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City of Chattanooga General Pension Plan

Experience Investigation for the

Five-Year Period

Ending December 31, 2022

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October 16, 2023

General Pension Board of Trustees
City of Chattanooga
101 East 11th Street, Suite 201, City Hall
Chattanooga, TN 37402

Members of the Board:

We are pleased to submit the results of an investigation of the economic and demographic experience for the City of Chattanooga General Pension Plan (the Plan) for the five-year period from January 1, 2018 to December 31, 2022. The study was based on the data submitted by the Plan for the annual valuation. In preparing this report, we relied, without audit, on the data provided.

The purpose of the investigation was to assess the reasonability of the current economic assumptions and demographic actuarial assumptions for the Plan. As a result of the investigation, it is recommended that revised demographic tables be adopted by the Board for future use.

All recommended rates of separation, mortality and salary increase at each age are shown in the attached tables in Appendix C of this report. In the actuary's judgment, the rates recommended are suitable for use until further experience indicates that modifications are desirable.

In order to prepare the results in this report, we have utilized actuarial models that were developed to measure liabilities and develop actuarial costs. These models include tools that we have produced and tested, along with commercially available valuation software that we have reviewed to confirm the appropriateness and accuracy of the output. In utilizing these models, we develop and use input parameters and assumptions about future contingent events along with recognized actuarial approaches to develop the needed results.

We hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the principles prescribed by the Actuarial Standards Board (ASB) and the Code of Professional Conduct and Qualification Standards for Public Statements of Actuarial Opinion of the American Academy of Actuaries.

We further certify that, in our opinion, the assumptions developed in this report satisfy Actuarial Standards of Practice, in particular, No. 27 (Selection of Economic Assumptions for Measuring Pension Obligations) and No. 35 (Selection of Demographic and Other Non-economic Assumptions for Measuring Pension Obligations).

The experience investigation was performed by, and under the supervision of, independent actuaries who are members of the American Academy of Actuaries with experience in performing valuations for public retirement systems. The undersigned meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Respectfully submitted,

Edward J. Koebel, EA, FCA, MAAA
Chief Executive Officer

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Senior Consultant

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Section I - Executive Summary

The purpose of an actuarial valuation is to provide a timely best estimate of the ultimate costs of a retirement system. An actuarial valuation of the City of Chattanooga General Pension Plan (the Plan) is prepared annually to determine the actuarial contribution rate required to fund them on an actuarial reserve basis, (i.e. the current assets plus future contributions, along with investment earnings will be sufficient to provide the benefits promised by the system). The valuation requires the use of certain assumptions with respect to the occurrence of future events, such as rates of death, termination of employment, retirement age, and salary changes to estimate the obligations of the system.

The basic purpose of an experience study is to determine whether the actuarial assumptions currently in use have adequately anticipated the actual emerging experience. This information, along with the professional judgment of the Plan's personnel and advisors, is used to evaluate the appropriateness of continued use of the current actuarial assumptions. When analyzing experience and assumptions, it is important to recognize that actual experience is reported in the short-term while assumptions are intended to be long-term estimates of experience. Therefore, actual experience is expected to vary from study period to study period, without necessarily indicating a change in assumptions is needed.

Cavanaugh Macdonald Consulting, LLC (CMC) has performed a study of the experience of the Plan for the five-year period ending December 31, 2022. This report presents the results, analysis, and resulting recommendations of our study. It is anticipated that the changes, if approved, will first be reflected in the December 31, 2023 actuarial valuations.

These assumptions have been developed in accordance with generally recognized and accepted actuarial principles and practices that are consistent with the applicable Actuarial Standards of Practice adopted by the Actuarial Standards Board (ASB). While the recommended assumptions represent our best estimate of future experience, there are other reasonable assumption sets that could be supported by the results of this experience study. Those other sets of reasonable assumptions could produce liabilities and costs that are either higher or lower.

Our Philosophy

Similar to an actuarial valuation, the calculation of actual and expected experience is a fairly mechanical process, and differences between actuaries in this area are generally minor. However, the setting of assumptions differs, as it is more art than science. In this report, we have recommended changes to certain assumptions. To explain our thought process, we offer a brief summary of our philosophy:

- **Do Not Overreact**: When we see significant changes in experience, we generally do not adjust our rates to reflect the entire difference. We will typically recommend rates somewhere between the old rates and the new experience. If the experience during the next study period shows the same result, we will probably recognize the trend at that point in time or at least move further in the direction of the observed experience. On the other hand, if experience returns closer to its prior level, we will not have overreacted, possibly causing volatility in the actuarial contribution rates.

- **Anticipate Trends**: If there is an identified trend that is expected to continue, we believe that this should be recognized. An example is the retiree mortality assumption. It is an established trend that people are living longer. Therefore, we believe the best estimate of liabilities in the valuation should reflect the expected increase in life expectancy.

- **Simplify**: In general, we attempt to identify which factors are significant and eliminate or ignore the ones that do not materially improve the accuracy of the liability projections.

The following summarizes the findings and recommendations with regard to the assumptions utilized for the Plan. Detailed explanations for the recommendations are found in the sections that follow.

Recommended Economic Assumption Changes

Economic assumptions are some of the most visible and significant assumptions used in the valuation process. The items in the broad economy modeled by these assumptions can be very volatile over short periods of time, as clearly seen in the economic recovery from the pandemic in 2021 followed by the downward trend in global markets in 2022. Our goal is to try to find the emerging long-term trends in the midst of this volatility so that we can then apply reasonable assumptions.

Most of the economic assumptions used by actuaries are developed through a building-block approach. For example, the expected return on assets is based on the expectation for inflation plus the expected real return on assets. At the core of the economic assumptions is the inflation assumption. As we discuss later in the report, although the last two years has experienced higher than normal inflation due to the recovery of the pandemic, we believe that long-term inflation will settle back down in the 2.40% to 2.50% range. So therefore, **we are recommending that the price inflation assumption remain at 2.50%**.

We are also recommending that the long-term expected return on assets assumption remain at 6.75%, reflecting the 2.50% inflation assumption and a 4.25% real rate of return assumption. This will be discussed in detail later in this report, but a real rate of return of 4.25% is supported by the forecasting models developed using the Horizon Actuarial Services Survey of investment consultant's capital market assumptions and the Board's target asset allocation.

The following table summarizes the current and proposed economic assumptions:

Item	Current	Proposed
Price Inflation	2.50%	2.50%
Investment Return*	6.75%	6.75%

* Net of investment expenses only.

We recognize there may be other sets of economic assumptions that are also reasonable for purposes of funding the Plan. For example, we have typically reflected conservatism to the degree we would classify as moderate. Actuarial Standards of Practice allow for this difference in approaches and perspective, as long as the assumptions are reasonable and consistent.

Actuarial Methods

The basic actuarial methodologies used in the valuation process include the:

- Actuarial Cost Method
- Asset Valuation Method
- Amortization Method

Based on our review, discussed in full detail in Section III of this report, we recommend no changes in these actuarial methods at this time. These methods all comply with the State of Tennessee Senate Bill No. 2079 relative to the financial security for the public defined benefit pension plans for political subdivisions within the State.

Recommended Demographic Assumption Changes

In the experience study, actual experience for the study period is compared to what was expected based on the current actuarial assumptions. Comparing the actual incidence of the event to what was expected (called the Actual-to-Expected ratio, or A/E ratio) then provides the basis for our analysis.

Mortality is perhaps the most important demographic assumption when valuing the liabilities of a pension plan. The issue of future mortality improvement is one that the actuarial profession has become increasingly focused on studying in recent years. There have been significant improvements in longevity in the past, although there are different opinions about future expectations. We believe it is prudent to anticipate that this trend will continue to some degree in the future.

The System currently reflects mortality improvements with the use of a static mortality table with "margin." Under this approach, the A/E ratio is intentionally targeted to be over 100% so that mortality can improve without creating actuarial losses. While there is no formal guidance as to the amount of margin required (how far above 100% is appropriate for the A/E ratio), we typically prefer to have a margin of around 10 to 14% at the core ages of the retired member. The goal is still for the general shape of the curve to be a reasonable fit to the observed experience. Depending on the magnitude and duration of actual mortality improvements in the future, the margin may decrease and eventually become insufficient. If that occurs, the assumption will need to be updated.

In this study, we are recommending a change to the mortality improvement methodology from a static approach to a generational mortality approach. This approach directly anticipates future improvements in mortality by using a different set of mortality rates for each year of birth, with the rates for later years of birth assuming lower mortality than the rates for earlier years of birth. The varying mortality rates by year of birth create a series of tables that contain "built-in" mortality improvements, e.g., a member who turns age 65 in 2040 has a longer life expectancy than a member who turns age 65 in 2023. When using generational mortality, the A/E ratios for the observed experience are set near 100% since future mortality improvements will be taken into account directly in the actuarial valuation process.

The generational approach is our preferred method for recognizing future mortality improvements because it is more direct and results in longer life expectancy for members who are younger, consistent with what we believe is more likely to occur. Over the last 10-15 years, this method has become more and more common in use by public sector pension plans. **Additionally, Senate Bill No. 2079, passed in the Spring of 2014, mandated that all pension plans in the state of Tennessee adopt generational improvements in their mortality assumptions by 2024.**

The current mortality assumptions are based on the RP-2014 family of mortality tables using a static mortality approach as described above. The Society of Actuaries (SOA) has recently published new mortality tables developed exclusively from public sector retirement system experience (Pub-2010). **We are recommending changes in the mortality assumptions to be based on the new Pub-2010 family of mortality tables as well as projecting future mortality improvements using a generational mortality approach. Other adjustments to the published mortality tables will be discussed in the demographic section of this report.**

The following is a general list of the other recommended changes to the demographic assumptions for the Plan.

- **Retirement: Recommend adjustments in the rates of retirement to better match experience of the System.**
- **Disability: Recommend no change to rates.**
- **Withdrawal: Recommend change to a purely service-based table and increase in the rates of withdrawal at most service levels that better match experience of the System.**
- **Merit Salary Scale: Recommend no change to rates.**

Section IV of this report will provide more detail to these recommended demographic changes.

Other Assumptions

Another assumption that is included in the valuations is the determination of administrative expense component that is added to the total normal cost each year. The current assumption is 0.50% of payroll. Over the study period, actual administrative expenses as a percentage of payroll have averaged about 0.43% of payroll, and in the most recent year it was 0.31%. As shown below, the administrative expenses in dollars has decreased over the past 2 years and after discussions with staff, we believe the dollar amount will remain around $300,000 in the short-term. **Therefore, with payroll now around $80 million, we recommend decreasing the administrative expense load added to the normal cost rate to 0.40% of payroll.**

The following table shows actual percentages over the past five years:

($ in Thousands)

Year Ending December 30	Administrative Expenses	Annual Payroll	Percentage
2019	343,320	62,944,765	0.55%
2020	281,555	65,158,198	0.43%
2021	302,592	61,223,547	0.49%
2022	266,414	68,884,020	0.39%
2023	249,067	81,077,975	0.31%

Financial Impact

Although the assumption changes, if approved, will first be reflected in the December 31, 2023 valuation, we have provided the following table which highlights the impact of the recommended changes on the unfunded accrued liabilities (UAL), funding ratios, amortization period and projected funding ratios on the December 31, 2022 valuation results.

($ in Thousands)

	December 31, 2022 Valuation	After All Changes
Valuation Accrued Liability	$430,169	$440,462
Valuation Actuarial Assets	360,296	360,296
Valuation UAL	$69,873	$80,166
Funding Ratio	83.8%	81.8%
Actuarially Determined Employer Contribution (ADEC)	20.94%	20.94%
Weighted UAL Amortization Period	12.3 years	14.6 years

Section II – Economic Assumptions

There are two economic assumptions used in the actuarial valuation performed for the City of Chattanooga General Pension Plan. They are:

- Price Inflation
- Investment Return

Note that future price inflation has an indirect impact on the results of the actuarial valuation through the development of the assumption for investment return. However, it is not directly used in the valuation process.

Unlike demographic assumptions, economic assumptions do not lend themselves to analysis largely on the basis of internal historical patterns because economic assumptions are impacted by external forces in the economy. The investment return assumption is selected on the basis of expectations in an inflation-free environment and then increased by the long-term expectation for inflation, called the "building block" approach.

