

COMPREHENSIVE ACTUARIAL REVIEW OF THE
2020 ACTUARIAL VALUATION OF THE
SHERIFFS' PENSION AND RELIEF FUND



ACTUARIAL SERVICES
PRESENTED TO THE PUBLIC RETIREMENT SYSTEMS' ACTUARIAL COMMITTEE
JANUARY 19, 2021



LOUISIANA LEGISLATIVE AUDITOR
DARYL G. PURPERA, CPA, CFE

December 29, 2020

Mr. Osey "Skip" McGee, Jr.
Executive Director
Sheriffs' Pension and Relief Fund
1225 Nicholson Drive
Baton Rouge, Louisiana 70802

Re: Comprehensive Actuarial Review of the 2020 Actuarial Valuation

Dear Mr. McGee:

To fulfill the requirements of R.S. 11:127(C) to the Public Retirement Systems' Actuarial Committee for 2020, the Louisiana Legislative Auditor has conducted a Comprehensive Actuarial Review for the Sheriffs' Pension and Relief Fund (SPRF).

The remainder of this letter contains the results of our Comprehensive Actuarial Review of your June 30, 2020, Actuarial Valuation (prepared by G.S. Curran & Company and dated December 1, 2020). More specifically, we have evaluated for reasonableness the actuarial assumptions and methods employed by SPRF and its actuary.

I would like to thank you, your staff, and the board's actuary for the cooperation and assistance provided for this review.

Sincerely,

Daryl G. Purpera, CPA, CFE
Legislative Auditor

DGP:JJR:ch

cc: G.S. CURRAN & COMPANY

2020 COMPREHENSIVE ACTUARIAL REVIEW FOR SPRF

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Scope of Review

The June 30, 2020, Actuarial Valuation Report (dated December 1, 2020) for the Sheriffs' Pension and Relief Fund (SPRF) for funding purposes was prepared by G.S. Curran & Company (GSC).

This Comprehensive Actuarial Review (CAR) of that report was prepared by James J. Rizzo, Senior Consultant and Actuary, and Piotr Krekora, Consultant and Actuary, both employed by Gabriel, Roeder, Smith & Company (GRS). GRS is under contract with the Louisiana Legislative Auditor (LLA) to provide backup, research, calculations, actuarial services, and advice to the LLA.

This CAR includes evaluations of the appropriateness of key actuarial assumptions and methods employed in the 2020 Actuarial Valuation, as well as documented support for opinions presented herein. However, a full actuarial valuation replicating the actuary's results was not performed; nor was a full actuarial valuation performed using recommended assumptions and methods.

Summary of Findings

A summary of our findings follows. Additional details are addressed in the remainder of this report.

- 1. Optimistic Return Assumption.** We consider SPRF's 2020 investment return assumption (7.00%) to be overly optimistic (a) considering SPRF's asset allocation and expected cash flow and (b) compared to the mainstream of numerous professional forecasting organizations. Refer to *Section 1: Optimistic Return Assumption* for more details.
- 2. Treatment of Cost-of-Living Adjustments (COLAs).** The cost of future COLAs is currently not included in the 2020 Actuarial Valuation. Given the prior use and magnitude of SPRF's Funding Deposit Account balance, we consider this an acceptable treatment for this year's funding requirements. Refer to *Section 2: Treatment of Cost-of-Living Adjustments* for more details.
- 3. Mortality Assumption.** Careful analysis was undertaken by SPRF's actuary, in compliance with current actuarial literature, in assessing the degree of plan-specific mortality experience that should be recognized in the mortality tables assumed for the 2020 Actuarial Valuation. The current mortality tables are acceptable. Refer to *Section 3: Mortality Assumption* for more details.
- 4. 2020 Experience Study.** We reviewed the 2020 experience study report, prepared by SPRF's actuary, and found all the sections relating to the demographic and other assumptions to be described with reasonable detail and careful recognition of relevant experience. Therefore, we accept all the demographic and other assumptions proposed in the experience study report and find them fully appropriate for this 2020 Actuarial Valuation. Refer to *Section 4: 2020 Experience Study* for more details.
- 5. Financing Calculations.** We reviewed the 2020 Actuarial Valuation with additional emphasis on the exhibits presenting the financing calculations. All relevant and material financing calculations were reasonably complete and accurate using the board's assumptions and methods.

Section 1: Optimistic Return Assumption

This section and the Appendices set forth a disciplined process for setting or assessing a return assumption that ensures the assumption is mainstream and defensible. They set forth the details for how we arrived at our “most appropriate” net return assumption (6.08%), compared to SPRF’s 2020 return assumption (7.00%).

Following are the primary reasons why our 6.08% most appropriate return assumption for the 2020 Actuarial Valuation differs from SPRF’s 7.00% assumption adopted for the 2020 Actuarial Valuation:

- **Inflation**: The consensus average expectation of professional inflation forecasters published in 2020 for the mid-term and longer-term, presented in *Appendix A: Sources of Inflation Forecasts*, leads to a 2.00% future inflation assumption embedded in the return assumption, while SPRF’s board of trustees adopted a 2.50% assumption about future inflation embedded in the return assumption.
- **Time Horizon**: Our most appropriate return assumption is between the mid-term consensus average (a lower rate) and the longer-term consensus average (higher) of professional investment forecasters. SPRF’s board of trustees relies on a straight long-term forecast, without reflecting what is expected to happen during the next 10 years. We believe the mid-term expectations should be considered in the process. *Appendix E: Single Equivalent Cash-flow Adjusted Expectation* illustrates why considering SPRF’s own expected benefit cash flow leads to a blending between the mid-term and long-term expected returns.
- **Methodology**: The Actuary for the LLA and SPRF’s actuary both rely on various independent professional forecasts to inform our opinions. In doing so, we both are applying an accepted principle in forecasting science. However, our methodologies are different: (a) The Actuary for the LLA uses a direct approach, mapping SPRF’s asset classes and allocations directly to each professional forecaster’s capital market assumptions to obtain each forecaster’s own separate opinion about SPRF’s portfolio, while (b) SPRF’s actuary first develops a single *standardized* set of asset classes and capital market assumptions for all its clients based on a mapping amalgamation of the experts’ capital market assumptions, then maps SPRF’s asset classes and allocations to those standardized asset classes and capital market assumptions. In our opinion, the direct approach is less prone to “mapping error” than an amalgamated standardized set of asset classes, but we do not know if there is a material difference or even which direction it might go. Furthermore, we did not pursue reconciling some mathematical questions concerning internal steps in the SPRF actuary’s methodology.
- **Board Action**: SPRF’s board of trustees adopting a rate near the top end of its actuary’s range. Earlier this year, SPRF’s actuary reported to the board of trustees:
 - That, over 30 years, the average geometric rate of return is expected to be 6.49%¹.
 - *“Based upon a reasonable range of 5.94% to 7.08%, the Board’s planned reduction in the assumed rate of return from 7.10% in the fiscal 2019 actuarial valuation to 7.00% for the fiscal 2020 actuarial valuation is within the reasonable range. The rate of 7.00% remains*

