases currently receiving benefits are shown below:

Test Case	Age	Disability Start Date	Current Monthly Benefit	Sex	Valuation Result	GRS	Gallagher	% Diff
1	61.42	10/2023	\$ 3,900.00	M	EAAL/PVB	\$ 135,837	\$ 129,049	5.26%
2	57.04	5/2010	1,866.93	F	EAAL/PVB	2,640	2,724	-3.08%
3	56.54	1/2011	3,172.86	F	EAAL/PVB	66,396	64,442	3.03%
4	63.27	6/2007	1,197.37	F	EAAL/PVB	520	302	72.19%
5	51.26	3/2018	2,421.70	M	EAAL/PVB	22,689	21,377	6.14%
6	53.58	9/2021	1,697.83	F	EAAL/PVB	48,614	45,244	7.45%
7	63.72	1/2019	1,894.51	M	EAAL/PVB	5,252	5,288	-0.68%
8	48.55	10/2015	1,639.81	M	EAAL/PVB	9,756	9,094	7.28%
9	52.51	4/2014	2,399.75	F	EAAL/PVB	6,710	5,690	17.93%
Total Test Cases					EAAL/PVB	298,414	283,210	5.37%

Terminated Vested

Terminated vested members of TSERS are not eligible for DIPNC benefits, therefore none were requested.

Total DIPNC

(Actives and Retirees)

Valuation Result	GRS	Gallagher	% Diff
EAAL	\$299,388	\$284,833	5.11%
PVB	304,747	288,465	5.64%



RHB

GRS requested test life information on 10 active, 10 retiree and 10 terminated vested cases. Some of the requested cases changed status and were not included. Segal previously indicated that they do not run valuations seriatim. Instead, they group the data into smaller categories, run each group as if it was an individual record, and then gross the results up by the number in the group. Segal was very helpful and worked with us to identify testing that GRS would be comfortable in using instead of individual records when we first began reviewing these reports (in 2018). Each test record in the following table actually represents a group of members.

Actives

Test Case	Age	Service	Reported Pay	Sex	Valuation Result	GRS	Segal	% Diff
1 Teachers	43.32	12.08	\$ 33,176	F	EAAL	\$ 63,393	\$ 79,871	-20.63%
					PVB	167,545	170,047	-1.47%
					NC	9,061	6,968	30.04%
					PVFS	389,018	430,004	-9.53%
2 General	39.39	18.90	\$ 63,735	M	EAAL	136,992	184,817	-25.88%
					PVB	263,648	298,239	-11.60%
					NC	11,294	11,656	-3.11%
					PVFS	722,700	620,180	16.53%
3 General	58.69	18.00	\$ 34,506	M	EAAL	69,903	66,694	4.81%
					PVB	100,756	93,849	7.36%
					NC	5,794	4,674	23.96%
					PVFS	186,341	200,483	-7.05%
4 General	53.43	13.42	\$ 42,561	F	EAAL	63,042	52,146	20.90%
					PVB	94,340	83,774	12.61%
					NC	3,676	3,303	11.29%
					PVFS	368,771	407,598	-9.53%
5 Other	80.56	21.90	\$ 45,876	M	EAAL	24,889	26,432	-5.84%
					PVB	24,889	26,432	-5.84%
					NC	0	0	
					PVFS	0	0	
6 Other	58.17	17.45	\$ 41,205	F	EAAL	61,794	58,127	6.31%
					PVB	92,962	90,596	2.61%
					NC	5,857	4,906	19.38%
					PVFS	224,328	272,711	-17.74%
7 Other	59.26	20.30	\$ 20,875	F	EAAL	70,566	68,440	3.11%
					PVB	94,555	94,578	-0.02%
					NC	5,671	4,934	14.94%
					PVFS	87,115	110,589	-21.23%
8 Other	37.68	12.92	\$ 61,464	F	EAAL	131,554	113,710	15.69%
					PVB	193,504	187,165	3.39%
					NC	5,313	5,753	-7.65%
					PVFS	724,811	784,723	-7.63%
9 Other	53.99	7.92	\$ 40,410	F	EAAL	29,991	30,273	-0.93%
					PVB	56,398	60,652	-7.01%
					NC	2,784	3,008	-7.45%
					PVFS	395,815	408,048	-3.00%
Total Test Cases					EAAL	652,124	680,510	-4.17%
					PVB	1,088,597	1,105,332	-1.51%
					NC	49,450	45,202	9.40%
					PVFS	3,098,899	3,234,337	-4.19%

