THE PUBLIC SCHOOL RETIREMENT SYSTEM OF THE SCHOOL DISTRICT OF KANSAS CITY, MISSOURI

EXPERIENCE STUDY
STUDY PERIOD:
FIVE YEARS ENDING
DECEMBER 31, 2024

SUBMITTED: NOVEMBER 11, 2025

CavMac
Actuarial Consulting Services

TABLE OF CONTENTS

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November 11, 2025

The Board of Trustees
Public School Retirement System of the School District of Kansas City, Missouri
3100 Broadway, Suite 1211
Kansas City, MO 64111

Dear Members of the Board:

It is a pleasure to submit this report of our investigation of the experience of the Public School Retirement System of the School District of Kansas City, Missouri (KCPSRS) for the five-year period ending December 31, 2024. The study was based on the data submitted by KCPSRS for the annual valuations. In preparing this report we relied, without audit, on the data provided.

The purpose of this report is to present the results of our review of the actuarial methods and assumptions used in the actuarial valuations of the KCPSRS. With the Board's approval of the recommendations in this report, these assumptions and methods would be used in the January 1, 2026 actuarial valuation.

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. We further certify that, in our opinion, the assumptions developed in this report satisfy Actuarial Standards of Practice, in particular, No. 27 (Selection of Assumptions for Measuring Pension Obligations).

The impact of the COVID-19 pandemic likely had an effect on both economic and demographic experience. During the study period, when reviewing and analyzing the data, the impact of the COVID-19 pandemic was taken into consideration when developing recommended assumptions.

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. Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the

following: plan experience differing from that anticipated by the economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period); and changes in plan provisions or applicable law.

I, Patrice A. Beckham, F.S.A., am a member of the American Academy of Actuaries and a Fellow of the Society of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

I, Bryan K. Hoge, F.S.A., am a member of the American Academy of Actuaries and a Fellow of the Society of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

We are available to answer any questions on the material contained in the report, or to provide explanations or further details as may be appropriate.

Sincerely,

Patrice A. Beckham, FSA, EA, FCA, MAAA
Consulting Actuary

Bryan K. Hoge, FSA, EA, FCA, MAAA
Principal and Consulting Actuary

SECTION 1 – BOARD SUMMARY

Introduction

The purpose of an actuarial valuation is to provide a timely best estimate of the ultimate costs of a retirement system. The actuarial valuation of the Public School Retirement System of the School District of Kansas City, Missouri (KCPSRS) is prepared annually to determine the actuarial contribution rate required to fund the system 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 system 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.

At the request of the Board of Trustees, Cavanaugh Macdonald Consulting, LLC (CavMac), performed a study of the experience of the KCPSRS, for the five-year period ending December 31, 2024. 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 January 1, 2026 actuarial valuation.

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.

The impact of the COVID-19 pandemic likely had an effect on both economic and demographic experience. During the study period, when reviewing and analyzing the data, the impact of the COVID-19 pandemic was taken into consideration when developing recommended assumptions.

SECTION 1 – BOARD SUMMARY

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 and is typically influenced by professional judgment. In this report, we have recommended changes to certain assumptions. To allow you to better understand our thought process, we offer a brief summary of our philosophy:

- **Don't 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 rate.

- **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 some 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.

We generally analyzed experience for each of the five years individually as well as in aggregate. If any of the experience in certain years appear to be outliers, the credibility of that experience was reduced in evaluating the current assumptions and proposing changes. A portion of this study was during the COVID-19 pandemic, and so we are aware that the behavior and experiences of the members during this period could be affected, while not necessarily representing a long-term trend. Our recommendations for change were influenced by this awareness.

Actuarial Methods

The basic actuarial methodologies used in the valuation process include:

- actuarial cost method,
- asset valuation method and
- unfunded actuarial accrued liability (UAAL) amortization methodology.

The actuarial methods are reviewed to determine if there is reason to propose any changes. The current methods are all methods commonly used by public plans and will systematically fund the benefits to be provided by KCPSRS. **Based on our review, we recommend all of the current methods be retained.**

Summary of Recommendations – Economic Assumptions

The following table summarizes the current and proposed economic assumptions:

	Current Assumptions	Proposed Assumptions
Price Inflation	2.25%	2.50%
Long-term Investment Return	7.25%	7.25%
Real Wage Inflation (Productivity)	0.60%	0.75%
General Wage Growth (Wage Inflation)	2.85%	3.25%
Payroll Growth	2.85%	3.00%
Interest Crediting Rate on Member Accounts	2.50%	3.00%
Individual Salary Increase	Varies by service	Increase at most durations

As the table indicates, we are recommending an increase to the price inflation assumption from 2.25% to 2.50%. We are recommending that the long-term expected return on assets be unchanged from 7.25%. This reflects an inherent lowering of the real rate of return from 4.75% to 4.50%, due to the increase in the price inflation assumption.

Additional changes to other economic assumptions include increasing the productivity assumption from 0.60% to 0.75% which increases the general wage inflation assumption from 2.85% to 3.25% (price inflation plus productivity). We are also recommending the payroll growth assumption increase from 2.85% to 3.00% to reflect the higher general wage inflation, while allowing for some adverse deviation if the active membership and total payroll don't increase as expected. We recommend the interest crediting rate on member accounts increase from 2.50% to 3.00%. Finally, we recommend an increase to the individual salary scale, which includes a higher wage growth assumption as well as adjustments to the merit scale at most service durations.

Although we have recommended a change in the set of economic assumptions, we recognize that there may be other sets of economic assumptions which are also reasonable for purposes of funding KCPSRS. For example, we have typically reflected conservatism to the degree we would

classify as moderate. Some actuaries (and/or boards) might be more risk averse and desire a greater degree of conservatism, while others are more risk tolerant and would choose less cautious assumptions. Actuarial Standards of Practice allow for this difference in approach and perspective, as long as the assumptions are reasonable and consistent.

Summary of Recommendations – Demographic Assumptions

The following table summarizes the current and proposed demographic assumptions:

	Current Assumptions	Proposed Assumptions
Mortality		
- Base Tables	Pub-2010 General Members (Below Median) Tables	Pub-2016 General Members (Below Median) Tables
- Mortality Improvement	Projected 7 years for retirees Projected 15 years for actives	Generational mortality improvements using MP-2021
- Adjustments	1-year age set forward for females 1-year age setback for males	1-year age set forward for females No age adjustments for males
Retirement		
- Early	5% for ages 55-59	3% for ages 55-59
- First eligible “Select”	Age-based table	Eliminate “Select” assumption
- Ultimate	Age-based table	Modify to partially reflect actual experience
Termination	Service-based table	No changes
Disability	None	No changes

As the table indicates, we are recommending a change to the newly published Pub-2016 mortality tables, with some age adjustments and a change to generational mortality improvements.