¹ Near the top of Page 11 of the SPRF actuary’s experience study report dated June 16, 2020.

close to the top of the range so the Board may wish to consider additional reductions in future actuarial valuations.”²

Ultimately, the board decided to lower the return assumption for the 2020 Actuarial Valuation to 7.00%.

A Disciplined Process

The cost of being materially wrong is substantial, whether it is over a 10-year period or a 30-year period, and could be detrimental to plan members (jeopardizing actuarial benefit security) and detrimental to taxpayers (unexpected contribution increases).

The process of our assessment of SPRF’s 2020 actuarial return assumption is captured in our treatment of the most significant factors in setting, defending or assessing the appropriateness of an assumed return:

1. Forecasts of future rates of *inflation* (forward-looking), as expected by experts who are both independent and nationally recognized in the field of inflation forecasting; refer to Appendix A (*Sources of Inflation Forecasts*) for more details;
2. Forecasts of future *investment returns* (forward-looking) and other capital market assumptions for various asset classes as expected by experts who are both independent and nationally recognized in the field of investment return forecasting; refer to Appendix B (*Sources of Investment Return Forecasts*) for more details;
3. The SPRF investment policy’s current and future *asset allocation percentages*, by asset class; refer to Appendix C (*Asset Allocation*) for more details;
4. *Future investment performance* of the pension fund’s portfolio: (1) as expected by each independent forecaster, (2) considering the consensus average of their 50th percentile expectations for SPRF’s compound return over time; refer to Appendix D (*Portfolio’s Expected Returns*) for more details; and
5. *Expected benefit cash flow* influences how much of a fund’s future earnings will be affected by mid-term forecasts versus long-term forecasts; refer to Appendix E (*Single Equivalent Cash-flow Adjusted Expectations*) for more details.

This disciplined process assures decision-makers that the result is a net return assumption that:

- a. Is unbiased, objective, free of agency risk (i.e., not overly influenced by what the participating agencies think is affordable);
- b. Is developed in a disciplined, robust and defensible manner; and
- c. Improves actuarial benefit security, intergenerational equity, and contribution stability.

² Near the bottom of Page 11 of the Fund actuary’s experience study report dated June 16, 2020.

Conclusion – Based on this analytical process for assessing the return assumption, we consider 6.08% to be the “most appropriate” net return assumption and consider SPRF’s 2020 return assumption of 7.00% to be overly optimistic for funding purposes.

Professional inflation forecasters and professional investment forecasters are expecting future returns to be lower than what we have seen in certain time frames in the past. Expert forecasters are not guaranteed to be right, of course. However:

- There is no other source to turn for input when selecting, defending or assessing a pension return assumption;
- It is not prudent to be out of step with the mainstream of subject matter experts;
- Just because the experts do not know for sure, that is insufficient reason to discard their opinions; trustees in the pension industry do not generally disregard the advice of other subject matter experts such as investment managers, investment consultants, actuaries or attorneys simply because they do not know for sure; actuaries do not know for sure what the future rates of turnover, retirement and mortality will be either, but SPRF’s actuary and the LLA’s actuary follow a disciplined and robust process to develop those recommended assumption – both demographic and economic; and
- It is a fiduciary’s responsibility to select the best estimate of the future expectations of SPRF’s portfolio, with professional input and without outside influences that may detract from attaining and maintain actuarial benefit security for plan members.

SPRF’s trustees are to be commended for lowering the return assumption over the years. Since the return assumption selected by SPRF’s trustees for the 2020 Actuarial Valuation is 92 basis points above our “most appropriate” return assumption, we continue to recommend they move it even lower.

Section 2: Treatment of Cost-of-living Adjustments (COLAs)

The cost of future COLAs is currently not included in the 2020 Actuarial Valuation. Future COLAs are currently recognized in the calculations of costs and liabilities only after they are granted.

There are, basically, two broad categories of COLAs available to SPRF:

1. “Gain-sharing COLA.” This is a COLA granted when the actuarial earnings exceed the actuarial assumption by a sufficient margin, and
2. “FDA COLA.” This is a COLA granted and paid out of the balance accumulated in SPRF’s Funding Deposit Account (FDA).

There are many other rules for COLAs relating to: How often and when they may be granted, minimum and maximum percentage and dollar increases granted, and who is eligible to receive the increases.

Whether and how *future* COLAs should be recognized in annual actuarial valuations for funding purposes and for accounting purposes depends on whether the future COLAs expected are of the “Gain-sharing COLA” variety or the “FDA COLA” variety.

Actuarial Treatment of “Gain-sharing COLAs”

When there is a reasonable expectation (not a guaranteed expectation) of “Gain-sharing COLAs” being granted by a retirement system in the future, an actuary should recognize the likelihood and magnitude of future “Gain-sharing COLAs” in the measurement of fund costs and liabilities for both funding and accounting purposes.

Actuarial Treatment of “FDA COLAs”

However, when there is a reasonable expectation that future COLAs will be of the “FDA COLA” type under Louisiana statutes, the actuarial treatment may be different:

- For funding purposes, future FDA COLAs are already being pre-funded by making higher contributions than what is required under a non-COLA version of the future. The excess contributions are set-aside and not counted as plan assets in the actuarial valuation until such time an FDA COLA is granted, when an equivalent amount is released from the FDA into the actuarial value of assets. Therefore, for funding purposes, if there is a reasonable expectation that future COLAs would be granted from the balance in the FDA, then no actuarial advance-recognition is necessary because the advance-recognition is already happening more directly, in the additional contributions.
- For accounting purposes, Governmental Accounting Standards Board (GASB) does not consider whether the contributions are exceeding a minimum calculation. They are not focused on funding, but on accounting. The GASB requires advance recognition of future COLAs when there is a reasonable pattern expected for granting future COLAs (whether they are FDA COLAs or otherwise). Therefore, even when COLAs are actually paid and expected to be paid out of the FDA balance, the GASB standards would require advance-recognition in the actuarial calculations of costs and liabilities if there is a pattern of FDA COLAs expected,

regardless of whether the actual contributions are exceeding the minimum recommended contributions.