Sources of data considered in the analysis and selection of the economic assumptions included:

- The 2023 Social Security Trustees Report
- Future expectations of other investment consultants (2023 Horizon Survey)
- U.S. Department of the Treasury bond rates
- Assumptions used by other large public retirement systems, based on the Public Fund Survey, published by the National Association of State Retirement Administrators (NASRA)
- Historical observations of price and wage growth statistics and investment returns

Actuarial Standard of Practice (ASOP) No. 27, *"Selection of Economic Assumptions for Measuring Pension Obligations"* provides guidance to actuaries in selecting economic assumptions for measuring obligations under defined benefit plans. ASOP No. 27 requires that each economic assumption selected by the actuary should be reasonable which means it has the following characteristics:

- It is appropriate for the purpose of the measurement;
- It reflects the actuary's professional judgment;
- It takes into account historical and current economic data that is relevant as of the measurement date;
- It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data, or a combination thereof; and

- It has no significant bias (i.e., it is not significantly optimistic or pessimistic), except when provisions for adverse deviation or plan provisions that are difficult to measure are included and disclosed, or when alternative assumptions are used for the assessment of risk.

With respect to relevant data, the standard recommends the actuary review appropriate recent and long-term historical economic data but advises the actuary not to give undue weight to recent experience. Furthermore, it advises the actuary to consider that some historical economic data may not be appropriate for use in developing assumptions for future periods due to changes in the underlying environment. In addition, with respect to any particular valuation, each economic assumption should be consistent with all other economic assumptions over the measurement period.

ASOP 27 recognizes that economic data and analyses are available from a variety of sources, including representatives of the plan sponsor, investment advisors, economists, and other professionals. The actuary is permitted to incorporate the views of experts, but the selection or advice must reflect the actuary's professional judgment.

The standard also discusses a "range of reasonable assumptions" which in part states "the actuary should also recognize that different actuaries will apply professional judgment and may choose different reasonable assumptions. As a result, a range of reasonable assumptions may develop both for an individual actuary and across actuarial practice."

In our opinion, the economic assumptions recommended in this report have been developed in accordance with ASOP No. 27. The following table shows our recommendations followed by detailed discussions of each assumption.

Item	Current Assumptions	Proposed Assumptions
Price Inflation	2.50%	2.50%
Real Rate of Return*	4.25	4.25
Investment Return	6.75%	6.75%

* net of investment expenses.

Price Inflation

Background

As can be seen from the table on the previous page, assumed price inflation is used as the basis for the investment return assumption.

It is important that the price inflation assumption be consistently applied throughout the economic assumptions utilized in an actuarial valuation. This is called for in ASOP No. 27 and is also required to meet the parameters for determining pension liabilities and expense under Governmental Accounting Standards Board (GASB) Statements No. 67 and 68. The long-term relationship between price inflation and investment return has long been recognized by economists. The basic principle is that the investor demands a more or less level "real return" – the excess of actual investment return over price inflation. If inflation rates are expected to be high, investment return rates are also expected to be high, while low inflation rates are expected to result in lower expected investment returns, at least in the long run.

The current price inflation assumption is 2.50% per year.

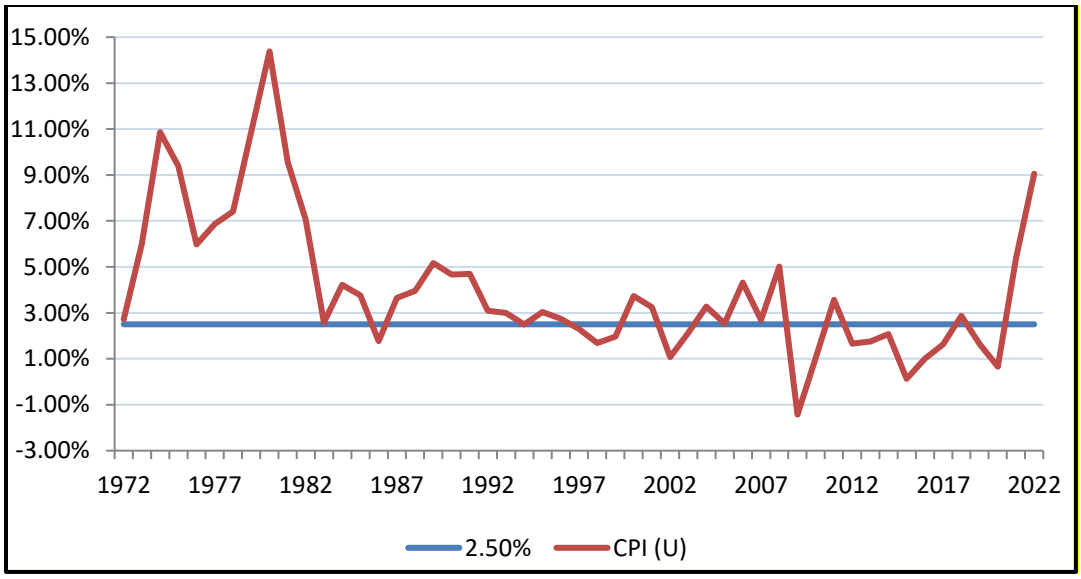
Past Experience

The Consumer Price Index, US City Average, All Urban Consumers, CPI (U), has been used as the basis for reviewing historical levels of price inflation. The table below provides historical annualized rates and annual standard deviation of the CPI-U over periods ending December 31st.

Period	Number of Years	Annualized Rate of Inflation	Annual Standard Deviation
1926 – 2022	96	2.94%	3.98%
1962 – 2022	60	3.87	2.88
1972 – 2022	50	3.96	3.07
1982 – 2022	40	2.82	1.52
1992 – 2022	30	2.49	1.45
2002 – 2022	20	2.51	1.74
2012 – 2022	10	2.60	2.24

The following graph illustrates the historical levels of price inflation measured as of December 31st of each of the last 50 years and compared to the current 2.50% annual rate currently assumed.

Annual Rate of CPI (U) Increases



As can be seen from the table on the previous page, over the last 30 years, the average annual rate of increase in the CPI-U has been just under 2.50%. The higher annual rates over the past two years have increased this average.

Forecasts

Based upon information contained in the "Survey of Professional Forecasters" for the second quarter of 2023 as published by the Philadelphia Federal Reserve Bank, the median expected annual rate of inflation for the next ten years is 2.36%. Although 10 years of future expectation is too short of a period for the basis of our inflation assumption, the information does provide some evidence that the consensus expectations of these experts are for rates of inflation very close to our current assumption of 2.50% for the near-term future.

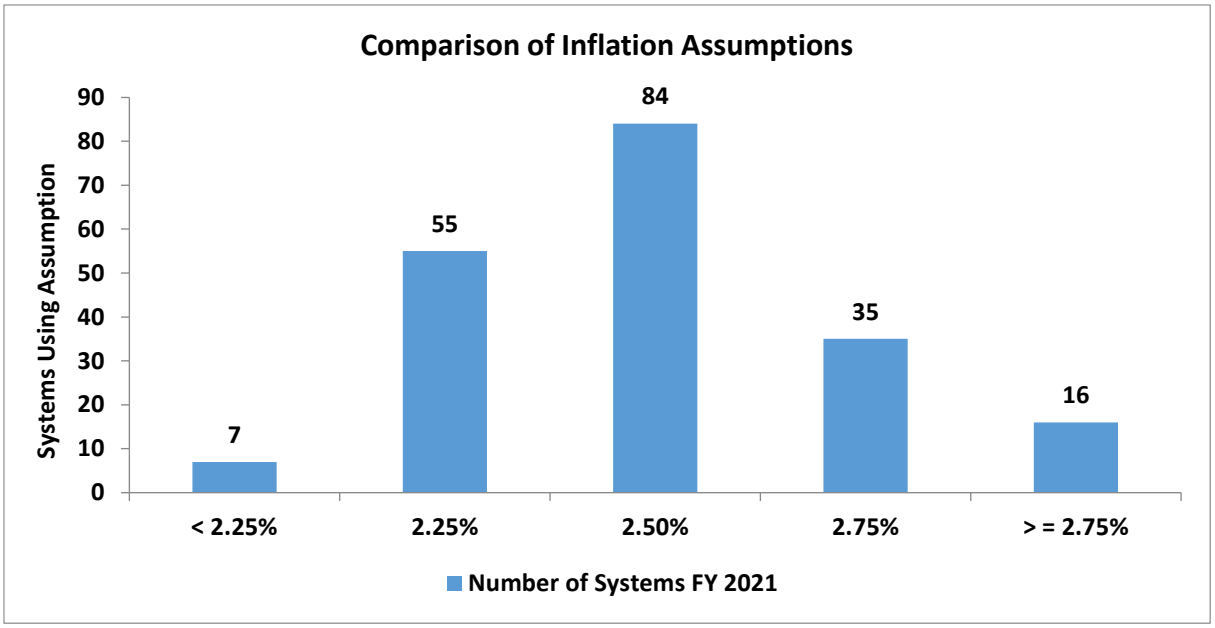
Horizon Actuarial Services surveys a significant portion of the major investment advisors and publishes their assumptions. For the 2023 study, the long-term inflation assumption (20 years) was 2.47%.

Social Security Administration

Although many economists forecast lower inflation than the assumption used by most retirement plans, they are generally looking at a shorter time horizon than is appropriate for a pension valuation. To consider a longer, similar time frame, we looked at the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. In the 2023 annual report, the projected ultimate average annual increase in the CPI over the next 75 years was estimated to be 2.40%, under the intermediate (best estimate) cost assumption. The range of inflation assumptions used in the Social Security 75-year modeling, which includes a low and high-cost scenario, in addition to the intermediate cost projection, was 1.80% to 3.00%. These rates remained unchanged from their 2022 annual report.

Peer Comparison

While we do not recommend the selection of any assumption based on what other systems use, it does provide another set of relevant information to consider. The following chart shows the inflation rate assumptions of 194 plans in the Public Plan Database of the Center for Retirement Research. Based on the current data, the average inflation assumption is 2.52%. The assumptions are from actuarial valuations reported in FYE 2021. Although inflation has spiked recently, we have not seen a reversal of this trend and expect most systems to take a wait-and-see approach.



Recommendation

It is difficult to predict inflation accurately. Inflation's short-term volatility is illustrated by comparing its average rate over the last 10 and 50 years. Although the 10-year average of 2.60% is closer to the System's assumed rate of 2.50%, the longer 50-year average of 3.96% is much higher and it includes the very high rates of inflation from the late 1970s and early 1980s. Those high rates will not be part of the 50-year average for much longer.

Although we have experienced rather high inflation over the last few months due to the recovery from the COVID-19 pandemic, current economic forecasts suggest annual inflation rates closer to 2.50% over the short-term and long-term, respectively. We concur with these forecasts and recommend maintaining the inflation assumption for the System at 2.50%.

Price Inflation Assumption	
Current	2.50%
Recommended	2.50%

Section II – Economic Assumptions

Investment Return

Background

The investment return assumption reflects anticipated returns on the current and future assets. The assumed investment return is one of the most significant assumptions in the annual actuarial valuation process as it is used to discount the expected benefit payments for all active, inactive and retired members. Minor changes in this assumption can have a major impact on valuation results. The investment return assumption should reflect the asset allocation target for the funds set by the Board of Trustees.

The current assumption is 6.75%, consisting of a price inflation assumption of 2.50% and a real rate of return assumption of 4.25%.

Long Term Perspective

Because the economy is constantly changing, assumptions about what may occur in the near term are volatile. Asset managers and investment consultants usually focus on this near-term horizon in order to make prudent choices regarding how to invest the trust funds. For actuarial calculations, we typically consider very long periods of time. For example, a newly hired employee who is 25 years old may work for 35 years, to age 60, and live another 30 years, to age 90 (or longer). The retirement system would receive contributions for the first 35 years and then pay out benefits for the next 30 years. During the entire 65-year period, the system is investing assets related to the member. For such a typical career employee, more than one-half of the investment income earned on assets accumulated to pay benefits is received after the employee retires. In addition, in an open, ongoing system like the Chattanooga General Pension Plan, the stream of benefit payments is continually increasing as new hires replace current members who leave covered employment due to death, termination of employment, and retirement. This difference in the time horizon used by actuaries and investment consultants is frequently a source of debate and confusion when setting economic assumptions.