For the retirement assumption, we are recommending lowering the early retirement assumption from 5% to 3%. In addition, we recommend eliminating the assumption when members are first eligible for unreduced benefits (select) as the data no longer supports separate “select” and “ultimate” assumptions. The assumption for unreduced retirements (ultimate) was modified to partially reflect actual experience during the study period.

We recommend no changes be made to the termination and disability assumptions.

Financial Impact

The financial impact of the suggested assumption changes is estimated by performing additional valuations using the January 1, 2025 valuation data. The cost impact, illustrated in the following table, is based on the January 1, 2025 valuation using the recommended set of assumptions, as outlined in this report.

When this set of assumptions is formally used, for the first time, in the January 1, 2026 valuation, we expect the relative impact to be similar to the results shown here (as a percentage of the actuarial accrued liability and normal cost). However, the actual impact may vary due to underlying changes that occur between valuation dates.

Comparison of Valuation Results and Costs
KCPSRS

	January 1, 2025 Valuation	Proposed Assumption Changes	Difference
Actuarial Accrued Liability ($M)	$1,031	$1,019	(12)
Actuarial Assets ($M)	706	706	0
Unfunded Actuarial Accrued Liability (UAAL) ($M)	325	312	(12)
Funded Ratio	68.5%	69.3%	0.8%
Normal Cost Rate	9.55%	10.02%	0.47%
Administrative Expense	0.61%	0.60%	(0.01%)
UAAL Amortization Rate	7.58%	7.11%	(0.47%)
Actuarial Required Contribution Rate	17.74%	17.73%	(0.01%)
Member Contribution Rate	(9.00%)	(9.00%)	0.00%
Employer Contribution Rate	(12.00%)	(12.00%)	0.00%
Contribution Rate Shortfall/(Margin)	(3.26%)	(3.27%)	(0.01%)

Note: Numbers may not add due to rounding.
Until the System is fully funded, RSMO requires a minimum employer contribution rate of 12.00%

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SECTION 2 – ACTUARIAL METHODS

ACTUARIAL COST METHOD

The systematic financing of a pension plan requires that contributions be made in an orderly fashion while a member is actively employed so that the accumulation of these contributions, together with investment earnings, should be sufficient to provide promised benefits and cover administration expenses. The actuarial valuation is the process used to determine when money should be contributed, i.e., as part of the budgeting process.

The actuarial valuation will not impact the actual amount of benefits paid which is the true cost of the plan. In the long run, actuaries cannot change the costs of the pension plan, regardless of the funding method used or the assumptions selected. However, the choice of actuarial methods and assumptions **will** influence the incidence of costs.

The valuation, or determination of the present value of all future benefits to be paid by the System, reflects the assumptions that best seem to describe anticipated future experience. The choice of a funding method does not impact the determination of the present value of future benefits. The funding method determines only the incidence or allocation of cost. In other words, the purpose of the funding method is to allocate the present value of future benefits determination into annual costs. In order to do this allocation, it is necessary for the funding method to "break down" the present value of future benefits into two components: (1) that which is attributable to the past (2) and that which is attributable to the future. The excess of that portion attributable to the past over the plan assets is then amortized over a period of years. Actuarial terminology calls the part attributable to the past the "past service liability" or the "actuarial accrued liability". The portion of the present value of future benefits allocated to the future is commonly known as the "present value of future normal costs", with the specific piece of it allocated to the current year being called the "normal cost". The difference between the plan assets and actuarial accrued liability is called the "unfunded actuarial accrued liability".

Two key points should be noted. First, there is no single "correct" funding method. Second, the allocation of the present value of future benefits, and hence cost, to the past for amortization and to the future for annual normal cost payments is not necessarily in a one-to-one relationship with service credits and benefits earned in the past and the future.

There are various actuarial cost methods, each of which has different characteristics, advantages and disadvantages. However, Governmental Accounting Standard Board 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 KCPSRS.

The rationale of the Entry Age Normal (EAN) cost method is that the cost of each member's benefit is determined as 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 which 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 actuarial contribution rate.

Considering that the Entry Age Normal cost method is (1) the most commonly used cost method by public plans, (2) develops a normal cost rate that tends to be stable and less volatile, and (3) is the required cost method under calculations required by Governmental Accounting Standard Numbers 67 and 68, **we recommend the Entry Age Normal actuarial cost method be retained.**

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.

KCPSRS values assets, for actuarial valuation purposes, based on the principle that the difference between actual and expected investment returns should be subject to partial recognition to smooth out fluctuations in the total return achieved by the fund from year to year. This philosophy is consistent with the long-term nature of a retirement system. Under the current method, the dollar amount of the difference between the actual investment return and the assumed investment return on the market value of assets is recognized equally over a five-year period. This methodology is the asset smoothing method most commonly used by public plans and we believe that it meets actuarial standards under ASOP 44. It effectively provides the smoothing of returns desired to provide more stability to the contribution rates. **We recommend the current asset valuation method be retained**.

AMORTIZATION OF UAAL

As described earlier, 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 and at the end of the period, the UAAL is eliminated. 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 and the UAAL is never paid off.

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 and the system is funded with contributions that are a level percentage of payroll, the unfunded actuarial accrued liability should be amortized 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 they 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 25 or more years.

Amortization Bases: The UAAL can either be amortized as one single amount/base or as components or "layers", each with a separate amortization base, payment schedule and amortization period. If the UAAL is amortized as one amount, the total 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 (called layered amortization). 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.

Current KCPSRS Amortization Method: The System moved to the layered amortization approach beginning with the January 1, 2017 valuation. The UAAL in that valuation (January 1, 2017) is amortized over a closed period of 30 years, with payments determined as a level percent of covered payroll. The period decreases each year so there will be 21 years remaining in the January 1, 2026 valuation. Additional pieces of UAAL, created after the 2017 valuation, are established as a new amortization base with a separate closed amortization period of 20 years and a separate payment schedule with increasing payments.