SPRF differs from some other Louisiana statewide retirement systems in that it has accumulated a substantial balance in its FDA in recent years by way of actual contributions that have exceeded the minimum recommended net direct employer contribution. The FDA balance in SPRF may be used to fund COLAs when otherwise permitted under the rules.

We expect that future COLAs granted for SPRF would be of the “FDA COLA” type. The last COLA granted was an FDA COLA, effective January 1, 2018, at a time when a “Gain-sharing COLA” could have been granted; however, the board of trustees opted for financing a COLA with the balance in the FDA rather than with “excess” interest (i.e., gain-sharing).

Unless the balance in the FDA is used repeatedly for other purposes (e.g., reducing the net direct employer contribution or reducing the present value of future costs), thereby depleting the balance available for COLAs, we expect that future COLAs would be financed by using the balance in the FDA. This opinion may not hold in future years for SPRF and is not our opinion for other Louisiana retirement systems.

The exhibit on the following page illustrates the recent history of SPRF’s COLAs.

Conclusion – For SPRF’s 2020 Actuarial Valuation for funding purposes, we accept the 2020 treatment of not recognizing future COLAs in the funding calculations of costs and liabilities as appropriate treatment in this situation.

COLA History for the Sheriffs' Pension and Relief Fund

| Actuarial Measurement Date | Statutory Conditions for Gain-Sharing COLA Under: | | Authorizing Gain-sharing (G-s) COLAs Pct and Recipients ³ | | Authorizing Funding Deposit Account COLAs | | Amount Granted by Board | Date Approved by Board | Effective Date of COLA | Comments |
|----------------------------|---|---|--|--|---|---------------------------|---|------------------------|------------------------|---|
| | The Window Rule ⁴ for any COLA | The Sufficient Actuarial Return Rule ⁵ for G-s COLAs | R.S. 11:2178(K)(2)(a) G-s COLA [Up to 2.5%, to All Elg] | R.S. 11:2178(K)(2)(b) G-s COLA [2% or Nothing, to Elg Over 65] | Balance in the FDA | FDA Balance used? | | | | |
| 6/30/2020 | <u>Satisfied</u> (For YE 2021) | Not Satisfied (5.4% vs. 7.1%) | None Permitted [To All Eligibles] | None Permitted [To Elg Over 65] | \$100,391,434 | TBD | TBD | TBD | TBD | None permitted for failure of Actuarial Return Rule |
| 6/30/2019 | <u>Satisfied</u> (For YE 2020) | Not Satisfied (6.1% vs. 7.25%) | None Permitted [To All Eligibles] | None Permitted [To Elg Over 65] | \$78,520,547 | No | NA | NA | NA | None permitted for failure of Actuarial Return Rule |
| 6/30/2018 | Not Satisfied (For YE 2019) | <u>Satisfied</u> (8.1% vs. 7.4%) | None Permitted [To All Eligibles] | None Permitted [To Elg Over 65] | \$52,683,236 | No | NA | NA | NA | None permitted for failure of Window Rule |
| 6/30/2017 | <u>Satisfied</u> (For YE 2018) | <u>Satisfied</u> (8.3% vs. 7.5%) | <u>≤3.0% Permitted</u> [To All Eligibles] | None Permitted [To Elg Over 65] | \$56,567,343 | Yes, to grant a 3.0% COLA | <u>3.0% Granted</u> [To All Eligibles] | 12/18/2017 | 1/1/2018 | COLA granted from Funding Deposit Account |
| 6/30/2016 | Not Satisfied (For YE 2017) | Not Satisfied (6.6% vs. 7.6%) | None Permitted [To All Eligibles] | None Permitted [To Elg Over 65] | \$30,142,795 | No | NA | NA | NA | None permitted for failure to satisfy both Rules |
| 6/30/2015 | Not Satisfied (For YE 2016) | <u>Satisfied</u> (10.4% vs. 7.7%) | None Permitted [To All Eligibles] | None Permitted [To Elg Over 65] | \$0 | No | NA | NA | NA | None permitted for failure of Window Rule |
| 6/30/2014 ⁶ | <u>Satisfied</u> (For YE 2015) | <u>Satisfied</u> (11.6% vs. 7.8%) | <u>3.0% Permitted</u> [To All Eligibles] | <u>2% Permitted</u> [To Elg Over 65] | \$0 | No | <u>2.5% Granted</u> [To All Eligibles] | 2/24/2015 | 1/1/2015 | Gain-sharing COLA granted |

³ Prior to 2019, per R.S. 11:2178(K), the Board was authorized to provide a COLA of not less than 2% or more than 3% to all eligible pensioners. Additionally, per R.S. 11:246, the Board was authorized to provide an additional COLA of 2% to eligible pensioners over age 65. No COLA may be provided during any fiscal year until the lapse of at least one-half of the fiscal year.

⁴ Per R.S. 107.1(D)(4)(b) and R.S. 11:243(G)(1) and (3), the Board may grant a benefit increase only if any of the following apply: (a) the system has a funded ratio of at least 90% and has not granted a benefit increase to retirees, survivors, or beneficiaries in the most recent fiscal year, (b) the system has a funded ratio of at least 80% and has not granted such an increase in any of the two most recent fiscal years, or (c) the system has a funded ratio of at least 70% and has not granted a benefit increase to retirees, survivors, or beneficiaries in any of the three most recent fiscal years. The funded ratio as of any fiscal year is the ratio of the actuarial value of assets to the actuarial accrued liability under the funding method prescribed by the office of the legislative auditor.

⁵ Prior to 2019, per R.S. 11:2178(K), the Board was authorized to use interest earnings on investments of the system in excess of normal requirements to provide a supplemental COLA of not less than 2% or more than 3% to all eligible pensioners. Additionally, per R.S. 11:246, the Board was authorized to provide an additional COLA of 2% to eligible pensioners over age 65 if there is sufficient excess interest earnings to fund the entire 2% additional COLA.

⁶ The 6/30/14 valuation date marks the first year that Act 170 applies, after the trustees elected to be covered under R.S. 11:243 by 12/31/13.