RHB

Retirees

	Test Case	Age	Sex	Valuation Result	GRS	Segal	% Diff
1	General	94.59	F	EAAL/PVB	\$ 5,513	\$ 7,049	-21.79%
2	General	87.03	F	EAAL/PVB	12,289	14,391	-14.60%
3	General	79.76	M	EAAL/PVB	25,115	26,703	-5.95%
4	General	75.04	F	EAAL/PVB	34,214	35,371	-3.27%
5	General	75.29	M	EAAL/PVB	35,325	37,309	-5.32%
6	General	70.77	M	EAAL/PVB	46,766	46,810	-0.09%
7	General	69.63	F	EAAL/PVB	46,613	46,143	1.02%
8	General (disabled)	70.09	F	EAAL/PVB	37,663	38,511	-2.20%
9	General	64.26	M	EAAL/PVB	75,756	79,840	-5.12%
10	Teachers	65.65	F	EAAL/PVB	39,437	39,693	-0.64%
11	General	71.54	F	EAAL/PVB	5,575	2,463	126.36%
Total Test Cases				EAAL/PVB	364,268	374,283	-2.68%

Terminated Vested

	Test Case	Age	Service	Sex	Valuation Result	GRS	Segal	% Diff
1	Teacher	50.61	18.42	F	EAAL/PVB	\$ 101,504	\$ 109,972	-7.70%
2	Teacher	45.59	7.60	F	EAAL/PVB	107,636	116,639	-7.72%
3	Teacher	45.27	8.05	F	EAAL/PVB	107,931	118,036	-8.56%
4	Teacher	39.17	7.58	F	EAAL/PVB	36,378	24,785	46.77%
5	Teacher	54.81	7.91	F	EAAL/PVB	31,114	21,445	45.09%
6	Teacher	62.68	5.33	F	EAAL/PVB	28,126	17,428	61.38%
7	General	59.83	5.00	M	EAAL/PVB	46,043	40,561	13.52%
8	General	66.61	6.17	F	EAAL/PVB	49,581	53,785	-7.82%
9	General	59.41	11.17	F	EAAL/PVB	88,355	96,003	-7.97%
10	Law Enforcement	49.70	18.50	M	EAAL/PVB	108,821	119,914	-9.25%
Total Test Cases					EAAL/PVB	705,489	718,568	-1.82%

Total RHB

(Actives, Retirees, and Terminated Vested)

Valuation Result	GRS	Segal	% Diff
EAAL	\$1,721,881	\$1,773,361	-2.90%
PVB	2,158,354	2,198,183	-1.81%

Test Lives Comments

We believe that the test lives are close enough to state that the liabilities shown in the funding valuations are reasonable and an appropriate representation of the liabilities, based on the current assumptions. When performing a full replication valuation, we generally consider replication a successful match if the replication is within the following tolerances (in plan total):

Total Present Value of Benefits	2%
Total Accrued Liability	5%
Normal Cost	5%
Present Value of Future Pay	2%

When looking at individual test life cases, differences may be much larger due to differences in rounding between actuarial software. For this reason, it is also important to consider the variance between the sums of the test cases, which will generally dampen the effect of differences due to rounding. However, the smaller the group of test cases, the larger the acceptable tolerances should be. We have found that the sums of the test cases (actives, retirees and terminated vested) for each of the plans we have reviewed are all within or acceptably close to the tolerance we would have applied to the plan totals when performing a full replication. We therefore believe the plan total results for TSERS, LGERS, RODSPF, DIPNC and RHB are reasonable.

This is our seventh year performing this analysis. As such, we attempted to request some of the same test life cases this year as we did in previous years, so we could review how the results changed from year-to-year. The results of our test life comparisons are generally consistent with the analysis performed in past years.

We have the following comments regarding the valuation reports and the current actuaries' calculations:

- Several of the terminated vested test cases showed greater discrepancies than others. GRS was not provided with the estimated benefits for the vested terminated members and, therefore, attempted to estimate the members' benefits using methods and assumptions described in the Gallagher reports. It may be that test cases where the difference is greater is attributable to using actual available data versus an estimation. In addition, we could not locate an assumption detailing when a terminated vested member would commence benefits. We assumed these members would commence receipt of benefits at earliest eligibility for reduced retirement benefits.
- We recommend Segal review the disability rates used in their actuarial valuation for consistency with the rates disclosed by Gallagher in the DIPNC valuation. Gallagher notes that the rates disclosed in a prior valuation (performed by Cavanaugh Macdonald Consulting) were incorrectly disclosed.

We have the following comments regarding future audits:

- As discussed previously, provide the estimated benefits for terminated vested members to the auditor.

SECTION 4

REVIEW OF THE RESPECTIVE GASB REPORTS

Content Review

The GASB Statement Nos. 67 and 74 letters combined with the schedules in the funding valuation appear to have all of the actuarial schedules required by GASB Statement Nos. 67 and 74.