Past Experience

One of the inherent problems with analyzing historical data is that the results can look significantly different depending on the timeframe used, especially if the year-to-year results vary widely. In addition, the asset allocation can also impact the investment returns so comparing results over long periods when different asset allocations were in place may not be meaningful.

Section II – Economic Assumptions

The assets for the Plan are valued using a widely accepted asset-smoothing methodology that fully recognizes the expected investment income and also recognizes 20% of each year's investment gain or loss (the difference between actual and expected investment income). The recent experience over the last five years is shown in the table below.

Year Ending 12/31	Actuarial Value	Market Value
2018	6.76%	-1.98%
2019	6.92	15.77
2020	8.53	13.89
2021	11.27	16.16
2022	6.04	-15.21
Average	7.90%	5.73%

While important to review and analyze, historical returns over such a short time period are not credible for the purpose of setting the long-term assumed future rate of return.

Future Expectation Analysis

ASOP 27 provides that the actuary may rely on outside experts in setting economic assumptions. The Plan utilizes the services of an investment consultant to assist them in developing investment strategies and providing capital market assumptions for the Plan portfolio. As part of their duties, the investment consultant periodically performs asset-liability studies, along with comprehensive reviews of the expected return of the various asset classes in which the Plan portfolio is invested. We believe it is appropriate to consider the results of investment consultant's work as one factor in assessing expected future returns. Since the City is in between investment consultants at the time of this report, we have not analyzed future expectations on any individual investment consultant's capital market assumptions.

However, Horizon Actuarial Services prepares an annual study in which they survey various investment advisors (42 were included in the 2023 study with a 10-year horizon) and provide ranges of results as well as averages. This information provides an additional perspective on what a broad group of investment experts anticipate for future investment returns.

Section II – Economic Assumptions

Our forward-looking analysis used the real rates of return in Horizon's capital market assumptions survey, which uses a 10-year and 20-year horizons, and the Plan's target asset allocation. Using statistical projections that assume investment returns approximately follow a lognormal distribution with no correlation between years, produces an expected range of real rates of return over a 50-year time horizon. Looking at one year's results produces a mean real return, but also has a high standard deviation or measurement of volatility. By expanding the time horizon, the real return does not change, but the volatility declines significantly.

We applied a statistical analysis as described above to these survey results as we did the capital market assumption of the Plan's investment advisor with the following real return results for the 10-year horizon and 20-year horizon:

Horizon Survey 10-year horizon

Time Span In Years	Mean Real Return	Standard Deviation	Real Returns by Percentile				
			5th	25th	50th	75th	95th
1	4.67%	10.26%	-11.30%	-2.48%	4.17%	11.27%	22.34%
5	4.27%	4.56%	-3.06%	1.14%	4.17%	7.29%	11.93%
10	4.22%	3.22%	-1.00%	2.02%	4.17%	6.36%	9.60%
20	4.19%	2.28%	0.49%	2.64%	4.17%	5.72%	7.98%
30	4.19%	1.86%	1.15%	2.92%	4.17%	5.43%	7.27%
50	4.18%	1.44%	1.83%	3.20%	4.17%	5.14%	6.56%

Horizon Survey 20-year horizon

Time Span In Years	Mean Real Return	Standard Deviation	Real Returns by Percentile				
			5th	25th	50th	75th	95th
1	5.03%	10.26%	-10.95%	-2.12%	4.53%	11.63%	22.70%
5	4.63%	4.56%	-2.70%	1.50%	4.53%	7.65%	12.30%
10	4.58%	3.22%	-0.63%	2.38%	4.53%	6.73%	9.96%
20	4.56%	2.28%	0.85%	3.01%	4.53%	6.08%	8.34%
30	4.55%	1.86%	1.52%	3.28%	4.53%	5.79%	7.63%
50	4.54%	1.44%	2.19%	3.56%	4.53%	5.51%	6.93%

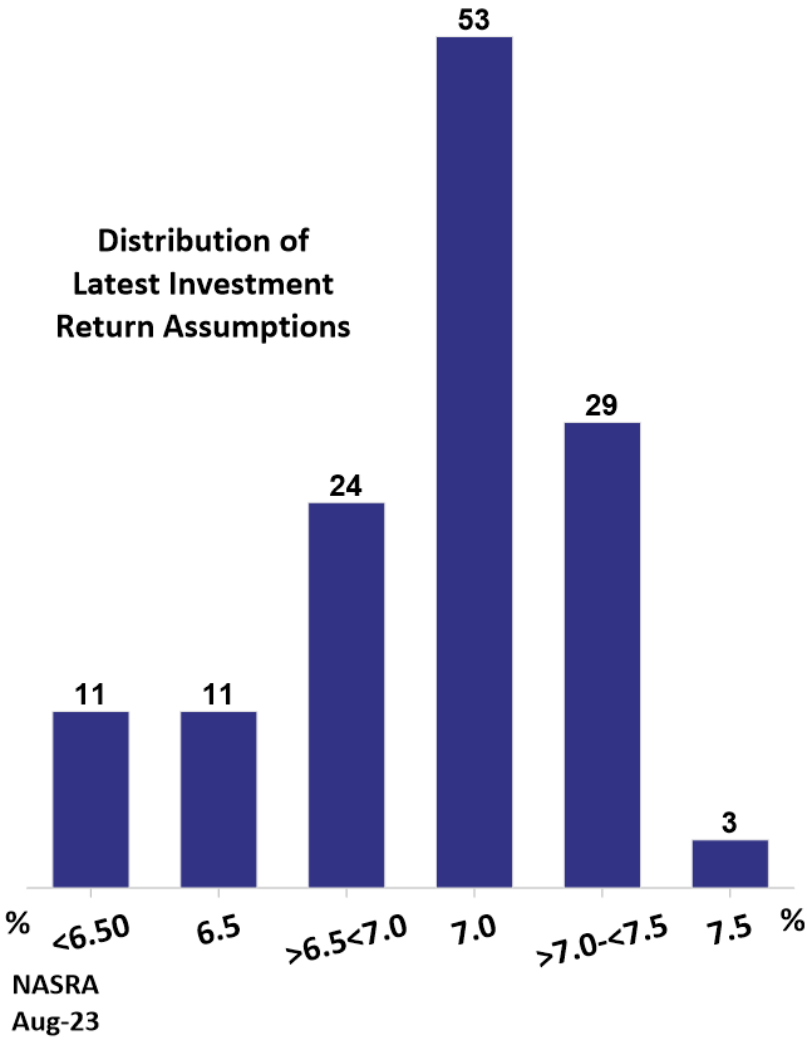
As you can see from the two tables above, setting a real return assumption depends on the time horizon a plan seeks. Although Horizon's 10-year horizon analysis generates a real return of 4.17% at the 50th percentile, the Horizon Actuarial Services Survey using 20-year horizon analysis is 0.36% higher, or 4.53%. Ideally, we would recommend a real return analysis that uses a longer time horizon and falls around the 50th percentile range.

Using a 2.50% inflation assumption, the current investment return assumption of 6.75% utilizes a 4.25% real rate of return (using the "building block" methodology). Based on the 20-year horizon analysis, 4.25% falls into the 45th percentile which is within a reasonable range.

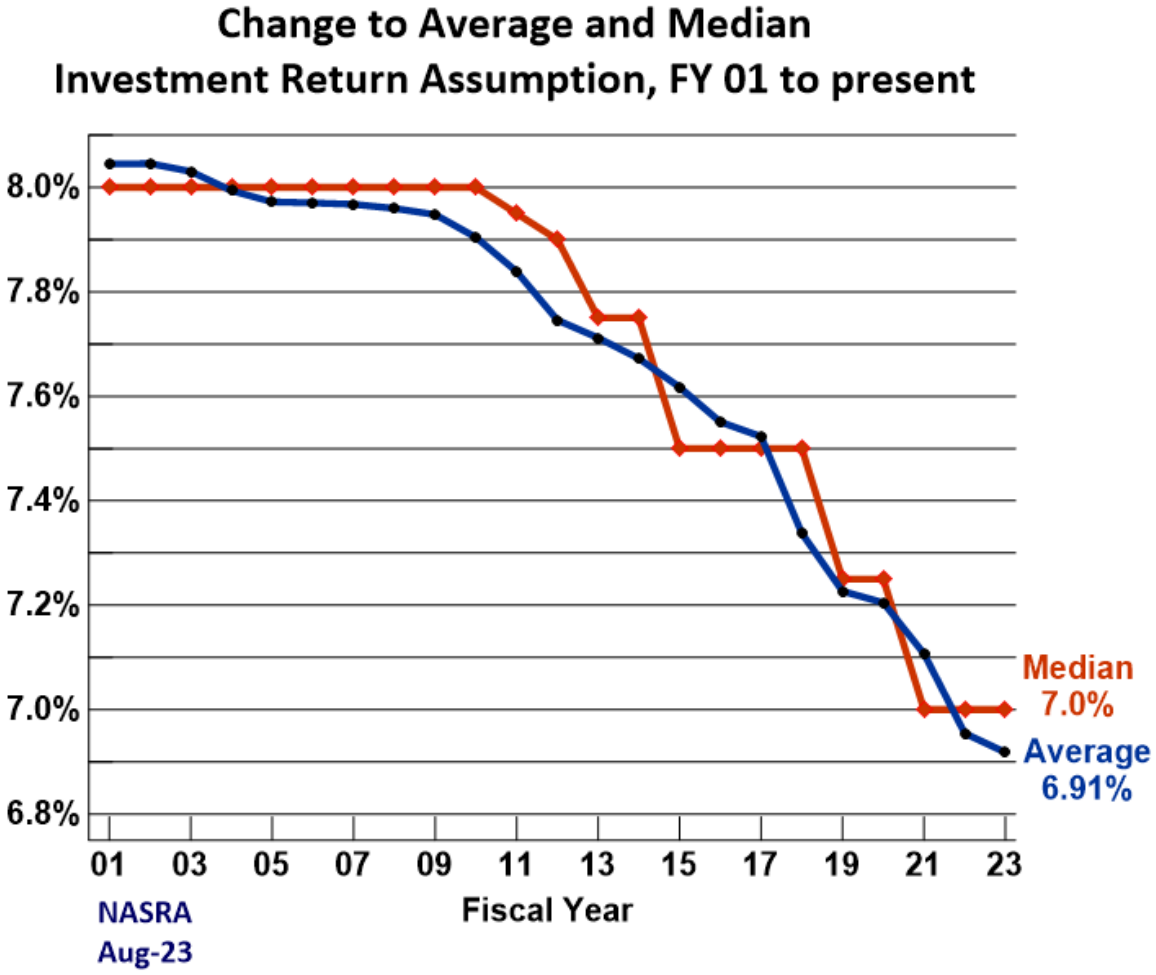
Peer Comparison

Public retirement systems have historically compared their investment performance to their peer group. While we believe there is some merit in assessing the movement in the assumed rate of return for other systems, this is not an appropriate basis for setting this assumption in our opinion. For example, different plans have different plan dynamics which will impact their choice of the assumed investment return. This peer group information merely provides another set of relevant data to consider as long as we recognize that asset allocation varies from system to system.

The following chart shows the nominal investment return assumptions of 131 plans in the National Association of State Retirement Administrators (NASRA). The assumptions shown below are as of August 2023 and are updated frequently by the NASRA staff.



The following chart shows the changes in expected investment return assumption from the NASRA public plan survey over the last 22 years from 2001.



Section II – Economic Assumptions

Recommendation

By actuarial standards, we are required to maintain a long-term perspective in setting all assumptions, including the investment return assumption. Therefore, we believe we must be careful not to let recent experience or short-term expectations impact our judgment regarding the appropriateness of the current assumption over the long term.

Based on our analysis of Horizon Survey capital market assumptions, we are recommending continuation of a real return assumption of 4.25%. We acknowledge that this real return assumption is below the anticipated return over the next 20 years of 4.53%, but we prefer a more conservative assumption during this potential volatile investment period. Based on our recommended inflation assumption of 2.50% and real return assumption of 4.25%, we are recommending continuation of the 6.75% expected long-term nominal rate of return assumption.