KCPSRS is financed by contributions that are a percentage of payroll so there is a reason to determine the amortization payment on the UAAL as a level percent of payroll. This produces an actuarial contribution rate that is more consistent with how the System is funded. The use of the layered amortization method with closed amortization periods is consistent with best practices in the public pension industry. **We recommend the current amortization methodology be retained.**

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ECONOMIC ASSUMPTIONS

The economic assumptions used in the KCPSRS valuation include price inflation, long-term investment return, general wage inflation (the across-the-board portion of salary increases), payroll growth, salary increases for individual members, interest crediting rate on member accounts and cost-of-living adjustments. Unlike demographic assumptions, economic assumptions do not lend themselves to analysis based heavily upon internal historical patterns, because both salary increases and investment returns are influenced more by external forces which are difficult to accurately predict over the long term. The investment return and salary increase assumptions are generally selected on the basis of expectations in an inflation-free environment and then increased by the long-term expectation for price inflation, called the "building block" approach.

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

- The 2025 Social Security Trustees Report;
- Data from the Bureau of Labor Statistics;
- Bond pricing from the Department of the Treasury;
- Future expectations of KCPSRS's investment consultant, Segal;
- Historical observations of price and wage inflation statistics and investment returns;
- Survey information from large public retirement systems (National Association of State Retirement Administrators (NASRA)).

ACTUARIAL STANDARD OF PRACTICE NUMBER 27

Guidance regarding the selection of economic assumptions for measuring pension obligations is provided by Actuarial Standard of Practice (ASOP) No. 27, *Selection of Assumptions for Measuring Pension Obligations*. Because no one knows what the future holds, the best an actuary can do is to use professional judgment to estimate possible future economic outcomes. These estimates are based on a mixture of past experience, future expectations, and professional judgment.

ASOP 27 requires the actuary to select a "reasonable" assumption. For this purpose, an assumption is reasonable if it has the following characteristics:

a. it is appropriate for the purpose of the measurement;
b. it reflects the actuary's professional judgment;
c. it takes into account historical and current economic data that is relevant as of the measurement date;
d. 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
e. it has no significant bias (i.e., it is neither significantly optimistic nor pessimistic) except when provisions for adverse deviation or plan provisions that are difficult to measure are included.

SECTION 3 – ECONOMIC ASSUMPTIONS

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 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 notes that "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. For this study, we have selected a single set of recommended economic assumptions, but there are other sets of economic assumption that would also be reasonable.

The remainder of this section of the report will address the relevant types of economic assumptions used in the actuarial valuation to determine the obligations of the Public School Retirement System of Kansas City, Missouri. In our opinion, the economic assumptions proposed in this report have been developed in accordance with ASOP No. 27.

The following table summarizes the current and proposed economic assumptions:

	Current Assumptions	Proposed Assumptions
Price Inflation	2.25%	2.50%
Long-term Investment Return	7.25%	7.25%
Real Wage Inflation (Productivity)	0.60%	0.75%
General Wage Growth (Wage Inflation)	2.85%	3.25%
Payroll Growth	2.85%	3.00%
Interest Crediting Rate on Member Accounts	2.50%	3.00%
Individual Salary Increase	Varies by service	Increase at most durations

PRICE INFLATION

Use in the Valuation: Price inflation is typically measured by the annual increase in the Consumer Price Index (CPI). This assumption underlies most of the other economic assumptions, either directly or indirectly. The current assumption for price inflation is 2.25% per year.

Future price inflation is used directly in developing the actuarial assumption for cost-of-living increases since they are based on the change in the Consumer Price Index (CPI). Inflation is used indirectly in the development of the assumptions for investment return, interest on member contributions, and general wage increase, which also impacts individual salary increases and payroll growth. Under ASOP 27, the price inflation assumption must be consistent among all economic assumptions.

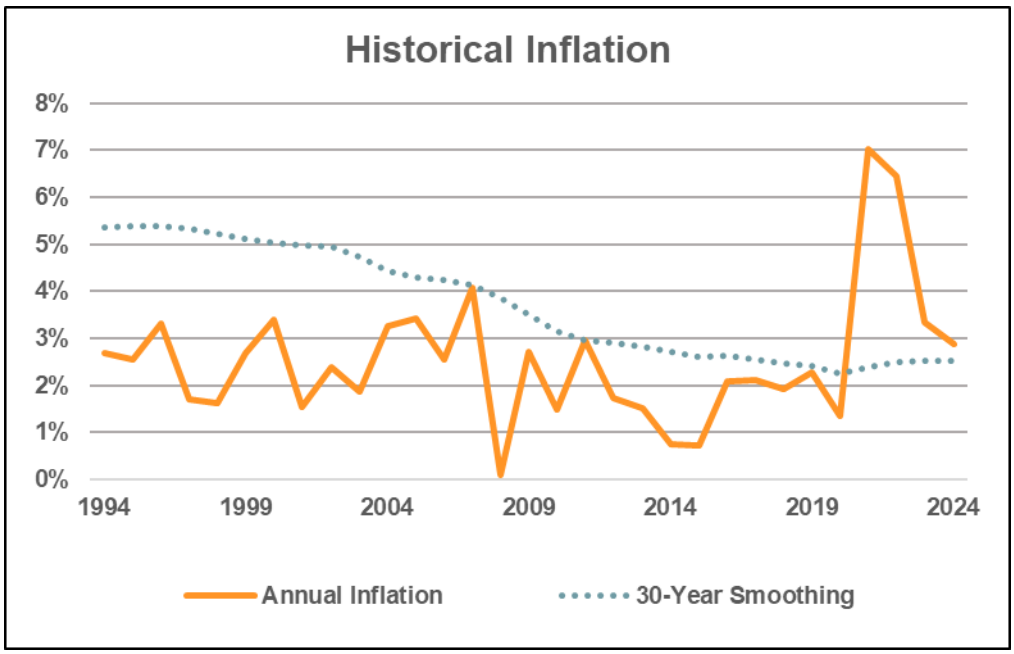
Historical Experience

Although economic activities, in general, and inflation in particular, do not lend themselves to prediction solely on the basis of historical analysis, historical patterns and long-term trends are factors to be considered in developing the inflation assumption. 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 following table provides historical annualized rates and annual standard deviations of the CPI-U over periods ending December 31st.