Section 3: Mortality Assumption

The 2020 Actuarial Valuation (pages 39-41) states that the mortality assumption:

- For active member mortality: “Pub-2010 Public Retirement Plans Mortality Table for Safety Below-Median Employees multiplied by 120% for males and 115% for females, each with full generational projection using the MP2019 scale.”
- For annuitant and beneficiary mortality: “Pub-2010 Public Retirement Plans Mortality Table for Safety Below-Median Healthy Retirees multiplied by 120% for males and 115% for females, each with full generational projection using the MP2019 scale.”
- For disabled lives mortality: “Pub-2010 Public Retirement Plans Mortality Table for Safety Disabled Retirees multiplied by 120% for males and 115% for females, each with full generational projection using the MP2019 scale.”

These tables constitute a revision from those used in the 2019 Actuarial Valuation, and were recommended by SPRF’s actuary in the SPRF Experience Study, dated June 16, 2020.

To evaluate appropriateness in a mortality assumption, we reviewed the base mortality (Pub-2010) and the plan/gender-specific adjustment factors separately from the projection scale (MP2019).

Base Mortality Table

The Pub-2010 Public Retirement Plans Mortality Tables Report was published in January 2019. This table was developed by the Society of Actuaries based on data obtained from public sector pension plans across the U.S. It is the most recent reliable broad-base mortality table available, for purposes of national estimates of mortality for public pension plans.

The observed mortality rates, after combining this plan with two other plans which have similar workforce composition, were compared to the standard reference table in order to set the appropriate adjustment factors to determine the best fitting table to use for the final mortality assumption. Because the plan is too small for a full statistical credibility of its own mortality experience, observed rates were blended with standard tables. The resulting adjustment factor of 120% was determined by SPRF’s actuary to be the best fit for males and an adjustment factor of 115% was determined to be the best fit for females.

Mortality Improvement Scale

Once the base table was found to be appropriate, we turned our attention to the projection scale used in the mortality assumption to reflect expected mortality improvements over time. The 2020 Actuarial Valuation stated that the Pub-2010 table was projected generationally using scale MP2019. We note that the projection scale MP2019 was the most recent projection scale available as of that valuation date.

Conclusion – We consider the base mortality tables and the mortality improvement scale as applied to both non-disabled and disabled lives to be appropriate.

Section 4: 2020 Experience Study

An actuarial experience study (dated June 16, 2020) was prepared by SPRF's actuary for the period from July 1, 2014, through June 30, 2019. The experience study report addresses the following demographic assumptions:

- Mortality Rates
- Retirement Rates
- Disability Rates
- Withdrawal Rates
- Salary Increases

In addition, the experience study report addresses the following other assumptions:

- Vesting Election Percentage
- Family Statistics
- Actuarial Equivalence Factors

Mortality Assumption

The mortality assumption is based on the most recently developed broad-based mortality tables and on reasonable applications of actuarial credibility principles. For details of the mortality assumption, please refer to Section 3 of this 2020 Comprehensive Actuarial Review.

Other Demographic Assumptions

Without performing an actuarial audit, we reviewed the experience study report thoroughly and found all the sections relating to the other demographic assumptions to be described with reasonable detail and careful recognition of relevant experience.

Other Assumptions

We also found all the sections relating to the other assumptions to be described with reasonable detail and careful recognition of relevant experience.

Conclusion –We accept all the other demographic assumptions and other non-demographic assumptions proposed in the experience study report, and find them to be appropriate for use in the SPRF's 2020 Actuarial Valuation.

Actuarial Certification

This Comprehensive Actuarial Review report constitutes a Statement of Actuarial Opinion. It has been prepared by actuaries who have substantial experience valuing public employee retirement systems. To the best of our knowledge the information contained in this report is accurate and fairly presents information it is purported to present. All calculations have been made in conformity with generally accepted actuarial principles and practices and with the Actuarial Standards of Practice issued by the Actuarial Standards Board.

James J. Rizzo and Piotr Krekora are members of the American Academy of Actuaries. These actuaries meet the Academy's Qualification Standards to render the actuarial opinions contained herein.

The signing actuaries are independent of the Sheriffs' Pension and Relief Fund.



James J. Rizzo, ASA, EA, MAAA
Senior Consultant and Actuary
Gabriel, Roeder, Smith & Company

December 29, 2020

Date



Piotr Krekora, ASA, EA, MAAA, PhD
Consultant and Actuary
Gabriel, Roeder, Smith & Company

December 29, 2020

Date

Appendix A Sources of Inflation Forecasts

An assumed rate of future inflation is a major component of both the return and the salary increase assumptions. Expected future inflation is a critical component of the other pension finance calculations as well. Therefore, much care and objectivity should be given to the expected future rates of inflation.

In the 2020 experience study, SPRF’s actuary recommends and uses a 2.50% inflation rate assumption in the development of the recommendations concerning the return assumption. The 2020 Actuarial Valuation (page 39) uses an inflation rate assumption of 2.50%. We find an inflation assumption closer to 2.00% is more supported by the research on expected inflation rates from national experts as illustrated in the exhibits below.

What other retirement systems assume for inflation and what the past actual rates of inflation have been, are not directly pertinent to setting, defending or assessing an assumption about future inflation. Even having one expert’s forward-looking opinion is not sufficient. Without having multiple inputs, a board would not know if there are other expert opinions that differ. It is well-established that a consensus average of diverse forecasters improves forecast accuracy.