Investment Return Assumption		
	Current	**Recommended**
Real Rate of Return*	4.25%	4.25%
Inflation	2.50	2.50
Net Investment Return	6.75%	6.75%

* net of investment expenses.

Section III – Actuarial Methods

ACTUARIAL COST METHOD

There are various actuarial cost methods, each of which has different characteristics, advantages and disadvantages. However, Governmental Accounting Standard Board (GASB) Statement Numbers 67 and 68 require that the Entry Age Normal cost method be used for financial reporting. Most systems do not want to use a different actuarial cost method for funding and financial reporting. In addition, the Entry Age Normal method has been the most common funding method for public systems for many years. This is the cost method currently used by the Plan.

The rationale of the Entry Age Normal (EAN) cost method is that the cost of each member's benefit is determined to be a level percentage of his salary from date of hire to the end of his employment with the employer. This level percentage multiplied by the member's annual salary is referred to as the normal cost and is that portion of the total cost of the employee's benefit that is allocated to the current year. The portion of the present value of future benefits allocated to the future is determined by multiplying this percentage times the present value of the member's assumed earnings for all future years including the current year. The Entry Age Normal actuarial accrued liability is then developed by subtracting from the present value of future benefits that portion of costs allocated to the future. To determine the unfunded actuarial accrued liability, the value of plan assets is subtracted from the Entry Age Normal actuarial accrued liability. The current year's cost to amortize the unfunded actuarial accrued liability is developed by applying an amortization factor.

It is to be expected that future events will not occur exactly as anticipated by the actuarial assumptions in each year. Actuarial gains/losses from experience under this actuarial cost method can be directly calculated and are reflected as a decrease/increase in the unfunded actuarial accrued liability. Consequently, the gain/loss results in a decrease/increase in the amortization payment, and therefore the contribution rate.

Considering that the Entry Age Normal cost method is the most commonly used cost method by public plans, that it develops a normal cost rate that tends to be stable and less volatile and is the required cost method under calculations required by GASB Numbers 67 and 68, **we recommend the Entry Age Normal actuarial cost method be retained for the Plan.**

ACTUARIAL VALUE OF ASSETS

In preparing an actuarial valuation, the actuary must assign a value to the assets of the fund. An adjusted market value is often used to smooth out the volatility that is reflected in the market value of assets. This is because most employers would rather have annual costs remain relatively smooth, as a percentage of payroll or in actual dollars, as opposed to a cost pattern that is extremely volatile.

The actuary does not have complete freedom in assigning this value. The Actuarial Standards Board also has basic principles regarding the calculation of a smoothed asset value, Actuarial Standard of Practice No. 44 (ASOP 44), *Selection and Use of Asset Valuation Methods for Pension Valuations.*

ASOP 44 provides that the asset valuation method should bear a reasonable relationship to the market value. Furthermore, the asset valuation method should be likely to satisfy both of the following:

- Produce values within a reasonable range around market value, AND
- Recognize differences from market value in a reasonable amount of time.

In lieu of both of the above, the standard will be met if either of the following requirements is satisfied:

- There is a sufficiently narrow range around the market value, OR
- The method recognizes differences from market value in a sufficiently short period.

These rules or principles prevent the asset valuation methodology from being used to manipulate annual funding patterns. No matter what asset valuation method is used, it is important to note that, like a cost method or actuarial assumptions, the asset valuation method does not affect the true cost of the Plan; it only impacts the incidence of cost.

Currently, the actuarial value of assets recognizes a portion of the difference between the market value of assets and the expected market value of assets, based on the assumed valuation rate of return. The amount recognized each year is 20% of the difference between market value and expected market value. **We recommend no change in this methodology.**

AMORTIZATION OF THE UNFUNDED ACTUARIAL ACCRUED LIABILITY

The actuarial accrued liability is the portion of the actuarial present value of future benefits that are not included in future normal costs. Thus, it represents the liability that, in theory, should have been funded through normal costs for past service. Unfunded actuarial accrued liability (UAAL) exists when the actuarial accrued liability exceeds the actuarial value of plan assets. These deficiencies can result from:

(i) plan improvements that have not been completely paid for,
(ii) experience that is less favorable than expected,
(iii) assumption changes that increase liabilities, or
(iv) contributions that are less than the actuarial contribution rate.

There are a variety of different methods that can be used to amortize the UAAL. Each method results in a different payment stream and, therefore, has cost implications. For each methodology, there are three characteristics:

- The period over which the UAAL is amortized,
- The rate at which the amortization payment increases, and
- The number of components of UAAL (separate amortization bases).

Amortization Period: The amortization period can be either closed or open. If it is a closed amortization period, the number of years remaining in the amortization period declines by one in each future valuation. Alternatively, if the amortization period is an open or rolling period, the amortization period does not decline but is reset to the same number each year. This approach essentially "refinances" the System's debt (UAAL) every year.

Amortization Payment: The level dollar amortization method is similar to the method in which a homeowner pays off a mortgage. The liability, once calculated, is financed by a constant fixed dollar amount, based on the amortization period until the liability is extinguished. This results in the liability steadily decreasing while the payments, though remaining level in dollar terms, in all probability decrease as a percentage of payroll. (Even if a plan sponsor's population is not growing, inflationary salary increases will usually be sufficient to increase the aggregate covered payroll).

The rationale behind the level percentage of payroll amortization method is that since normal costs are calculated to be a constant percentage of pay, the unfunded actuarial accrued liability should be paid off in the same manner. When this method of amortizing the unfunded actuarial accrued liability is adopted, the initial amortization payments are lower than they would be under a level dollar amortization payment method, but the payments increase at a fixed rate each year so that ultimately the annual payment far exceeds the level dollar payment. The expectation is that total payroll will increase at the same rate so that the amortization payments will remain constant, as a percentage of payroll. In the initial years, the level percentage of payroll amortization payment is often less than the interest accruing on the unfunded actuarial accrued liability meaning that even if there are no experience losses, the dollar amount of the unfunded actuarial accrued liability will grow (called negative amortization). This is particularly true if the Plan sponsor is paying off the unfunded actuarial accrued liability over a long period, such as 20 or more years.

Amortization Bases: The UAAL can be amortized either as one single amount or as components or "layers", each with a separate amortization base, payment and period. If the UAAL is amortized as one amount, the UAAL is recalculated each year in the valuation and experience gains/losses or other changes in the UAAL are folded into the single UAAL amortization base. The amortization payment is then the total UAAL divided by an amortization factor for the applicable amortization period.

If separate amortization bases are maintained, the UAAL is composed of multiple amortization bases, each with its own payment schedule and remaining amortization period. In each valuation, the unexpected change in the UAAL is established as a new amortization base over the appropriate amortization period beginning on that valuation date. The UAAL is then the sum of all of the outstanding amortization bases on the valuation date and the UAAL payment is the sum of all of the amortization payments on the existing amortization bases. This approach provides transparency in that the current UAAL is paid off over a fixed period of time and the remaining components of the UAAL are clearly identified. Adjustments to the UAAL in future years are also separately identified in each future year. One downside of this approach is that it can create some discontinuities in contribution rates when UAAL layers/components are fully paid off. If this occurs, it likely would be far in the future, with adequate time to address any adjustments needed.

Section III – Actuarial Methods

Recommendation

In the current Board funding policy, the methodology for calculating the actuarially determined employer contribution (ADEC) is as follows:

- Amortization Period – Closed period with maximum period of 25 years for new bases
- Amortization Payment – Level Dollar
- Amortization Bases – Separate bases for all experience gains and losses, assumption changes or benefit changes

We recommend no changes in these methods. These methods all comply with the State of Tennessee Senate Bill No. 2079 relative to the financial security for the public defined benefit pension plans for political subdivisions within the State.

Section IV – Demographic Assumptions

There are several demographic assumptions used in the actuarial valuation performed for the System. They are:

- Rates of Withdrawal
- Rates of Disability Retirement
- Rates of Service Retirement
- Rates of Mortality
- Rates of Salary Increase

Actuarial Standard of Practice (ASOP) No. 35, *"Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations"* provides guidance to actuaries in selecting demographic assumptions for measuring obligations under defined benefit plans. In our opinion, the demographic assumptions recommended in this report have been developed in accordance with ASOP No. 35.

The purpose of a study of demographic experience is to compare what actually happened to the membership during the study period (January 1, 2018 through December 31, 2022) with what was expected to happen based on the assumptions used in the most recent Actuarial Valuation.

Detailed tabulations by age, service and/or gender are performed over the entire study period. These tabulations look at all active and retired members during the period as well as separately annotating those who experience a demographic event, also referred to as a decrement. In addition, the tabulation of all members together with the current assumptions permits the calculation of the number of expected decrements during the study period.

If the actual experience differs significantly from the overall expected results, or if the pattern of actual decrements, or rates of decrement, by age, gender, or service does not follow the expected pattern, new assumptions are recommended. Recommended changes usually do not follow the exact actual experience during the observation period. Judgment is required to extrapolate future experience from past trends and current member behavior. In addition, non-recurring events, such as early retirement windows, need to be taken into account in determining the weight to give to recent experience.

We note in particular that the period of time in this study overlaps with the COVID-19 pandemic that affected not only the health of individuals, but also led to individuals and employers responding differently than they had before. As a result, we have been more cautious in recommending changes for demographic assumptions than we would during a more normal period.

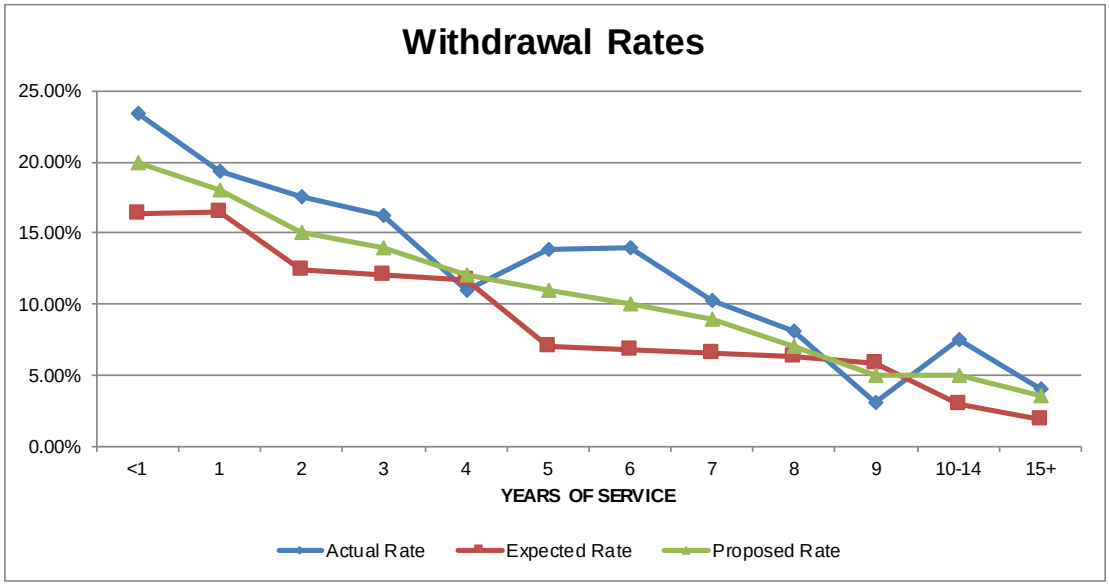
The remainder of this section presents the results of the demographic study. We have prepared tables that show a comparison of the actual and expected decrements and the overall ratio of actual to expected results (A/E Ratios) under the current assumptions. These A/E Ratios are expressed as percentages. An A/E Ratio above 100% indicates that actual decrements were more than expected and an A/E Ratio below 100% indicates actual decrements were less than expected. In most cases, it is desirable to set demographic assumptions so that A/E Ratios are close to 100%. If a change is being proposed, the revised A/E Ratios are shown as well. Salary adjustments, other than the economic assumption for wage inflation discussed in the previous section, are treated as demographic assumptions.