Period	Number of Years	Annualized Rate of Inflation
1974 – 2024	50	3.68%
1984 – 2024	40	2.78%
1994 – 2024	30	2.52%
2004 – 2024	20	2.65%
2014 - 2024	10	3.00%

Historical averages are heavily dependent on the period selected. For example, the period of high inflation from 1973 to 1981 has a significant impact on the averages over periods which include these years. Over more recent periods (last 20 to 30 years) measured from December 31, 2024, the average annual rate of increase in the CPI-U has been closer to the current assumption of 2.25%, but still above it.

The following graph illustrates the historical annual change in price inflation, measured as of December 31 for each of the last 30 years, as well as the thirty-year rolling average.



While inflation has been relatively low for most of the last 30+ years, there have been periods when higher inflation has occurred. While there has been a general downward trend since the early 1980's, the recent brief spike is a reminder that there can be unexpected changes.

Forecasts Implied from the Bond Market

Additional information to consider in formulating this assumption is obtained from measuring the spread on Treasury Inflation Protected Securities (TIPS) and from the prevailing economic forecasts. The spread between the nominal yield on treasury securities (bonds) and the inflation indexed yield on TIPS of the same maturity is referred to as the "breakeven rate of inflation" and represents the bond market's expectation of inflation over the period to maturity.

The table below provides the calculation of the breakeven rate of inflation as of December 31, 2024.

Years to Maturity	Nominal Bond Yield	TIPS Yield	Breakeven Rate of Inflation
5	4.38%	2.00%	2.38%
10	4.58	2.24	2.34
20	4.86	2.41	2.45
30	4.78	2.48	2.30

As this data indicates, the bond market is anticipating inflation of 2.3% to 2.5% for both the short and long term. The bond market expectations may be heavily influenced by the expectations of actions by the Federal Reserve Bank. We note that measures can move fairly significantly over just a few months.

Forecasts from the Social Security Administration

Although many economists forecast lower inflation than the assumptions used by retirement systems, they are generally looking at a shorter time horizon (10 years) 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 most recent report (June 2025), the projected average annual increase in the CPI over the next 75 years was estimated to be 2.4%, under the intermediate (best estimate) cost assumption. The range of price inflation used in the Social Security 75-year modeling, which includes a low and a high-cost scenario, in addition to the intermediate cost projection, was 1.8% to 3.0%.

Forecasts from Investment Consulting Firms and Other Professionals

In setting their capital market assumptions, most investment consulting firms use an inflation assumption. The 2025 capital market assumptions for KCPSRS' investment consultant, Segal Consulting, include a 20-year forecast of inflation of 2.40%.

Horizon Actuarial Services, LLC publishes a survey of capital market assumptions obtained from various investment consultants. The 2025 Horizon Survey, published in August of 2025, includes the assumptions, including the expected rate of inflation, for twenty-seven advisors who develop longer-term assumptions (20 years or more). The Survey showed a range of expected inflation for the next 20 years, for these consultants, of 2.2% to 2.7%, with a median of 2.4%. Inflation over a shorter time horizon (and including another 15 consultants), for the next 10 years, was very similar range of 2.0% to 2.9%, with a median of 2.4%.

Another source to consider in setting this assumption is a quarterly survey of the Society of Professional Forecasters that is conducted by the Philadelphia Federal Reserve of economists. Their most recent forecast (second quarter of 2025) was for inflation over the next ten years (2025 to 2034) to average 2.35%.

Forecasts from Peer System 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. Based on the Public Plan Database (a survey of over 130 state and local retirement systems maintained by a collaboration between the Center for Retirement Research at Boston College, the Center for State and Local Government Excellence, and the National Association of State Retirement Administrators), the average inflation assumption for governmental plans is 2.46%. This data is largely based on

actuarial valuations prepared with measurement dates in 2023. Based on our experience, we believe the inflation assumption has been steady for most systems over the last few years.

Recommendation

The following table provides a comparison of the current levels of expected inflation.

Source	Expected Inflation
Segal Consulting (20 years)	2.40%
2025 Horizon Survey (20 years)	2.40%
Bond Market (30 years)	2.30%
2025 SSA Trustees Report (75 years)	2.40%
Survey of Professional Forecasters (10 years)	2.35%
Peer Retirement Systems	2.46%

Based on the various forecasts for inflation, **we believe the current assumption of 2.25% should be increased to better reflect future expectations. We recommend it be increased to 2.50%.**

Consumer Price Inflation	
Current Assumption	2.25%
Recommended Assumption	2.50%

INVESTMENT RETURN

Use in the Valuation

The investment return assumption reflects the anticipated returns on the current and future assets. It is one of the primary determinants in the allocation of the expected cost of the promised benefits, providing a discount of the estimated future benefit payments to reflect the time value of money. Generally, the investment return assumption should be set with consideration of the asset allocation policy, expected long term real rates of return on the specific asset classes, the underlying inflation rate, and any investment expenses.

The current investment return assumption is 7.25% per year, net of investment-related expenses. The 7.25% rate of return is referred to as the nominal rate of return and is composed of two components. The first component is price inflation (previously discussed). Any excess return over price inflation is referred to as the real rate of return. The real rate of return, based on the current set of assumptions, is 5.00% (7.25% nominal return less 2.25% inflation).