Currently, expert professional inflation forecasts generally lie between 1.34% and 2.40% across mid-term (10 years) and long-term (20-30+ years) horizons. Actuaries are not generally qualified to forecast future rates of inflation. Therefore, consider the forward-looking forecasts from 11 sources published by the following organizations.

| Major National Inflation Forecasters | |
|---|--------------------------------------|
| Congressional Budget Office | Federal Reserve Bank of Cleveland |
| Federal Reserve Bank of Philadelphia (2) | Federal Reserve Bank of New York (2) |
| Federal Reserve Board (OMC) | Social Security Trustees Report |
| Investment Forecaster Surveys (GRS and HAS) | U.S. Department of the Treasury |

Some of these organizations provide multiple surveys and horizons for their inflation forecasts. Following is a summary of the inflation forecasts of these eight major national organizations.

| Average Forward-looking Annual Inflation Forecasts | | | | | | |
|--|--------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Future Time Horizon | Number of Sources* | Mid-Yr 2020 Average | Mid-Yr 2019 Average | Mid-Yr 2018 Average | Mid-Yr 2017 Average | Mid-Yr 2016 Average |
| 10 Years | 10 | 1.93% | 2.12% | 2.23% | 2.19% | 2.08% |
| 20 to 30+ Years | 7 | 1.92% | 2.12% | 2.32% | 2.19% | 2.05% |

** For the Mid-Yr 2020 forecast averages; comprised of inputs over a hundred economists and investment forecasters*

Our preferred inflation assumption would currently be 2.00% for the mid-term and longer-term horizons. Consider the following exhibit, which shows the detailed inflation forecasts of these large reputable expert organizations in the field of inflation forecasting. A 2.50% inflation expectation currently employed by SPRF is higher than any of the professional forecasters presented in the summary table above and the detailed table below.

| Forward-looking Annual Inflation Forecasts | | | | | |
|--|----------------|----------------|----------------|----------------|----------------|
| Professional Experts in the Field of Forecasting Inflation | Mid-Yr 2020 | Mid-Yr 2019 | Mid-Yr 2018 | Mid-Yr 2017 | Mid-Yr 2016 |
| Federal Reserve Board's Federal Open Market Committee Current "Long-run" Price Inflation Objective (<10 years): Objective since Jan 2012; Personal Consumer Expenditures (PCE) Consumer Price Index Inflation Objective (CPI = PCE + approx 30-40 bps) | | | | | |
| | 2.00% | 2.00% | 2.00% | 2.00% | 2.00% |
| | 2.30% | 2.40% | 2.40% | 2.40% | 2.40% |
| Congressional Budget Office: <i>The Budget and Economic Outlook</i> Overall Consumer Price Index (10 Years) | 2.24% | 2.39% | 2.38% | 2.36% | 2.33% |
| Social Security Trustees Report CPI-W 75-Year Intermediate Assumption | 2.40% | 2.60% | 2.60% | 2.60% | 2.60% |
| Federal Reserve Bank of Philadelphia Livingston Survey: 10-Year Median Forecast Survey of Professional Forecasters: 10-Year Median Forecast | | | | | |
| | 2.00% | 2.26% | 2.28% | 2.33% | 2.25% |
| | 2.14% | 2.20% | 2.30% | 2.30% | 2.20% |
| Federal Reserve Bank of New York's Trading Desk Survey of Market Participants: 10-Year Median Expectation Survey of Primary Dealers: 10-Year Median Expectation | | | | | |
| | 1.87% | 2.05% | 2.12% | 2.14% | 2.00% |
| | 2.05% | 2.16% | 2.10% | 2.35% | 2.12% |
| Federal Reserve Bank of Cleveland 10-Year Expectation 20-Year Expectation 30-Year Expectation | | | | | |
| | 1.34% | 1.67% | 2.09% | 1.85% | 1.63% |
| | 1.63% | 1.88% | 2.23% | 2.04% | 1.87% |
| | 1.85% | 2.05% | 2.32% | 2.18% | 2.04% |
| U.S. Department of the Treasury 10-Year Breakeven Inflation 20-Year Breakeven Inflation 30-Year Breakeven Inflation | | | | | |
| | 1.24% | 1.70% | 2.12% | 1.73% | 1.44% |
| | 1.41% | 1.74% | 2.12% | 1.85% | 1.38% |
| | 1.71% | 1.90% | 2.16% | 2.00% | 1.77% |
| GRS Survey of Investment Consultants and Forecasters Median expectation (averaging a 10-year horizon) Median expectation (averaging a 25-30-year horizons) | | | | | |
| | 2.18% | 2.21% | 2.23% | 2.25% | 2.23% |
| | 2.27% | 2.41% | 2.31% | 2.21% | 2.38% |
| HAS Survey of Investment Consultants and Forecasters Median expectation (identified as a 10-year horizon) Median expectation (identified as a 20-year horizon) | | | | | |
| | 1.97% | 2.21% | 2.24% | 2.23% | 2.16% |
| | 2.16% | 2.29% | 2.47% | 2.44% | 2.31% |

Appendix B

Sources of Investment Return Forecasts

As with inflation forecasting, actuaries are not investment forecasters and are not qualified to forecast capital market assumptions⁷ for all relevant asset classes over mid-term and longer-term horizons. Therefore, we must turn to reputable professional forecasters that specialize in that field.

Again, it is not reliable practice to simply look to the past rates of return to guide current decisions about assumed returns for the future. It may also be tempting for board members to be influenced by (a) what boards of trustees of other retirement plans have decided concerning their return assumption or (b) whether the resulting contribution is affordable for the current year’s budget. However,

- Other retirement systems have different asset allocation targets.
- Other retirement systems have different investment-related fees and cash flow projections.
- Boards of trustees of other retirement systems around the country have their own agency risks and influences, as well, that are not necessarily best practices.

Retirement system fiduciaries should decide on actuarial assumptions with an emphasis on actuarial benefit security for the plan members and other funding objectives by relying more on mainstream forecasts of what the portfolio is expected to earn rather than what rate looks similar to other systems or what rate would make the contributions more affordable to current taxpayers.

It may be useful information to know what the past has produced and what other retirement systems’ return assumptions are, but these should not influence decisions about SPRF’s actuarial return assumption.

As with inflation, in our opinion it is best to obtain input concerning future rates of return over the mid-term and longer-term horizons based on forward-looking forecasts from several large reputable professional forecasters. Following are the professional forecasting organizations that provide us input concerning forward-looking capital market assumptions. These 13 organizations have significant depth in their research staff and are trusted sources of investment expertise. They also have significant experience with public sector pension funds.

| Participating Investment Forecasters | | | |
|--------------------------------------|---------------------------|--------------------------|----------------------|
| Aon/Hewitt ^{IC} | Blackrock ^{IM} | BNY/Mellon ^{IM} | Callan ^{IC} |
| Cambridge ^{IC} | J.P. Morgan ^{IM} | Marquette ^{IC} | Meketa ^{IC} |
| Mercer ^{IC} | RVK ^{IC} | NEPC ^{IC} | VOYA ^{IM} |
| | Wilshire ^{IC} | | |

^{IC} In the top 25 largest investment consultants, according to the most recent survey from P&I.

^{IM} In the top 75 largest investment managers, according to the most recent survey from P&I/WTW.