RATES OF WITHDRAWAL

COMPARISON OF ACTUAL AND EXPECTED RATES OF WITHDRAWAL FROM ACTIVE SERVICE

Years of Service	RATES OF WITHDRAWALS		
	Actual	Expected	Ratio of Actual to Expected
<1	0.234	0.163	1.436
1	0.193	0.164	1.177
2	0.176	0.124	1.419
3	0.163	0.120	1.358
4	0.110	0.117	0.940
5	0.138	0.071	1.944
6	0.140	0.067	2.090
7	0.103	0.065	1.585
8	0.081	0.064	1.266
9	0.031	0.058	0.534
10-14	0.076	0.030	2.533
15+	0.040	0.019	2.105
TOTAL	**0.122**	**0.086**	**1.419**

The following graph shows a comparison of the present, actual and proposed rates of withdrawal.



The rates of withdrawal adopted by the Board are used to determine the expected number of separations from active service which will occur as a result of resignation or dismissal. The current rates of withdrawal are based on both age and service. We did not find a significant difference in the rates among age levels within the service bands; therefore we recommend the use of strictly service-based rates rather than age- and service-based rates. As shown on the table on the previous page, the results of our five-year study indicate that, in aggregate, the actual rates of withdrawal were higher than expected at most service levels. Specifically, rates of withdrawal for members with 5 or more years of service were higher than expected. Additionally, the Plan has experienced significant gains due to withdrawals over the last five years. Therefore, we recommend increasing the rates at most service levels to better match experience in the future.

The following table shows a comparison between the current withdrawal rates and the proposed withdrawal rates.

COMPARATIVE RATES OF WITHDRAWAL

RATES OF WITHDRAWALS							
	Present					Proposed	
	Years of Service						
CENTRAL AGE OF GROUP	Less than 2	2 to 4	5 to 9	10 to 14	15 & Over	Years of Service	Rate
20-24	22.0%	20.0%	14.0%	8.0%	2.5%	<1	20.0%
25-29	22.0%	20.0%	14.0%	8.0%	2.5%	1	18.0%
30-34	17.0%	15.0%	14.0%	8.0%	2.5%	2	15.0%
35-39	17.0%	13.0%	8.0%	4.0%	2.5%	3	14.0%
40-44	15.0%	12.0%	4.5%	3.0%	2.5%	4	12.0%
45-49	13.0%	8.0%	4.5%	3.0%	2.0%	5	11.0%
50 & Over	13.0%	8.0%	4.5%	2.0%	1.6%	6	10.0%
						7	9.0%
						8	7.0%
						9	5.0%
						10-14	5.0%
						15+	3.5%

COMPARISON OF ACTUAL AND EXPECTED RATES OF WITHDRAWAL FROM ACTIVE SERVICE BASED ON PROPOSED RATES

Years of Service	RATES OF WITHDRAWALS		
	Actual	Expected	Ratio of Actual to Expected
<1	0.234	0.200	1.170
1	0.193	0.180	1.072
2	0.176	0.150	1.173
3	0.163	0.140	1.164
4	0.110	0.120	0.917
5	0.138	0.110	1.255
6	0.140	0.100	1.400
7	0.103	0.090	1.144
8	0.081	0.070	1.157
9	0.031	0.050	0.620
10-14	0.076	0.050	1.520
15+	0.040	0.035	1.143
TOTAL	**0.122**	**0.106**	**1.151**

RATES OF DISABILITY RETIREMENT

During the period under investigation, there were only 11 actual disability retirements and the current assumptions expected 17 during this period. There is not sufficient data to determine credible rates; **therefore, we recommend no change in the current rates of disability retirement.**

RATES OF RETIREMENT

COMPARISON OF ACTUAL AND EXPECTED RETIREMENTS

Service retirements for members retiring subject to the Rule of 80 were examined separately from those members retiring at 62 under a standard retirement (or retiring at age 55 with a reduced benefit).

Standard Retirement

AGE	NUMBER OF SERVICE RETIREMENTS		
	Actual	Expected	Ratio of Actual to Expected
55	4	5	0.800
56	9	5	1.800
57	7	5	1.400
58	5	5	1.000
59	10	4	2.500
60	8	4	2.000
61	10	11	0.909
62	36	58	0.621
63	12	35	0.343
64	21	28	0.750
65	20	27	0.741
66	20	20	1.000
67	19	13	1.462
68	7	8	0.875
69	6	7	0.857
70	5	5	1.000
71	2	4	0.500
72	3	4	0.750
73	3	4	0.750
74	3	3	1.000
75	6	9	0.667
SUB-TOTAL	**216**	**264**	**0.818**
75 & Over	8	25	0.320
TOTAL	**224**	**289**	**0.775**

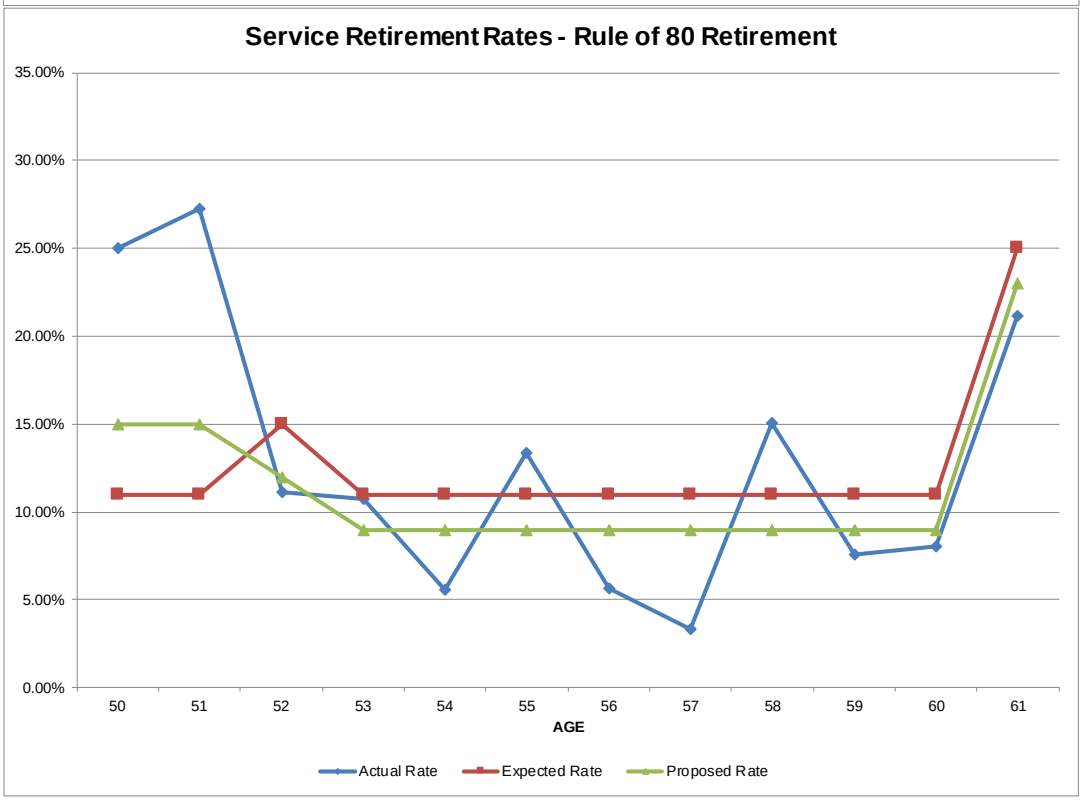
COMPARISON OF ACTUAL AND EXPECTED RETIREMENTS

Rule of 80 Retirement

AGE	RETIREMENTS		
	Actual	Expected	Ratio of Actual to Expected
50	1	0	0.000
51	3	1	3.000
52	2	3	0.667
53	3	3	1.000
54	2	4	0.500
55	6	5	1.200
56	3	6	0.500
57	2	7	0.286
58	11	8	1.375
59	6	9	0.667
60	7	10	0.700
61	18	21	0.857
TOTAL	**64**	**77**	**0.831**

The following graphs show a comparison of the present, actual, and proposed rates of service retirements.

RATES OF RETIREMENT FOR ACTIVE MEMBERS



For members retiring under standard retirement, the actual rates of service retirement were in aggregate lower than expected; specifically for ages 62 through 65. However for ages younger than 61, the actual rates were generally higher than expected.

For members retiring under the Rule of 80, the actual rates were in aggregate lower than expected; specifically for older ages.

Therefore, we recommend slight revisions to the rates of service retirement to more closely reflect the experience of the plan.

The following table shows a comparison between the present retirement rates and the proposed rates.

COMPARATIVE RATES OF RETIREMENT

Standard Retirement

AGE	RATES OF STANDARD SERVICE RETIREMENT	
	Present	Proposed
55	4.00%	6.50%
56	4.00%	6.50%
57	4.00%	6.50%
58	4.00%	6.50%
59	4.00%	6.50%
60	6.00%	6.50%
61	12.00%	11.00%
62	30.00%	20.00%
63	20.00%	18.00%
64	20.00%	18.00%
65	20.00%	20.00%
66	20.00%	21.00%
67	20.00%	23.00%
68	20.00%	20.00%
69	20.00%	19.00%
70	20.00%	22.00%
71	20.00%	15.00%
72-74	20.00%	18.00%
75+	100.00%	100.00%

COMPARATIVE RATES OF RETIREMENT

Rule of 80

AGE	RATES OF RULE OF 80 SERVICE RETIREMENT	
	Present	Proposed
50	11.00%	15.00%
51	11.00%	15.00%
52	11.00%	12.00%
53	11.00%	9.00%
54	11.00%	9.00%
55	11.00%	9.00%
56	11.00%	9.00%
57	11.00%	9.00%
58	11.00%	9.00%
59	11.00%	9.00%
60	11.00%	9.00%
61	28.00%	23.00%

COMPARATIVE RATES OF RETIREMENT

COMPARISON OF ACTUAL AND EXPECTED RETIREMENTS BASED ON PROPOSED RATES

Standard Retirement

AGE	NUMBER OF SERVICE RETIREMENTS		
	Actual	Expected	Ratio of Actual to Expected
55	4	8	0.500
56	9	8	1.125
57	7	8	0.875
58	5	7	0.714
59	10	7	1.429
60	8	7	1.143
61	10	11	0.909
62	36	41	0.878
63	12	29	0.414
64	21	26	0.808
65	20	24	0.833
66	20	20	1.000
67	19	14	1.357
68	7	8	0.875
69	6	6	1.000
70	5	5	1.000
71	2	3	0.667
72	3	4	0.750
73	3	4	0.750
74	3	3	1.000
75	6	9	0.667
SUB-TOTAL	**216**	**252**	**0.857**
75 & Over	8	25	0.320
TOTAL	**224**	**277**	**0.809**

COMPARISON OF ACTUAL AND EXPECTED RETIREMENTS BASED ON PROPOSED RATES

Rule of 80

AGE	RETIREMENTS		
	Actual	Expected	Ratio of Actual to Expected
50	1	1	1.000
51	3	2	1.500
52	2	2	1.000
53	3	3	1.000
54	2	3	0.667
55	6	4	1.500
56	3	5	0.600
57	2	5	0.400
58	11	7	1.571
59	6	7	0.857
60	7	8	0.875
61	18	20	0.900
TOTAL	**64**	**67**	**0.955**

RATES OF MORTALITY

One of the most important demographic assumptions in the valuation is mortality because it projects how long benefit payments will be made. The longer members live, the greater the true cost of future benefit obligations will be.

For many years, rates of mortality have been declining, meaning people, in general, are living longer. Consequently, we anticipate that mortality tables will need to be updated periodically. Because of potential differences in mortality, we break down our study by gender (males and females) and by status (healthy retirees, beneficiaries, disabled retirees, and active members).

Because of the substantial amount of data required to construct a mortality table, actuaries usually rely on standard tables published by the Society of Actuaries. Actuaries then use various adjustments such as age or scaling adjustments to the standard, published mortality tables in order to better match the observed mortality rates of a specific group.

The first of these adjustments is an age adjustment that can be either a "setback" or a "set forward". A one-year age setback treats all members as if they were one year younger than they truly are when applying the rates in the mortality table. For example, a one year set back would treat a 61-year old retiree as if he will exhibit the mortality of a 60-year old in the standard mortality table.

The second adjustment that can be used to adjust the mortality rates in a standard table to better fit actual experience is to "scale" a mortality table by multiplying the probabilities of death by factors less than one (to reflect better mortality) or factors greater than one (to reflect poorer mortality). Scaling factors can be applied to an entire table or a portion of the table. Of course, if needed, actuaries may use both of these methods to develop an appropriate table to model the mortality of the specific plan population.