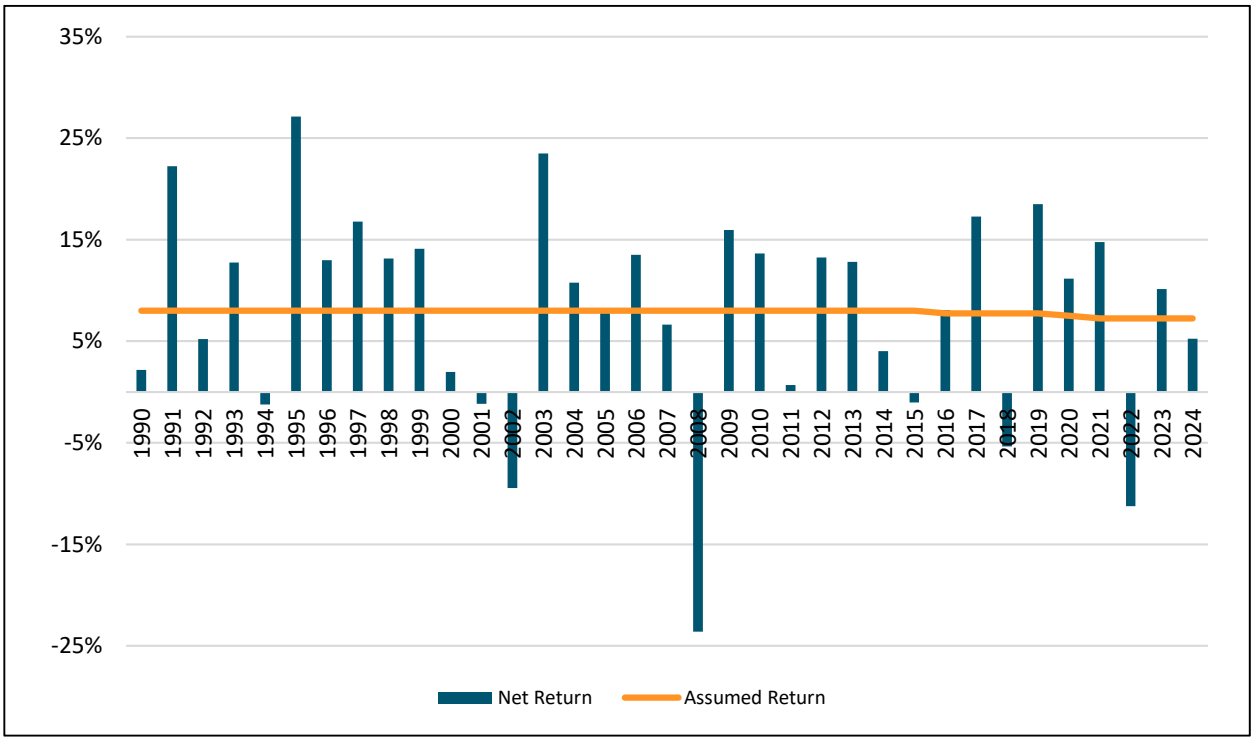
Because the economy is constantly changing, assumptions about what may occur in the near term are volatile. Asset managers and investment consultants usually focus on this near-term horizon to make prudent choices regarding how to invest the trust funds, i.e., asset allocation. For actuarial calculations, we typically consider very long periods of time as some current employees will be receiving benefit payments more than 70 years from now. It is important to remember that the retirement plan is investing assets on behalf of the member during both their working career and while they are receiving benefit payments. Often 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 plan like KCPSRS, 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 time horizon between investment consultants and actuaries is frequently a source of debate and confusion when setting economic assumptions.

Investment Return Assumption for Retirement Plan

Historical Perspective

One of the inherent problems with analyzing historical data is that the results can look significantly different depending on the time frame used, given that year-to-year results vary widely. Even though history provides a valuable perspective for setting this assumption, the economy of the past is not necessarily the economy of the future. In addition, asset allocations may have changed over the period so returns may not be directly comparable.

The System's actual investment return on the market value of assets is shown in the following graph:



The compound return has varied significantly when viewed over different time periods. For example, the rate of return over the ten-year period ending December 31, 2024 was 6.32%, the rate of return over the twenty-year period ending December 31, 2024 was 6.07% and the rate of return over the thirty-year period ending December 31, 2024 was 7.51%. However, historical investment performance is a poor indicator of what to expect in the future. Past performance is heavily impacted by past inflation rates, the interest rate environment and the asset allocation.

Forward Looking Analysis

We believe the most appropriate analysis to consider in setting the investment return assumption is to model the expected returns, given the system's target asset allocation and forward-looking capital market assumptions. However, we are trained as actuaries and not as investment professionals. As such, we rely heavily on professional investment consultants, such as Segal, to provide investment expertise including capital market assumptions.

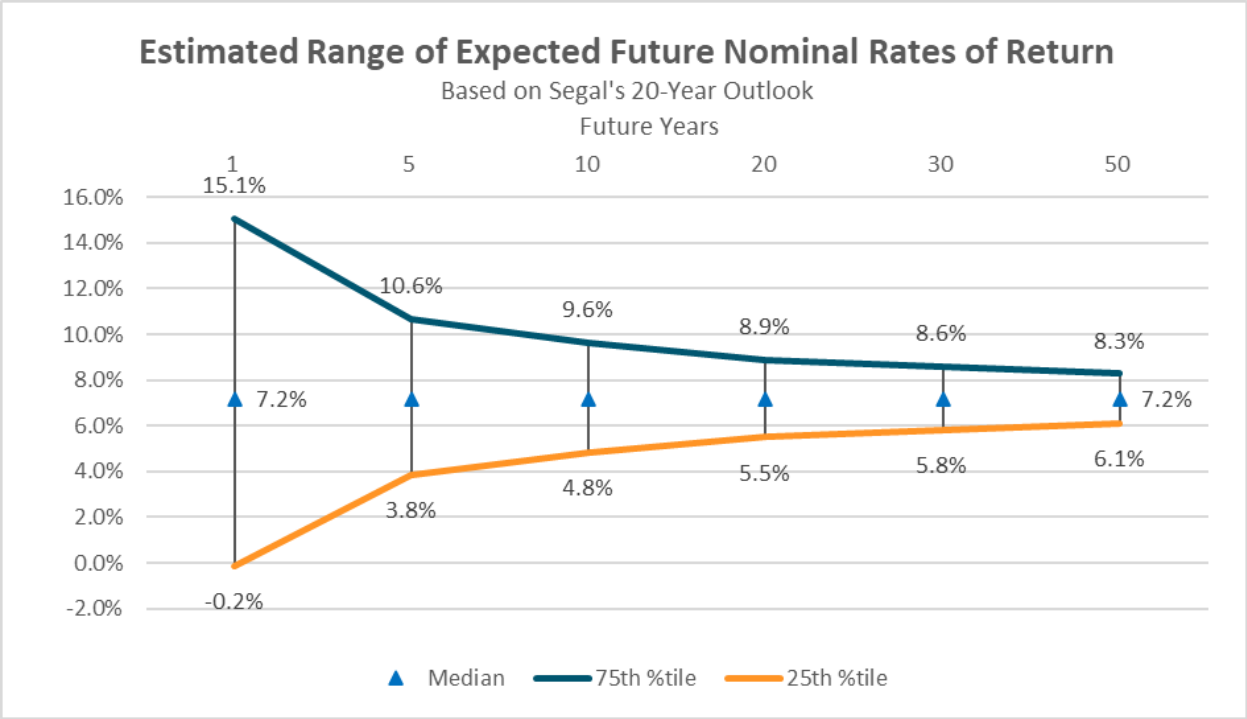
In performing our analysis, we use the building block approach so the underlying inflation assumption must be consistent with our recommended assumption of 2.50%. The analysis of the investment consultants typically focuses on the nominal return so if the investment consultant's inflation assumption differs from our assumption, an adjustment to the expected return is

necessary. KCPSRS' current target asset allocation, along with their investment consultant's (Segal's) capital market assumptions, are shown in the following table:

Asset Category	Target Asset Allocation	Expected Rate of Return*	Standard Deviation
U.S. Equities			
US Large Cap	9.0%	8.3%	17.4%
US Mid Cap	6.0%	8.9%	19.4%
US Small Cap	6.0%	9.1%	22.4%
Non-US Equities	12.0%	8.6%	18.5%
Emerging Markets	10.0%	9.8%	22.9%
Core Fixed Income	17.0%	4.3%	5.2%
High Yield Fixed Income	2.0%	5.9%	10.0%
International Fixed Income	2.0%	4.3%	7.2%
Private Credit	5.0%	8.5%	10.2%
Core Real Estate	4.0%	5.9%	12.5%
Value Add Real Estate	4.0%	8.9%	14.5%
Opportunistic Real Estate	4.0%	10.9%	17.5%
Hedge Funds	2.0%	5.3%	5.7%
MACS	9.0%	5.0%	7.5%
Private Equity	8.0%	12.1%	23.5%
Total	100.0%		

* 20-Year Arithmetic return

Based on data provided by Segal, using their March 2025 capital market assumptions and KCPSRS' target asset allocation, the expected return over the next twenty years is 7.2%. Using their inflation assumption of 2.4%, that results in an expected real return of 4.8%, slightly below the current assumption of 5.0%. Given the standard deviation of the portfolio of 11.4%, the 25th to 75th percentile nominal returns over time are shown in the following graph. Fifty percent of the expected returns fall in this range:



The percentile results are the percentage of random returns over the time span shown that are expected to be less than the amount indicated. Thus, for the 10-year time span, 25% of the nominal rates of return are expected to be below 4.8% and 75% are expected to be above that. As the time span increases, the range of results narrows. Over a 30-year time span, the results indicate a 25% probability that returns will be below 5.8% and a 25% probability they will be above 8.6%. There is a 50% probability that the return will be 7.2% or above and a 50% probability that the return will be below 7.2%.

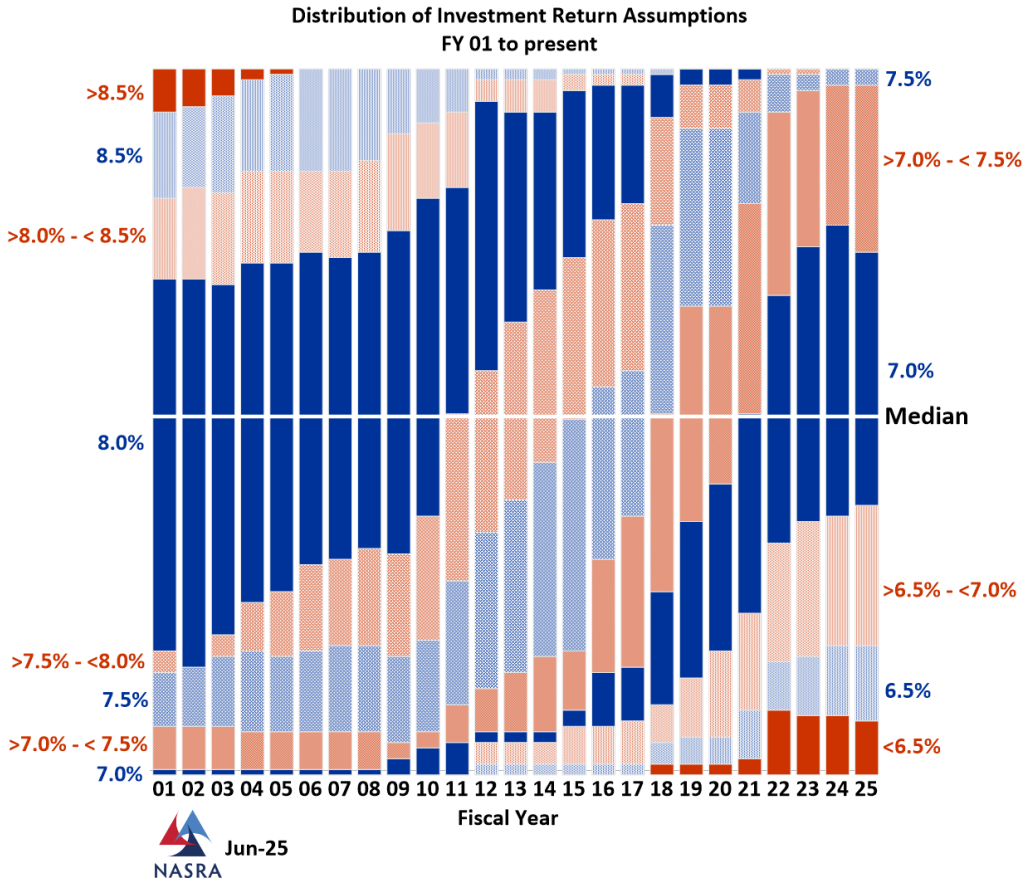
We also recognize that there can be differences of opinion among investment professionals regarding future return expectations. Horizon Actuarial Services prepares an annual study in which they survey various investment advisors (43 in the 2025 Survey) and provide ranges of results as well as averages. This information provides an additional perspective on what a broad group of investment experts anticipate for future investment returns. The results were consistent with Segal's expected return so we feel comfortable relying on Segal's analysis to set the investment return assumption.

For purposes of our analysis using the building block approach, the real rate of return must be set and then added to price inflation to arrive at the nominal investment return assumption. Based on Segal's assumption, 7.2% is the expected nominal return and it reflects an underlying inflation assumption of 2.4%. Therefore, the expected real rate of return over the next twenty years is 4.8%. Combined with our recommended price inflation assumption of 2.5% results in a nominal return of 7.3%.