⁷ Capital market assumptions include expected returns (either geometric or arithmetic) and standard deviations for each asset class, expected correlation coefficients across asset classes, and expected rate of inflation. These may be expectations over a mid-term horizon, a longer-term horizon, or both.

Appendix C Asset Allocation

It has been generally accepted for many years that a fund’s asset allocation is responsible for the vast majority of a fund’s investment performance. Therefore, SPRF’s asset allocation is a core element in process of setting and evaluating assumed future returns.

We first relied on the target asset allocation percentages set forth in SPRF’s Investment Policy Statement (IPS), as updated December 2020. We then relied on the September 30, 2020 Performance Report, prepared by BNY/Mellon, to further separate these percentages into 13 target asset allocation percentages.

| 2020 SPRF Target Asset Allocation | | | |
|-----------------------------------|--------------|----------------------------------|---------------|
| Risk-oriented Assets | | Fixed Income Assets | |
| Domestic Equity | 40.0% | U.S. Core Bonds | 15.0% |
| Large Cap (85%) | | Emerging Market Debt | 3.0% |
| Mid Cap (5%) | | High Yield Bonds | 2.0% |
| Small Cap (10%) | | Private Credit | 5.0% |
| Non-U.S. Equity | 19.0% | | |
| Emerging Market Equity | 3.0% | | |
| Private Real Estate | 6.0% | <i>Total Fixed Income Assets</i> | 25.0% |
| Hedge Funds | 5.0% | | |
| Commodities | 1.0% | | |
| REITS | 1.0% | | |
| <i>Total Risk-oriented Assets</i> | <i>75.0%</i> | | |
| | | <i>Total Asset Allocation</i> | <i>100.0%</i> |

Source: Current 2020 Investment Policy Statement (December, 2020)

Appendix D

Portfolio's Expected Return

We applied SPRF's target asset allocations to the expectations (asset class by asset class) of each of the 13 major national investment forecasters. We replaced the investment forecasters' respective inflation assumptions with 2.00%, our preferred assumption based on the consensus of expert inflation forecasters' expectations presented above in order to normalize for a consistent inflation assumption across all forecasters.

We reduced each forecast for SPRF's portfolio slightly, by certain expected investment-related expenses. This process results in SPRF's expected return for any one given year in the forecast horizon (called the expected arithmetic return). Finally, we reduced the resultant one-year arithmetic returns for the correlation among asset classes and the volatility drag in the compound return expected over time, because pensions are all about compounding in a volatile environment over the horizon.

This produces probability distributions of possible compound average returns over the relevant time period by each of the 13 professional forecasters. The most useful metrics for the relevant time period from these probability distributions are (a) the 50th percentile expectation of the compound average return (the 50-50 chance of success) and (b) the probability of achieving the assumption.

It matters not whether the field of forecasting is for hurricanes, earthquakes, elections, inflation, investment returns or economics; using a *consensus average* of many reputable experts increases a forecast's accuracy.

Below are the results of this process for the mid-term horizon.

| Investment Forecaster | Distribution of 10-Year Compound Average Percentile Expectations | | | Probability of exceeding 7.00% |
|-----------------------|--|--------------|--------------|--------------------------------|
| | 40th | 50th | 60th | |
| (1) | (2) | (3) | (4) | (5) |
| 1 | 3.04% | 4.06% | 5.09% | 23.75% |
| 2 | 4.03% | 5.01% | 5.99% | 30.55% |
| 3 | 4.04% | 5.04% | 6.05% | 31.20% |
| 4 | 4.20% | 5.09% | 5.98% | 29.38% |
| 5 | 4.48% | 5.33% | 6.17% | 30.93% |
| 6 | 4.42% | 5.34% | 6.27% | 32.66% |
| 7 | 4.59% | 5.58% | 6.58% | 35.97% |
| 8 | 4.76% | 5.73% | 6.71% | 37.16% |
| 9 | 4.81% | 5.75% | 6.70% | 37.00% |
| 10 | 5.01% | 5.87% | 6.74% | 37.11% |
| 11 | 4.91% | 5.92% | 6.94% | 39.39% |
| 12 | 4.95% | 5.99% | 7.05% | 40.46% |
| 13 | 5.19% | 6.18% | 7.18% | 41.73% |
| Average | 4.50% | 5.45% | 6.42% | 34.41% |

There are four important takeaways from the exhibit above:

- a. Over the mid-term horizon the range of expectations of the 50th percentile of compound average return runs from 4.06% to 6.18%. SPRF's current 7.00% is well-above the highest and most optimistic forecaster for the next 10 years.
- b. The 50th percentile consensus average mid-term forecast is 5.45%. In other words, the consensus opinion is that there is a 50-50 chance of returning at least 5.45% when compounded over the next 10 years.
- c. The consensus of these experts is that there is only a 34.41% chance of achieving at least the current 7.00% adopted by SPRF over the mid-term horizon. This does not mean a 34.41% chance of achieving the 7.00% assumption in any one year during the time horizon; it means that the compound return over the next 10 years has only a 34.41% chance of achieving at least the 7.00% assumption.

This is not a forecast opinion of the Actuary for the LLA. This is the consensus average of the opinions many national experts in forecasting inflation and investment returns, i.e., it is the mainstream of professional forecasters' opinions concerning SPRF's portfolio in the next 10 years.

Mid-term and Longer-term

In addition, we applied a similar process to longer-term forecasts (averaging 27 years) which resulted in a consensus average 50th percentile of the compound average return over the next 27 years of 6.21%. SPRF's current 7.00% is also above the highest and most optimistic forecaster for the next 30 years.

However, as discussed in the next section, we do not have to choose between the mid-term and long-term horizons of consensus averages. The most appropriate return is somewhere in between the two horizons; and it is derived by recognizing the plan's own expected benefit stream.