For the reports prepared by Gallagher, there are separate GASB letters issued with the main results. We believe that all of the actuarial schedules and actuarial disclosures required by GASB Statement Nos. 67 and 74 are detailed in the GASB letters and funding valuation reports.

For the report prepared by Segal, there is no funding valuation (in accordance with the plan sponsor's decisions). The report that Segal provided for the GASB Statement No. 74 results contained the underlying valuation results as of December 31, 2023. We believe that the Segal GASB Statement No. 74 report contains all the actuarial schedules and disclosures required by GASB Statement No. 74.

Calculations Review

While our review affirmed the December 31, 2023 calculations of liabilities, the following chart shows our attempt at replicating the roll forward to June 30, 2024. Since the exact calculations were not provided and certain elements had to be estimated, we did not expect to exactly reproduce the June 30, 2024 numbers. As the schedules show, our estimates were extremely close.

Data	TSERS	LGERS	RODSPF	DIPNC	RHB
1 December 31, 2023 AAL	\$ 99,809,701,710	\$39,519,443,654	\$34,167,398	\$ 223,036,899	\$36,658,152,000
2 Employee Contris during 12 months, ending 6/30/24	1,106,850,000	574,906,000	-	-	-
3 Employer Normal Cost Rate (Excl Admin Exp) as of 1/1/24	6.18%	6.64%	15.81%	0.06%	1,430,998,000
4 Payroll as of 12/31/23	16,889,491,503	8,350,199,322	8,099,206	19,204,112,835	
5 Benefits Paid during 12 months ending 6/30/24	5,783,536,000	1,913,522,000	1,932,000	31,846,000	1,222,657,000
6 GRS' approximation of numbers needed for roll forward Change in Benefit Terms or Assumptions (not already included in 12/31/2023 AAL)	-	-	-	-	-
7 Service Cost from 12/31/23 to 6/30/24: (3)*(4)/2	521,885,287	277,117,950	640,102	5,761,234	715,499,000
8 Benefit Payments from 12/31/23 to 6/30/24: (5)/2	2,891,768,000	956,761,000	966,000	15,923,000	611,328,500
GRS' approximation of 6/30/24 TPL/OBEP Liab (roll forward)					
9 12/31/23 TPL: (1)+(6)	99,809,701,710	39,519,443,654	34,167,398	223,036,899	36,658,152,000
10 Service Cost: (2)/2 + (7)	1,075,310,287.44	564,570,949.69	640,102	5,761,233.85	715,499,000
11 Benefit Payments	2,891,768,000	956,761,000	966,000	15,923,000	611,328,500
12 Interest: (1)* i/2 + [(10)-(11)]* i/4 [#]	3,214,297,868	1,278,008,830	510,067	3,269,340	721,356,162
13 TPL/OPEB Liab 6/30/24: (9) + (10) - (11) + (12)	101,207,541,865	40,405,262,434	34,351,566	216,144,473	37,483,678,662
14 TPL/OPEB Liab 6/30/24 developed by Gallagher/Segal	101,125,956,000	40,361,637,000	34,288,000	219,683,000	37,702,714,000
15 Ratio of GRS approximation to Gallagher/Segal Calculations	100.1%	100.1%	100.2%	98.4%	99.4%

[#] i = 6.50% for TSERS and LGERS; 3.00% for RODSPF; 3.00% for DIPNC, and 3.93% for RHB.



SECTION 5

COMMENTS, CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE YEARS

Comments

We would like to thank Segal and Gallagher for their cooperation in the completion of this review.

We have indicated we believe the assumed rate of return of 6.50% was reasonable for TSERS and LGERS (based on the information provided for this review).

Prior Year's Recommendations

We have reviewed the reports with regard to our recommendations from last year (and the prior years) and have found implementation of most of our recommendations.

Conclusions

We believe the actuarial assumptions, actuarial cost methods, procedures, and valuation results are reasonable and based on our test life review, the valuation results are of reasonable accuracy.

We certify that the plans' actuarial valuation was prepared in accordance with pronouncements issued by the Governmental Accounting Standards Board (GASB), principles and practices prescribed by the Actuarial Standards Board, and that the actuarial calculations were performed by qualified actuaries in accordance with accepted actuarial procedures.

Recommendations for Future Years

We have the following recommendations for future valuations:

- We recommend the North Carolina Retirement Systems continue working to provide their actuaries with more complete information regarding terminated vested members.
- We recommend Gallagher and/or Segal review their calculations, assumptions, and/or disclosures with regard to the following:
 - Assumed commencement age for vested terminated members (pension valuations)
 - Disability rates (RHB/DIPNC)
- Providing additional data used in the valuation to the actuarial auditor:
 - Estimated benefits for terminated vested members