In 2019, the Society of Actuaries released a family of mortality tables named the Pub-2010 tables. While prior pension mortality tables have been based solely on private corporate and union retirement plans, these new tables are based entirely on public sector plan data. These tables are split by three membership types: Safety, Teachers, and General to reflect the observed differences in mortality patterns related to the three groups. Tables are further split for healthy retirees, disabled retirees, contingent beneficiaries, and employees. There are still other breakdowns in these tables for at, above or below median annuity values. We anticipate that this family of tables will be a good starting point in developing a recommended mortality assumption.

Section IV – Demographic Assumptions

The issue of future mortality improvement is one that the actuarial profession has become increasingly focused on studying and monitoring. This has resulted in changes to the relevant Actuarial Standard of Practice, ASOP 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*. This ASOP requires the pension actuary to make and disclose a specific recommendation with respect to future improvements in mortality after the valuation date, although it does not require that an actuary assume there will be future improvements. There have been significant improvements in longevity in the past, although there are different opinions about future expectations, and thus there is a subjective component in the estimation of future mortality improvement. We believe it is prudent to anticipate that the trend will continue to some degree in the future and that it is appropriate to reflect some future mortality improvement as part of the mortality assumption.

There are two, widely-used ways to reflect future improvements in mortality:

(1) Static table with "margin"
(2) Generational mortality

The first approach to reflecting mortality improvements is through the use of a static mortality table with "margin." This is the method used for the System's current mortality assumption. Under this approach, the Actual to Expected Ratio is intentionally targeted to be over 100% so that mortality can improve without creating actuarial losses. This process is repeated at each experience study resulting in the increase in liability due to future mortality improvements being introduced in installments. This has been the approach used historically by many other systems because of its computational simplicity but is becoming less and less common.

Another approach, referred to as generational mortality, directly anticipates future improvements in mortality by using a different set of mortality rates based on each year of birth, with the rates for later years of birth assuming lower mortality than the rates for earlier years of birth. The varying mortality rates by year of birth create a series of tables that contain "built-in" mortality improvements, e.g., a member who turns age 65 in 2035 has a longer life expectancy than a member who turns age 65 in 2020. When using generational mortality, the Actual to Expected Ratios for the observed experience are set near 100% as future mortality improvements will be taken into account directly in the actuarial valuation process.

The generational approach is our preferred method for recognizing future mortality improvements in the valuation process because it is more direct and results in longer life expectancy for members who are younger, consistent with what we believe is more likely to occur. Over the last 10-15 years, this method has become quite common as computing power has increased. Additionally, Senate Bill No. 2079, passed in the Spring of 2014, mandated that all pension plans in the state of Tennessee adopt generational improvements in their mortality assumptions by 2024.

Healthy Retirees

The valuation currently uses the same mortality assumption for both service retirees and beneficiaries. The current mortality assumption uses the RP-2014 Mortality Table with Blue Collar Adjustment and projected to 2025 with projection scale MP-2017, set forward four years for males and set forward three years for females, with no adjustments. The more recent Pub-2010 tables provide separate mortality rates for service retirees and beneficiaries. Therefore, for this study, we have reviewed service retirees separately from beneficiaries.

It is common in demographic studies to weight the exposures and decrements by an approximation of the associated liability. With that in mind, we have analyzed recent experience on a benefit-weighted basis where the exposures and deaths are multiplied by the annual retirement benefit amount. Because a valuation is designed to measure the amount and timing of future benefit payments (liability) rather than simply the number of retirees leaving pay status, this benefit-weighted approach is an important factor in valuing plan obligations. (Note that most mortality tables used by actuaries are developed on a weighted basis.) This also helps to reflect any differences that arise from better mortality experience among those with larger benefits. Please note that we are not saying that larger benefits definitely lead to better mortality, but simply that there is a correlation between the two.

Since the City of Chattanooga's data is not sufficiently large enough to be fully credible (there would need to be about 1,600 observed male deaths and 1,700 observed female deaths to be considered fully credible under Limited Fluctuation Credibility Theory methods), we also considered the mortality assumption used by the Tennessee Consolidated Retirement System (TCRS) in our analysis. This is a much larger retirement system with significantly more mortality experience and it is reasonable to think that the System would have similar patterns of mortality. TCRS recently completed an experience investigation for the period ending June 30, 2020. The relevant mortality tables selected from that study for general employees was the PubG-2010 Below Median Retiree Mortality Table adjusted 106% for males and 114% for females. Future mortality improvements are anticipated generationally with the most recent MP projection scale available.

Section IV – Demographic Assumptions

To more closely match the experience observed for the System and to make use of more recently published mortality tables, **we recommend that the rates of post-retirement mortality for service retirees be revised to the Pub-2010 healthy annuitant tables with adjustments as outlined below to better fit actual experience, projected generationally using the MP-2021 scale.**

Membership Table	Set Forward (+)/ Set Back (-)	Adjustment to Rates
General Healthy Retiree Below Median	+3 years	Males: 102% of rates Females: 104% of rates

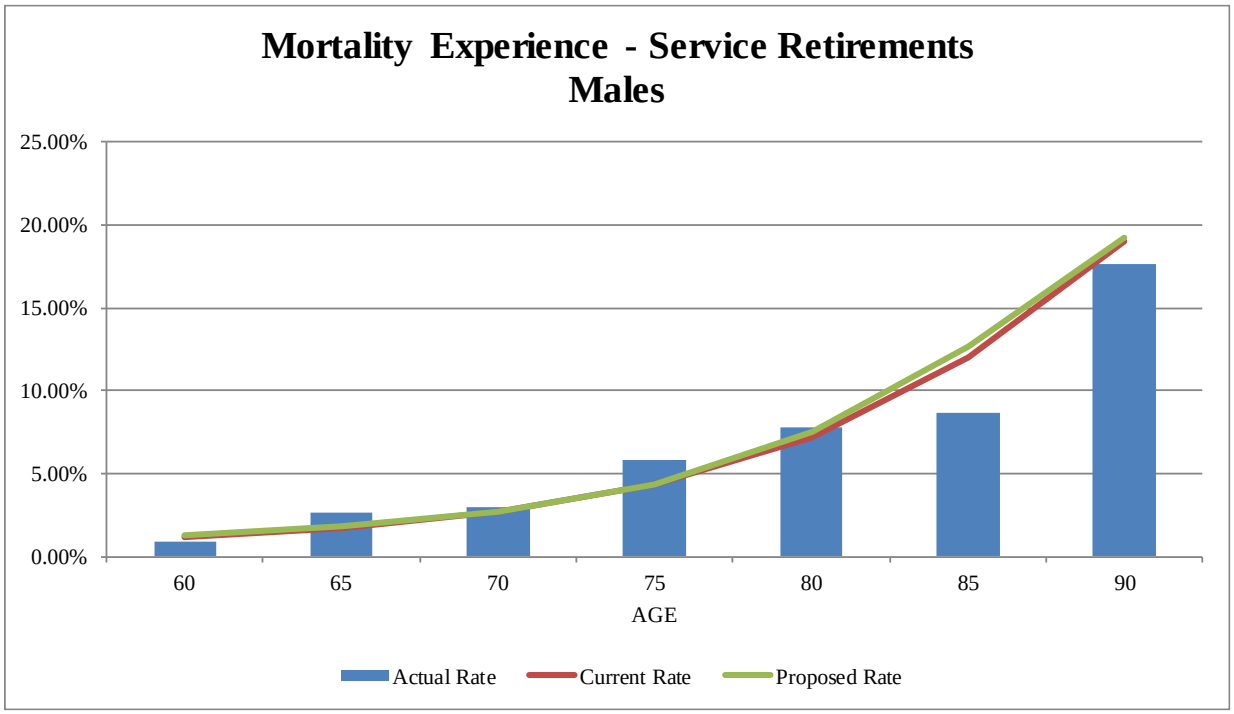
The resulting Actual to Expected Ratios, based on the current and proposed assumption, were developed using liability weighting and are shown in the following tables.

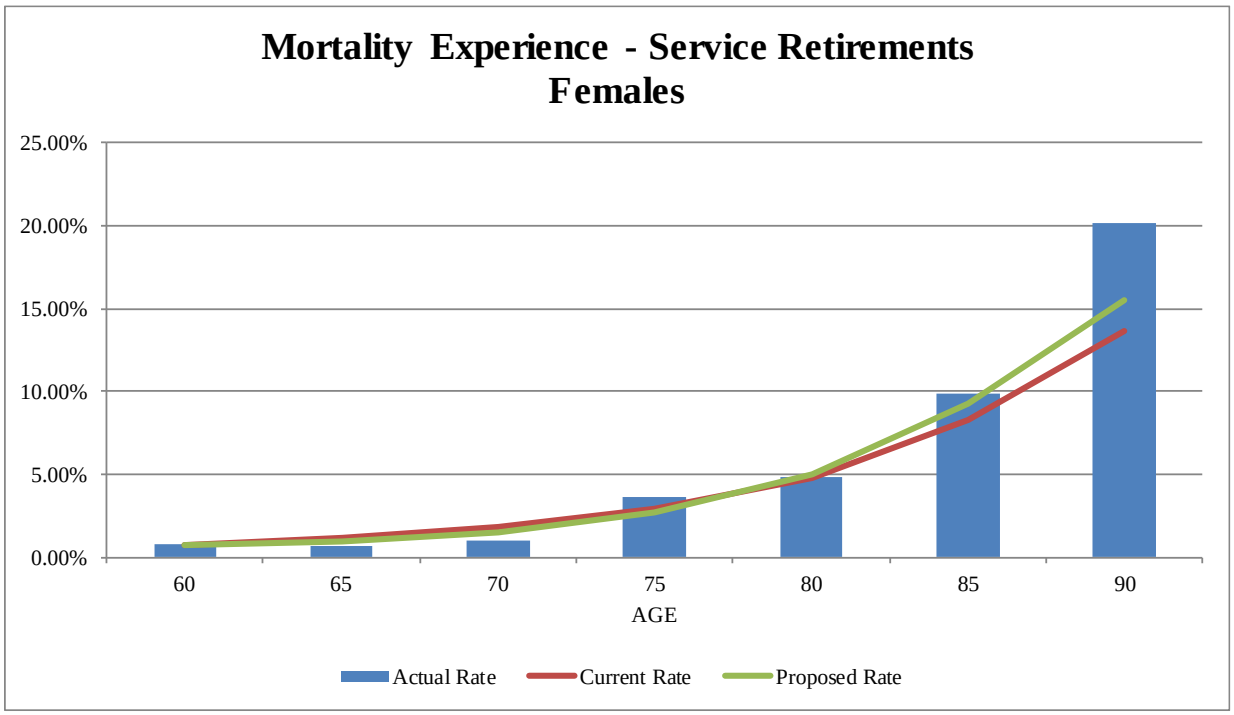
COMPARISON OF ACTUAL AND EXPECTED RATES OF MORTALITY

HEALTHY RETIREES

Central Age	RATES OF MORTALITY				
	Actual Rate	Expected-Current Rates	Ratio of Actual to Expected	Expected-Proposed Rates	Ratio of Actual to Expected
MALES					
57 & Under	0.012	0.008	1.500	0.010	1.200
60	0.009	0.011	0.818	0.013	0.692
65	0.027	0.018	1.500	0.018	1.500
70	0.030	0.028	1.071	0.027	1.111
75	0.058	0.043	1.349	0.043	1.349
80	0.077	0.072	1.069	0.076	1.013
85	0.086	0.121	0.711	0.126	0.683
90	0.177	0.190	0.932	0.192	0.922
93 & Over	0.511	0.268	1.907	0.267	1.914
TOTAL	**0.047**	**0.043**	**1.093**	**0.044**	**1.068**
FEMALES					
57 & Under	0.015	0.005	3.000	0.005	3.000
60	0.008	0.007	1.143	0.007	1.143
65	0.007	0.012	0.583	0.010	0.700
70	0.010	0.018	0.556	0.016	0.625
75	0.036	0.029	1.241	0.027	1.333
80	0.048	0.048	1.000	0.050	0.960
85	0.098	0.082	1.195	0.093	1.054
90	0.201	0.136	1.478	0.155	1.297
93 & Over	0.250	0.236	1.059	0.258	0.969
TOTAL	**0.032**	**0.030**	**1.067**	**0.031**	**1.032**

The following graphs show a comparison of the present, actual and proposed rates of post-retirement deaths among healthy retirees.