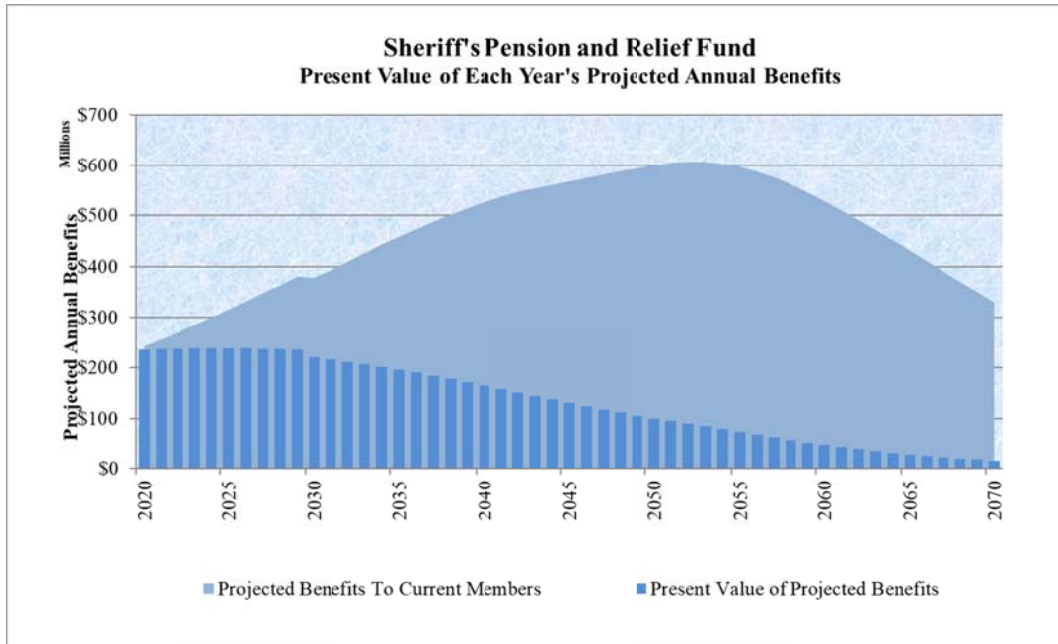
Consider a new pension plan with very little in benefits payable until the third decade. Such a plan can comfortably use a long-term horizon. But a pension plan, like SPRF, with a large proportion of its future benefits expected to be paid in the first decade or two should adopt a return assumption that is somewhere between the mid-term and the long-term. This derives from basic actuarial principles. Adopting long-term forecasts without any adjustment for cash flow is not appropriate for a plan that will be paying substantial benefits out of the fund in the next 10 to 15 years.

If the forecasters are right, years 1-10 will have a compound average of 5.45% per year, but years 1-27 have a compound average 6.21% per year. Mathematically, that means that years 11-27 will have a compound average of 6.65% per year.

Appendix E

Single Equivalent Cash-flow-adjusted Expectation

The graph below illustrates the SPRF actuary’s projected benefits cash flows⁸. The darker blue bars are the present values (as of June 30, 2020) of each year’s projected benefits, discounted at the investment return expectation during years 1-10 and during years 11-30 (and beyond), to illustrate the effect in terms of current dollars.



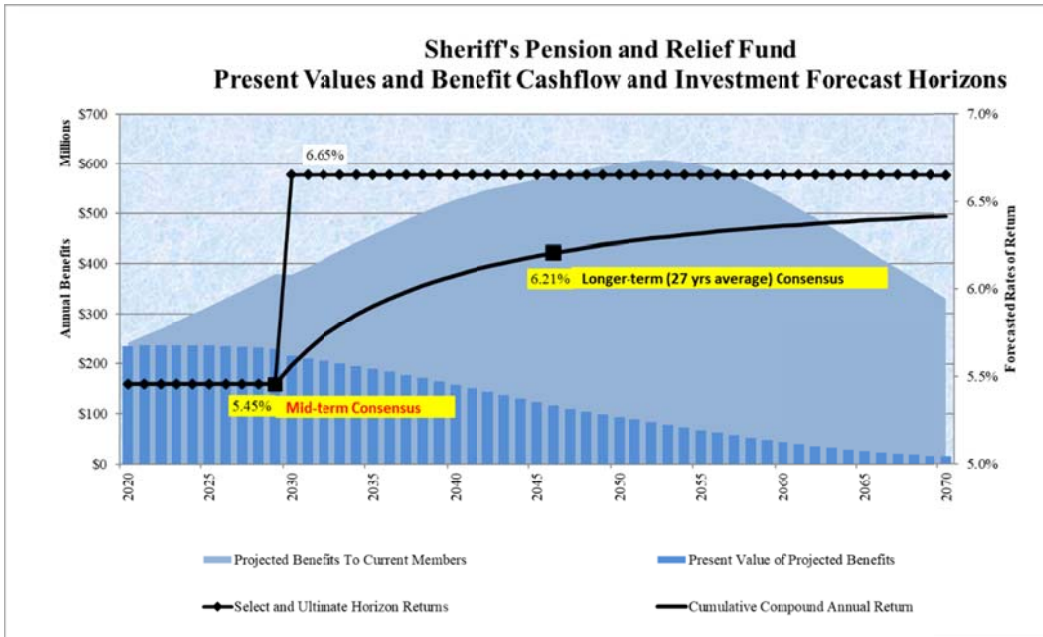
Much of SPRF’s projected benefits will be paid with its current assets, which is expected by a consensus average to earn only 5.45% during the next 10 years. The separate forecast of returns for years 1-10 (5.45%) and years 11-30 (6.65%) is what actuaries often call “select and ultimate” return forecasts.

However, since an actuarial valuation typically uses a single return assumption over the entire period, it is necessary to reflect the select and ultimate periods of return in a single equivalent return assumption. Therefore, it is necessary to measure the earnings generated by SPRF’s assets from the valuation date through each year when the benefits are expected to be paid.

The blended rate is always between the years 1-10 mid-term consensus average (5.45% in this case) and the years 1-27 long-term consensus average (6.21% in this case).