Peer System Comparison

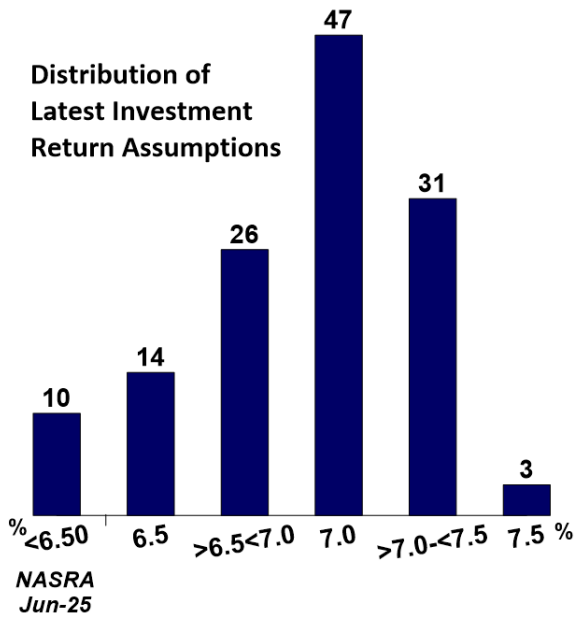
In general, we have observed a marked reduction in the capital market assumptions by both actuarial firms and investment consultants over the last decade. The impact of this trend on public pension funds is evident in the Public Fund Survey (published by the National Association of State Retirement Administrators). The median investment return assumption, which was 8.0% from 2001 to 2011, is now 7.0%.

While we do not recommend the selection of an investment return assumption be based on the assumptions used by other public retirement systems, this information does provide another set of relevant data to consider if we recognize that asset allocation varies from system to system, as does the risk profile of Boards. The following graph shows the change in the distribution of the investment return assumption from fiscal year 2001 through 2025 for the 130+ large public retirement systems included in the NASRA Public Fund Survey.



As the graph indicates, the investment return assumptions used by public plans have decreased significantly over the last decade, likely impacted by a corresponding decrease in the underlying inflation assumption over the same period.

The distribution of current investment return assumptions is shown below:



Summary and Recommendation

Because investment earnings account for the majority of revenue for most public plans, the choice of an investment return assumption has a major impact on a plan's financing and actuarial funded status. An investment return assumption that is too low will overstate liabilities and costs, causing current members/taxpayers to be overcharged and future members/taxpayers to be undercharged. An investment return assumption that is too high will understate liabilities and undercharge current members/taxpayers at the expense of future members/taxpayers. An assumption that is significantly wrong in either direction will cause a misallocation of resources and inequitable distribution of costs among generations of members/taxpayers. Because of this, setting the investment return assumption requires a balancing act with an attempt to not be overly conservative nor aggressive, although some margin for adverse deviation is acceptable under actuarial standards.

Actuarial standards require us 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 judgement regarding an appropriate investment return assumption over the long term.

Recommendation:

Earlier we recommended increasing the price inflation assumption to 2.50%. Based on the available information for the real rate of return, we believe 4.75% is a reasonable estimate.

The components of the nominal return are shown in the table below:

	Current Assumption	Proposed Assumption
Real return	5.00%	4.75%
Price inflation	2.25%	2.50%
Nominal return	7.25%	7.25%

ADMINISTRATIVE EXPENSE ASSUMPTION

All investment-related expenses are paid from returns on the plan assets, but an explicit expense assumption is necessary for any fees that are paid from plan assets that are considered an administrative expense. The expense assumption is added to the normal cost in calculating the actuarial contribution each year. The current expense assumption uses the actual administrative expenses in the prior year as an estimate for the current year. On that basis, the expense component of the contribution rate in the January 1, 2025 valuation was 0.61% of covered payroll. This is a commonly used approach, and **we recommend the current assumption be retained.**

COST OF LIVING ADJUSTMENTS

The KCPSRS Board of Trustees determines annually whether or not the system can provide an increase in benefits for those retirees who, as of the January 1 preceding the date of such increase, have been retired at least one year. The Board has a written policy that includes a number of different criteria that the system must meet in order for an increase to be granted. One of the requirements that needs to be met in order for a COLA to be granted is the System's funded ratio as of the January 1st of the preceding year of the proposed increase must be at least 100% after adjusting for the effect of the proposed increase. The current funded ratio is just under 70%.

KCPSRS' funding policy is designed to move the system to 100% funded, at which point, the contribution rates are expected to decline, with the goal of maintaining 100% funded, instead of accumulating surplus assets. Without a contribution margin, it will be difficult to pay regular and sustainable COLAs.

We recommend maintaining the current assumption that no COLA is paid in the future.

However, given the projected full funding date, the COLA policy, and the Contribution Funding Policy, we recommend the Board consider a separate study in 2026 to determine the best way to coordinate these policies.

INTEREST CREDITING RATE ON MEMBER CONTRIBUTIONS

The plan credits interest to the member contribution accounts at a rate that is approved by the Board. The rate is based on the yield on the 1-year through 5-year Treasury Bills on January 1 of the year for which interest is being credited or the valuation investment return assumption, if lower. The current assumption is that member accounts are credited with 2.50% interest per year. Given the prior study was performed in a low-interest rate environment, and current interest rates are much higher, **we recommend the interest crediting rate on member account balances be increased from 2.50% to 3.00%.**

GENERAL WAGE INFLATION

The general wage inflation assumption is used to model real wage growth over time in the general economy, i.e. "across the board" rate of salary increases or how much the pay scales will change year to year. The general wage inflation assumption is composed of the price inflation assumption and an assumption for the real rate of wage increases/real wage growth. Given the current price inflation assumption of 2.25%, the current general wage inflation assumption of 2.85% implies an assumed real wage increase/real wage growth assumption of 0.60%. It was discussed earlier that our recommendation is to increase the price inflation assumption from 2.25% to 2.50%.

The excess of wage growth over price inflation represents the real wage growth rate. The following table shows the compounded wage growth over various periods, along with the comparable price inflation rate for the same period. The differences represent the real wage growth rate. Note that there was a delay in the date the national average wage for the prior year was released, so the most recent data available at the time the Board meeting materials were produced was for 2023.