Beneficiaries

The mortality of beneficiaries applies to the survivors of members who retired with a joint and survivor option. There are fewer members receiving survivor benefits under the joint and survivor options than there are service retirements, and the results we were seeing were not as credible as for healthy retirees.

We recommend the Pub-2010 Contingent Survivors Table, projected generationally using the MP-2021 scale.

Membership Table	Set Forward (+)/ Set Back (-)	Adjustment to Rates
General Contingent Survivor Below Median	+3 years	None

Disabled Retirees

The valuation assumes that disabled members, in general, will not live as long as retired members who met the regular service retirement eligibility. There tends to be more fluctuation in disabled mortality than healthy mortality because of differences in the types of disabilities. In addition, the smaller number of exposures makes the results more volatile. The results are summarized in the following table:

We recommend the Pub-2010 General Disabled Retiree Table, projected generationally using the MP-2021 scale.

Membership Table	Set Forward (+)/ Set Back (-)	Adjustment to Rates
General Disability	None	None

Active Members

The active member mortality assumption models eligibility for death benefits prior to retirement. Therefore, it has a much smaller impact on the valuation results than the post-retirement mortality assumption.

It is difficult to isolate the mortality for active members as it may be impacted by active members first terminating or moving to disabled status before death. The data collection methods used in this study do not fully capture known deaths, and so can be misleading. Finally, the probability of active death is very small, so volatility is not uncommon.

Our recommended mortality assumption is based on the Pub-2010 General Employee tables, with adjustments as outlined below, projected generationally using the MP-2021 scale.

Membership Table	Set Forward (+)/ Set Back (-)	Adjustment to Rates
General Employee Below Median	+1 year	Males: 105% of rates Females: 107% of rates

RATES OF SALARY INCREASE

COMPARISON OF ACTUAL AND EXPECTED SALARIES OF ACTIVE MEMBERS

YEARS OF SERVICE	SALARIES AT END OF YEAR		
	Actual	Expected	Ratio of Actual to Expected
Less than 1	$ 27,541,133	$ 26,361,997	1.045
1-5	84,123,523	80,328,460	1.047
6-10	49,095,832	47,226,855	1.040
11-15	34,570,539	33,628,773	1.028
16-20	31,002,480	30,122,765	1.029
21-25	24,855,266	24,092,955	1.032
26-30	19,420,851	18,970,916	1.024
31-35	6,258,457	6,057,213	1.033
36 & Over	5,246,200	5,140,875	1.020
TOTAL	**$ 282,114,281**	**$ 271,930,809**	**1.037**

Actual rates of salary increase were higher than expected at all service levels over the five-year period. However, if we remove the past two years of the period (2021-2022), which experienced much higher than expected salary increases, then the actual rates of salary increase are much closer to expected, and all service level breakdowns are within 2% of expected.

COMPARISON OF ACTUAL AND EXPECTED SALARIES OF ACTIVE MEMBERS EXCLUDING 2021/2022

YEARS OF SERVICE	SALARIES AT END OF YEAR		
	Actual	Expected	Ratio of Actual to Expected
Less than 1	$ 15,749,408	$ 15,614,948	1.009
1-5	46,535,202	46,741,627	0.996
6-10	27,208,921	27,413,646	0.993
11-15	20,022,148	20,198,010	0.991
16-20	19,302,367	19,440,605	0.993
21-25	13,687,574	13,790,029	0.993
26-30	11,542,285	11,644,493	0.991
31-35	3,470,743	3,510,728	0.989
36 & Over	2,773,294	2,807,629	0.988
TOTAL	**$ 160,291,942**	**$ 161,161,715**	**0.995**

We believe the last two years of the study are skewing the results and are not a full representation of actual salary increases going forward. **Therefore we recommend no changes to the rates of salary increase at this time.**

OTHER ASSUMPTIONS

OPTION FACTORS: Per statute, optional payment forms are to be actuarially equivalent to the normal form of payment based on the mortality tables and investment rate of return (discount rate) used in the valuation. **We recommend that the factors be revised to be based on the proposed mortality table and investment rate of return assumption recommended for the valuation.**

LINE-OF-DUTY DEATH ASSUMPTION: Currently, it is assumed that 75% of active member deaths are non-line of duty and 25% of active member deaths are in the line of duty. Since we do not have sufficient data regarding the type of death, and since the number of active member deaths is relatively small, **we recommend no change be made to this assumption.**

LINE-OF-DUTY DISABILITY ASSUMPTION: Currently, it is assumed that 75% of disability retirements are non-line of duty and 25% of disability retirements are in the line of duty. Since the total number of disability retirements is relatively small, **we recommend no change be made to this assumption.**

PERCENT MARRIED: Currently, for the purposes of valuing pre-retirement survivor benefits, 85% of members are assumed to be married. Since we do not have sufficient data to analyze this assumption, **we recommend no change be made at this time.**

SPOUSE AGE DIFFERENCE: Currently, for married members, it is assumed a male is four years older than his spouse. **We have reviewed this assumption and recommend no changes at this time.**

Year	CPI (U)	Year	CPI (U)
1961	30.0	1992	141.9
1962	30.4	1993	145.8
1963	30.9	1994	149.7
1964	31.2	1995	153.5
1965	31.8	1996	158.6
1966	32.9	1997	161.3
1967	33.9	1998	163.9
1968	35.5	1999	168.3
1969	37.7	2000	174.0
1970	39.8	2001	176.7
1971	41.1	2002	180.9
1972	42.5	2003	184.3
1973	46.2	2004	190.3
1974	51.9	2005	196.8
1975	55.5	2006	201.8
1976	58.2	2007	210.036
1977	62.1	2008	210.228
1978	67.7	2009	215.949
1979	76.7	2010	219.179
1980	86.3	2011	225.672
1981	94	2012	229.601
1982	97.6	2013	233.049
1983	101.3	2014	234.812
1984	105.3	2015	236.525
1985	109.3	2016	241.432
1986	110.5	2017	246.524
1987	115.4	2018	251.233
1988	120.5	2019	256.974
1989	126.1	2020	260.474
1990	133.8	2021	278.802
1991	137.9	2022	296.797

Horizon 20-year Capital Market Assumptions and
City of Chattanooga's Board of Trustees Asset Allocation

Arithmetic Real Rates of Return and Standard Deviations by Asset Class

Asset Class	Expected Real Rate of Return	Standard Deviation
Large Cap	8.67%	16.64%
Small Cap	9.72%	20.51%
International Equity	9.38%	18.26%
Core Fixed Income	4.93%	5.85%
High Yield FI	7.03%	10.01%
International Fixed	3.81%	7.31%
Private Debt	8.89%	11.73%
Equity Hedge Funds	6.54%	8.06%
Diversified Hedge Funds	6.54%	8.06%
Private Equity	12.77%	22.57%
Real Estate	7.48%	16.72%
Cash	3.23%	1.09%

Asset Allocation Targets

Asset Class	Asset Allocation
Large Cap	25.00%
Small Cap	5.00%
International Equity	10.00%
Core Fixed Income	16.00%
High Yield FI	4.50%
International Fixed	6.00%
Private Debt	5.00%
Equity Hedge Funds	7.50%
Diversified Hedge Funds	7.50%
Private Equity	3.00%
Real Estate	10.00%
Cash	0.50%

Table 1

RATES OF WITHDRAWAL FROM ACTIVE SERVICE

YEARS OF SERVICE	RATES OF WITHDRAWAL
<1	20.0%
1	18.0%
2	15.0%
3	14.0%
4	12.0%
5	11.0%
6	10.0%
7	9.0%
8	7.0%
9	5.0%
10-14	5.0%
15+	3.5%

Table 2

RATES OF DISABILITY RETIREMENT FROM ACTIVE SERVICE

AGE	DISABILITY
26	0.00100
27	0.00100
28	0.00100
29	0.00100
30	0.00100
31	0.00100
32	0.00100
33	0.00100
34	0.00100
35	0.00100
36	0.00116
37	0.00132
38	0.00148
39	0.00164
40	0.00180
41	0.00196
42	0.00212
43	0.00228
44	0.00244
45	0.00260
46	0.00276
47	0.00292
48	0.00308
49	0.00324
50	0.00340
51	0.00360
52	0.00380
53	0.00400
54	0.00420
55	0.00440
56	0.00440
57	0.00440
58	0.00440
59	0.00400
60	0.00400
61	0.00400
62+	0.00000

Table 3

RATES OF SERVICE RETIREMENT FROM ACTIVE SERVICE

AGE	STANDARD RATE	RULE OF 80 RATE
45	0.0000	0.1500
46	0.0000	0.1500
47	0.0000	0.1500
48	0.0000	0.1500
49	0.0000	0.1500
50	0.0000	0.1500
51	0.0000	0.1500
52	0.0000	0.1200
53	0.0000	0.0900
54	0.0000	0.0900
55	0.0650	0.0900
56	0.0650	0.0900
57	0.0650	0.0900
58	0.0650	0.0900
59	0.0650	0.0900
60	0.0650	0.0900
61	0.1100	0.2300
62	0.2000	
63	0.1800	
64	0.1800	
65	0.2000	
66	0.2100	
67	0.2300	
68	0.2000	
69	0.1900	
70	0.2200	
71	0.1500	
72	0.1800	
73	0.1800	
74	0.1800	
75	1.0000	

Table 4

RATES OF PRE-RETIREMENT MORTALITY

AGE	MALES	FEMALES	AGE	MALES	FEMALES
20	0.0441%	0.0139%	71	1.2821%	0.8207%
21	0.0431%	0.0128%	72	1.4018%	0.9074%
22	0.0431%	0.0128%	73	1.5341%	1.0026%
23	0.0420%	0.0118%	74	1.6790%	1.1085%
24	0.0431%	0.0128%	75	1.8386%	1.2252%
25	0.0452%	0.0139%	76	2.0139%	1.3536%
26	0.0473%	0.0150%	77	2.2061%	1.4948%
27	0.0494%	0.0171%	78	2.4171%	1.6510%
28	0.0525%	0.0182%	79	2.6492%	1.8244%
29	0.0546%	0.0203%	80	6.9101%	4.3998%
30	0.0578%	0.0225%	81	7.6976%	4.9530%
31	0.0609%	0.0235%	82	8.5712%	5.5854%
32	0.0641%	0.0268%	83	9.5309%	6.3066%
33	0.0683%	0.0289%	84	10.5767%	7.1294%
34	0.0714%	0.0321%	85	11.7075%	8.0678%
35	0.0767%	0.0342%	86	12.9223%	9.1260%
36	0.0809%	0.0385%	87	14.2212%	10.3073%
37	0.0872%	0.0417%	88	15.6041%	11.6074%
38	0.0935%	0.0460%	89	17.0657%	13.0155%
39	0.1008%	0.0503%	90	18.5651%	14.4739%
40	0.1082%	0.0546%	91	20.0823%	15.9558%
41	0.1176%	0.0589%	92	21.6174%	17.4560%
42	0.1271%	0.0642%	93	23.1819%	18.9861%
43	0.1386%	0.0706%	94	24.7979%	20.5708%
44	0.1502%	0.0770%	95	26.4873%	22.2378%
45	0.1638%	0.0835%	96	28.2702%	24.0151%
46	0.1785%	0.0899%	97	30.1592%	25.9218%
47	0.1943%	0.0974%	98	32.1552%	27.9645%
48	0.2111%	0.1059%	99	34.2395%	30.1312%
49	0.2289%	0.1145%	100	36.3678%	32.3836%
50	0.2478%	0.1231%	101	38.4720%	34.6487%
51	0.2678%	0.1327%	102	40.5342%	36.9086%
52	0.2888%	0.1434%	103	42.5376%	39.1417%
53	0.3119%	0.1552%	104	44.4696%	41.3288%
54	0.3360%	0.1680%	105	46.3187%	43.4516%
55	0.3623%	0.1819%	106	48.0753%	45.4953%
56	0.3896%	0.1980%	107	49.7322%	47.4449%
57	0.4200%	0.2140%	108	51.2852%	49.2917%
58	0.4536%	0.2333%	109	52.5000%	51.0283%
59	0.4893%	0.2547%	110	52.5000%	52.6494%
60	0.5271%	0.2782%	111	52.5000%	53.5000%
61	0.5691%	0.3050%	112	52.5000%	53.5000%
62	0.6143%	0.3349%	113	52.5000%	53.5000%
63	0.6626%	0.3681%	114	52.5000%	53.5000%
64	0.7161%	0.4066%	115	52.5000%	53.5000%
65	0.7739%	0.4483%	116	52.5000%	53.5000%
66	0.8390%	0.4954%	117	52.5000%	53.5000%
67	0.9093%	0.5478%	118	52.5000%	53.5000%
68	0.9891%	0.6067%	119	100.0000%	100.0000%
69	1.0763%	0.6709%	120	100.0000%	100.0000%
70	1.1739%	0.7415%			