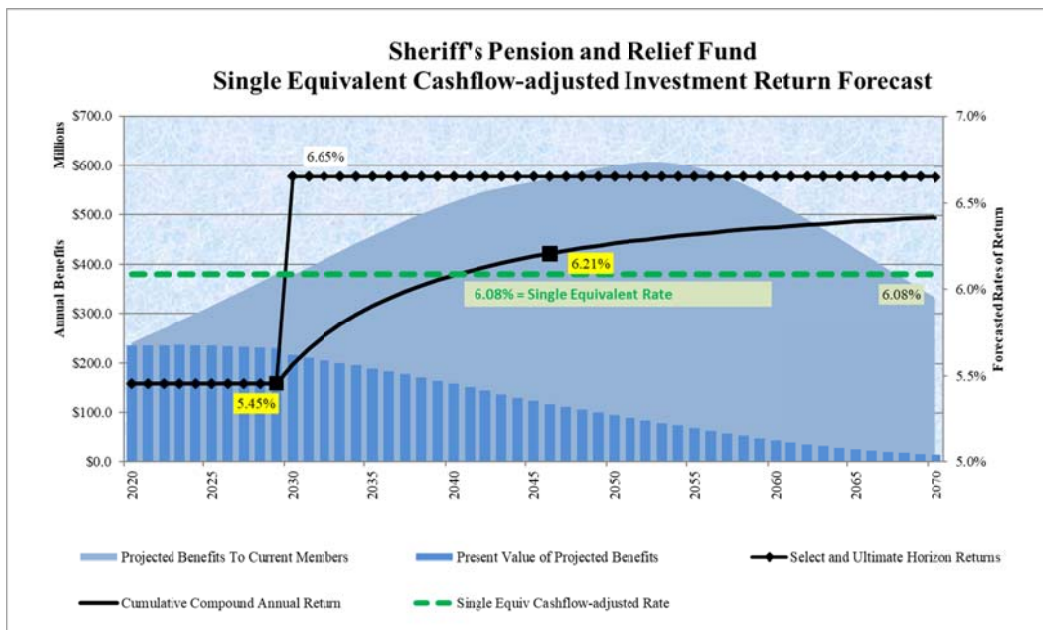
Consider the following graph, with the consensus average forecasts superimposed over the projected benefits and their present values.

⁸ Source: The Sheriffs’ Pension and Relief Fund Information for Financial Reporting as of June 30, 2020, dated December 21, 2020 (pages 31-32).



Under these forecasts, notice the significant amount of benefits (and their present values) that are expected to earn only 5.45% while still in the fund (years 1-10). Notice also, that even the benefits paid thereafter are expected to earn only 5.45% during the next 10 years. *The lower expected earnings in the next 10 years should be incorporated into the development of a final return assumption, somewhere between the mid-term and longer-term forecasts.*

A straight long-term forecast does not appropriately recognize benefit cash flow demands on the fund. Recognizing SPRF's own timing and magnitude of its benefit-demand cash flows and the different earnings expectations over years 1-10 versus years 11-27, the single equivalent net investment return on all assets used to pay these benefits is 6.08% – between the mid-term and longer-term forecasts.



Appendix F

Relevant Actuarial Standards of Practice

ASOP No. 4 Section 3.5:

3.5 Plan Provisions - When measuring pension obligations and determining **periodic costs** or **actuarially determined contributions**, the actuary should reflect all significant **plan provisions** known to the actuary as appropriate for the purpose of the measurement. However, if in the actuary's professional judgment, omitting a significant **plan provision** is appropriate for the purpose of the measurement, the actuary should disclose the omission in accordance with section 4.1(d).

ASOP No. 4 Section 3.5.3:

3.5.3 Plan Provisions that are Difficult to Measure - Some **plan provisions** may create pension obligations that are difficult to appropriately measure using traditional valuation procedures. Examples of such **plan provisions** include the following:

- a. Gain sharing provisions that trigger benefit increases when investment returns are favorable but do not trigger benefit decreases when investment returns are unfavorable;
- b. Floor-offset provisions that provide a minimum defined benefit in the event a **participant's** account balance in a separate plan falls below some threshold;
- c. Benefit provisions that are tied to an external index, but subject to a floor or ceiling, such as certain cost-of-living adjustment provisions and cash balance crediting provisions; and
- d. Benefit provisions that may be triggered by an event such as a plant shutdown or a change in control of the plan sponsor.

For such **plan provisions**, the actuary should consider using alternative valuation procedures, such as stochastic modeling, option-pricing techniques, or deterministic procedures in conjunction with assumptions that are adjusted to reflect the impact of variations in experience from year to year. When selecting alternative valuation procedures for such **plan provisions**, the actuary should use professional judgment based on the purpose of the measurement and other relevant factors.

The actuary should disclose the approach taken with any **plan provisions** of the type described in this section, in accordance with section 4.1(i).

ASOP No. 27 Section 3.11.2:

3.11.2 Cost-of-Living Adjustments—Plan benefits or limits affecting plan benefits (including the Internal Revenue Code (IRC) section 401(a)(17) compensation limit and section 415(b) maximum annuity) may be automatically adjusted for **inflation** or assumed to be adjusted for **inflation** in some manner (for example, through regular plan amendments). However, for some purposes (such as qualified pension plan funding valuations), the actuary may be precluded by applicable laws or regulations from anticipating future plan amendments or future cost-of-living adjustments in certain IRC limits.

Appendix G

Qualifications and Caveats

This Comprehensive Actuarial Review was prepared to fulfill the requirements of R.S. 11:127(C) to the Public Retirement Systems' Actuarial Committee (PRSAC) for 2020 and is intended for use by PRSAC and those designated or approved by PRSAC. This Comprehensive Actuarial Review may be provided to parties other than PRSAC only in its entirety and only with the permission of PRSAC. The Louisiana Legislative Auditor is not responsible for unauthorized use of this Comprehensive Actuarial Review.

This Comprehensive Actuarial Review should not be relied on for any purpose other than the purposes described herein. This Comprehensive Actuarial Review assumes the continuing ability of SPRF to collect the contributions necessary to fund this Plan. A determination regarding whether or not SPRF is actually willing and able to do so in the future is outside our scope of expertise and was not performed.

The findings in this Comprehensive Actuarial Review are based on data and other information as of June 30, 2020 and forecasts published for 2020. This Comprehensive Actuarial Review was based upon information furnished by SPRF, the Fund's investment consultant, the Fund's actuary and by numerous external inflation and investment forecasters. We checked for internal reasonability and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the information provided by outside parties.

All calculations have been made in conformity with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board and with applicable statutes.

At the time of this writing, we consider the 2020 forecasts of the future inflation and capital market assumptions (including future investment returns) from the subject matter experts to be suitable for development of a "most appropriate" net return assumption for the 2020 actuarial valuation. There has been considerable uncertainty about the economy and a lot of volatility in the markets. But for now, the robust process and results presented herein seem most appropriate.

This Comprehensive Actuarial Review was prepared using our proprietary valuation model and related software which in our professional judgment has the capability to provide results that are consistent with the purposes of the valuation. We performed tests to ensure that the model reasonably represents that which is intended to be modeled. We are relying on the GRS actuaries and Internal Software, Training, and Processes Team who developed and maintain the model.