Table 5
RATES OF POST-RETIREMENT MORTALITY
Service Retirements

AGE	MALES	FEMALES	AGE	MALES	FEMALES
20	0.0418%	0.0125%	71	3.1977%	1.9323%
21	0.0408%	0.0114%	72	3.5476%	2.1611%
22	0.0418%	0.0125%	73	3.9392%	2.4170%
23	0.0439%	0.0135%	74	4.3758%	2.7030%
24	0.0459%	0.0146%	75	4.8644%	3.0264%
25	0.0479%	0.0166%	76	5.4121%	3.3904%
26	0.0510%	0.0177%	77	6.0251%	3.8043%
27	0.0530%	0.0198%	78	6.7126%	4.2765%
28	0.0561%	0.0218%	79	7.4776%	4.8142%
29	0.0592%	0.0229%	80	8.3263%	5.4288%
30	0.0622%	0.0260%	81	9.2585%	6.1298%
31	0.0663%	0.0281%	82	10.2745%	6.9295%
32	0.0694%	0.0312%	83	11.3730%	7.8416%
33	0.0745%	0.0333%	84	12.5531%	8.8702%
34	0.0785%	0.0374%	85	13.8149%	10.0183%
35	0.0847%	0.0406%	86	15.1582%	11.2819%
36	0.0908%	0.0447%	87	16.5781%	12.6506%
37	0.0979%	0.0489%	88	18.0346%	14.0681%
38	0.1051%	0.0530%	89	19.5085%	15.5085%
39	0.1142%	0.0572%	90	20.9998%	16.9666%
40	0.1234%	0.0624%	91	22.5196%	18.4538%
41	0.1346%	0.0686%	92	24.0893%	19.9940%
42	0.1459%	0.0749%	93	25.7305%	21.6143%
43	0.1591%	0.0811%	94	27.4625%	23.3418%
44	0.1734%	0.0874%	95	29.2975%	25.1950%
45	0.1887%	0.0946%	96	31.2365%	27.1804%
46	0.2050%	0.1030%	97	33.2612%	29.2864%
47	0.7354%	0.4368%	98	35.3287%	31.4756%
48	0.7701%	0.4472%	99	37.3728%	33.6773%
49	0.8068%	0.4576%	100	39.3761%	35.8738%
50	0.8446%	0.4680%	101	41.3222%	38.0442%
51	0.8813%	0.4784%	102	43.1990%	40.1700%
52	0.9190%	0.4888%	103	44.9953%	42.2334%
53	0.9568%	0.4982%	104	46.7017%	44.2198%
54	0.9935%	0.5086%	105	48.3113%	46.1146%
55	1.0302%	0.5200%	106	49.8199%	47.9097%
56	1.0669%	0.5356%	107	51.0000%	49.5976%
57	1.1047%	0.5543%	108	51.0000%	51.1732%
58	1.1434%	0.5782%	109	51.0000%	52.0000%
59	1.1842%	0.6074%	110	51.0000%	52.0000%
60	1.2291%	0.6417%	111	51.0000%	52.0000%
61	1.2781%	0.6802%	112	51.0000%	52.0000%
62	1.3342%	0.7228%	113	51.0000%	52.0000%
63	1.4515%	0.8018%	114	51.0000%	52.0000%
64	1.5892%	0.8913%	115	51.0000%	52.0000%
65	1.7462%	0.9932%	116	51.0000%	52.0000%
66	1.9258%	1.1076%	117	100.0000%	100.0000%
67	2.1277%	1.2366%	118	100.0000%	100.0000%
68	2.3531%	1.3822%	119	100.0000%	100.0000%
69	2.6041%	1.5444%	120	100.0000%	100.0000%
70	2.8846%	1.7274%			

Table 6

RATES OF POST-RETIREMENT MORTALITY
Beneficiaries

AGE	MALES	FEMALES	AGE	MALES	FEMALES
20	0.0410%	0.0120%	71	3.5160%	2.4760%
21	0.0400%	0.0110%	72	3.8360%	2.6990%
22	0.0410%	0.0120%	73	4.1830%	2.9460%
23	0.0430%	0.0130%	74	4.5590%	3.2200%
24	0.0450%	0.0140%	75	4.9710%	3.5270%
25	0.0470%	0.0160%	76	5.4240%	3.8700%
26	0.0500%	0.0170%	77	5.9260%	4.2580%
27	0.0520%	0.0190%	78	6.4860%	4.6980%
28	0.0550%	0.0210%	79	7.1100%	5.1970%
29	0.0580%	0.0220%	80	7.8020%	5.7620%
30	0.0610%	0.0250%	81	8.5690%	6.4020%
31	0.0650%	0.0270%	82	9.4140%	7.1270%
32	0.0680%	0.0300%	83	10.3440%	7.9450%
33	0.0730%	0.0320%	84	11.3610%	8.8570%
34	0.0770%	0.0360%	85	12.4680%	9.8570%
35	0.0830%	0.0390%	86	13.6760%	10.9330%
36	0.0890%	0.0430%	87	15.1110%	12.0640%
37	0.0960%	0.0470%	88	16.6730%	13.2580%
38	0.1030%	0.0510%	89	18.3000%	14.5230%
39	0.1120%	0.0550%	90	19.9560%	15.8700%
40	0.1210%	0.0600%	91	21.6290%	17.3100%
41	0.1320%	0.0660%	92	23.3230%	18.8520%
42	0.7330%	0.4640%	93	25.0530%	20.5030%
43	0.7600%	0.4790%	94	26.8370%	22.2660%
44	0.7880%	0.4930%	95	28.6890%	24.1380%
45	0.8160%	0.5080%	96	30.6160%	26.1090%
46	0.8450%	0.5230%	97	32.6090%	28.1600%
47	0.9110%	0.5370%	98	34.6360%	30.2650%
48	0.9350%	0.5670%	99	36.6400%	32.3820%
49	0.9600%	0.5990%	100	38.6040%	34.4940%
50	0.9850%	0.6320%	101	40.5120%	36.5810%
51	1.0120%	0.6670%	102	42.3520%	38.6250%
52	1.0420%	0.7040%	103	44.1130%	40.6090%
53	1.0730%	0.7420%	104	45.7860%	42.5190%
54	1.1080%	0.7820%	105	47.3640%	44.3410%
55	1.1470%	0.8250%	106	48.8430%	46.0670%
56	1.1920%	0.8710%	107	50.0000%	47.6900%
57	1.2430%	0.9210%	108	50.0000%	49.2050%
58	1.3020%	0.9750%	109	50.0000%	50.0000%
59	1.3710%	1.0340%	110	50.0000%	50.0000%
60	1.4500%	1.0980%	111	50.0000%	50.0000%
61	1.5430%	1.1680%	112	50.0000%	50.0000%
62	1.6500%	1.2430%	113	50.0000%	50.0000%
63	1.7760%	1.3320%	114	50.0000%	50.0000%
64	1.9210%	1.4290%	115	50.0000%	50.0000%
65	2.0860%	1.5350%	116	50.0000%	50.0000%
66	2.2710%	1.6530%	117	100.0000%	100.0000%
67	2.4760%	1.7840%	118	100.0000%	100.0000%
68	2.7030%	1.9310%	119	100.0000%	100.0000%
69	2.9500%	2.0940%	120	100.0000%	100.0000%
70	3.2210%	2.2750%			

Table 7
RATES OF POST-RETIREMENT MORTALITY
Disability Retirements

AGE	MALES	FEMALES	AGE	MALES	FEMALES
20	0.4120%	0.2330%	71	4.1130%	3.0390%
21	0.3860%	0.2150%	72	4.3440%	3.2390%
22	0.3520%	0.1940%	73	4.5990%	3.4640%
23	0.3160%	0.1760%	74	4.8800%	3.7180%
24	0.2890%	0.1640%	75	5.1920%	4.0030%
25	0.2780%	0.1640%	76	5.5370%	4.3220%
26	0.2920%	0.1790%	77	5.9210%	4.6780%
27	0.3060%	0.1960%	78	6.3470%	5.0750%
28	0.3210%	0.2150%	79	6.8220%	5.5170%
29	0.3370%	0.2350%	80	7.3480%	6.0070%
30	0.3540%	0.2570%	81	7.9290%	6.5500%
31	0.3720%	0.2810%	82	8.5650%	7.1500%
32	0.3910%	0.3070%	83	9.2590%	7.8110%
33	0.4110%	0.3360%	84	10.0100%	8.5360%
34	0.4340%	0.3670%	85	10.8150%	9.3310%
35	0.4580%	0.4010%	86	11.6780%	10.1630%
36	0.4860%	0.4380%	87	12.6050%	11.0140%
37	0.5180%	0.4790%	88	13.6030%	11.8780%
38	0.5550%	0.5240%	89	14.8610%	12.7570%
39	0.5970%	0.5740%	90	16.2530%	13.6650%
40	0.6450%	0.6290%	91	17.6810%	14.6170%
41	0.7000%	0.6890%	92	19.1260%	15.6350%
42	0.7630%	0.7540%	93	20.5880%	16.7400%
43	0.8340%	0.8250%	94	22.0780%	17.9550%
44	0.9160%	0.9020%	95	23.6170%	19.2980%
45	1.0070%	0.9850%	96	25.2260%	20.7840%
46	1.1090%	1.0730%	97	26.9240%	22.4440%
47	1.2210%	1.1670%	98	28.7230%	24.2260%
48	1.3420%	1.2670%	99	30.6240%	26.1350%
49	1.4700%	1.3730%	100	32.6090%	28.1600%
50	1.6050%	1.4830%	101	34.6360%	30.2650%
51	1.7120%	1.5350%	102	36.6400%	32.3820%
52	1.8180%	1.5870%	103	38.6040%	34.4940%
53	1.9210%	1.6400%	104	40.5120%	36.5810%
54	2.0200%	1.6920%	105	42.3520%	38.6250%
55	2.1140%	1.7420%	106	44.1130%	40.6090%
56	2.2010%	1.7890%	107	45.7860%	42.5190%
57	2.2800%	1.8330%	108	47.3640%	44.3410%
58	2.3550%	1.8740%	109	48.8430%	46.0670%
59	2.4280%	1.9140%	110	50.0000%	47.6900%
60	2.5030%	1.9560%	111	50.0000%	49.2050%
61	2.5840%	2.0000%	112	50.0000%	50.0000%
62	2.6770%	2.0510%	113	50.0000%	50.0000%
63	2.7850%	2.1100%	114	50.0000%	50.0000%
64	2.9080%	2.1780%	115	50.0000%	50.0000%
65	3.0440%	2.2560%	116	50.0000%	50.0000%
66	3.1930%	2.3460%	117	50.0000%	50.0000%
67	3.3530%	2.4500%	118	50.0000%	50.0000%
68	3.5240%	2.5690%	119	50.0000%	50.0000%
69	3.7060%	2.7060%	120	100.0000%	100.0000%
70	3.9010%	2.8620%			

Table 8
RATES OF ANTICIPATED SALARY INCREASES

YEARS OF SERVICE	RATES OF INCREASE
< 1	5.25%
1-5	4.75%
6-10	4.25%
11-15	3.75%
16-20	3.50%
21-25	3.25%
26 & Over	3.00%