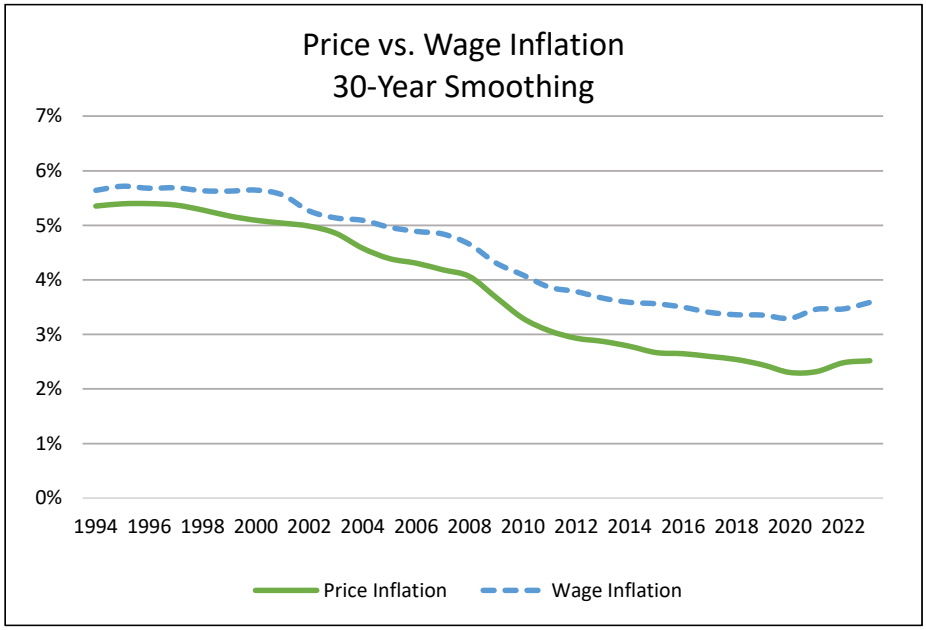
Years	Period	General Wage Inflation	CPI Increase	Real Wage Inflation
2013-2023	10	4.03%	2.79%	1.24%
2003-2023	20	3.41%	2.58%	0.83%
1993-2023	30	3.59%	2.51%	1.08%
1983-2023	40	3.76%	2.81%	0.95%
1973-2023	50	4.44%	3.86%	0.58%

Because the National Average Wage is based on all wage earners in the country who are covered by Social Security, it can be influenced by the mix of jobs (full-time vs. part-time, manufacturing vs. service, etc.) as well as by changes in some segments of the workforce that are not seen in all segments (e.g. regional changes or growth in computer technology). Furthermore, if compensation is shifted between wages and benefits, the wage index would not accurately reflect increases in total compensation. KCPSRS' membership is composed exclusively of

governmental employees working in the Kansas City metro area, whose wages and benefits are somewhat linked as a result of the state and local economy, funding allocations, and governing policies. Because the competition for workers can, in the long term, extend across industries and geography, the broad national earnings growth will have some impact on KCPSRS members. In the shorter term, however, the wage inflation of KCPSRS employees and the nation may be less directly correlated.

Compensation data gathered and compiled by the Bureau of Labor and Statistics indicates that those working in public employment are receiving larger increases in total compensation than salary increases. In other words, benefits are becoming a larger percentage of total compensation. This seems to be particularly true in retirement systems covering school employees. To the extent we expect this trend to continue, it would support a lower general wage increase assumption for those in public employment compared to private employment.

The difference between wage and price inflation over rolling 30-year periods is shown in the following graph:



Over the last 30 years, the real wage increase, as measured by the increase in the National Average Wage Index, has been about 1.0% per year on average.

Forecasts of Future Wages: The wage index used for the historical analysis is projected forward by the Office of the Chief Actuary of the Social Security Administration in their 75-year projections. In the June 2025 Trustees Report, the annual increase in the National Average Wage Index under the intermediate cost assumption (best estimate) was 3.53%, 1.13% higher than the Social Security Administration's intermediate inflation assumption of 2.40% per year. The range of the assumed real wage growth in the 2025 Trustees report was 0.53% to 1.73% per year.

Based on data available and our professional judgment, **we recommend that the long-term assumed real wage increase assumption be increased from 0.60% to 0.75% per year. When coupled with the price inflation assumption of 2.50%, the resulting recommendation for the general wage increase assumption is 3.25%.**

PAYROLL GROWTH

The unfunded actuarial accrued liability is funded with amortization payments that are determined as a level percent of payroll. Therefore, an assumption regarding future increases in covered payroll is needed to develop the payment schedule. The general wage inflation assumption is often used as a starting point for setting this assumption.

Payroll growth is dependent on two factors:

- the number of active members and
- the increase in wages for members of the system.

The payroll growth assumption generally reflects the assumption that there will be no future growth in the number of active members. With no assumed growth in active membership, future salary growth due only to general wage increases is anticipated. Based on our knowledge of the System, we do not have a reason to incorporate a change in the number of active members in the valuation process.

This would generally indicate a payroll growth assumption equal to wage growth, or 3.25%. However, Actuarial Standards of Practice allow for some conservatism in assumptions to account for potential adverse deviation. While our assumption is that active membership will remain constant, KCPSRS has had a fairly volatile past 20 years in regard to active membership. When covered payroll grows less than expected, it has a negative impact on the actuarial contribution rate. **Therefore, we recommend the payroll growth assumption, used to amortize the UAAL, be set 0.25% lower than the wage growth assumption, or 3.00%.**

TOTAL SALARY INCREASE

Estimates of future salaries are based on assumptions for two types of increases:

- Increases in each individual's salary due to promotion or longevity (often called a merit scale), and
- Increases in the general wage level of the membership, directly related to price and wage inflation.

Earlier in this report, we recommended a general wage inflation assumption of 3.25% (2.50% inflation and 0.75% real wage growth). Therefore, the merit scale will be added to the 3.25% wage inflation assumption to develop the total individual salary increase assumption.

Analysis of the merit salary scale is complicated by the fact that a retirement system receives only the total salary paid, which includes both the underlying wage inflation component of salary increases and the merit salary scale. In addition, there are multiple employers participating in KCPSRS so the general wage inflation granted may vary by employer. There also is often a delay in the actual price and general wage inflation compared to when it impacts salary increases for active members. As a result, it is difficult to isolate the merit scale for purposes of measuring the actual experience.

In our analysis, we compared individual salary increases using total reported salary for all members active in two consecutive actuarial valuations (e.g. January 1, 2020 and January 1, 2021, January 1, 2021 and January 1, 2022, etc.). The following table contains a summary of the actual versus expected salary increases during the study period:

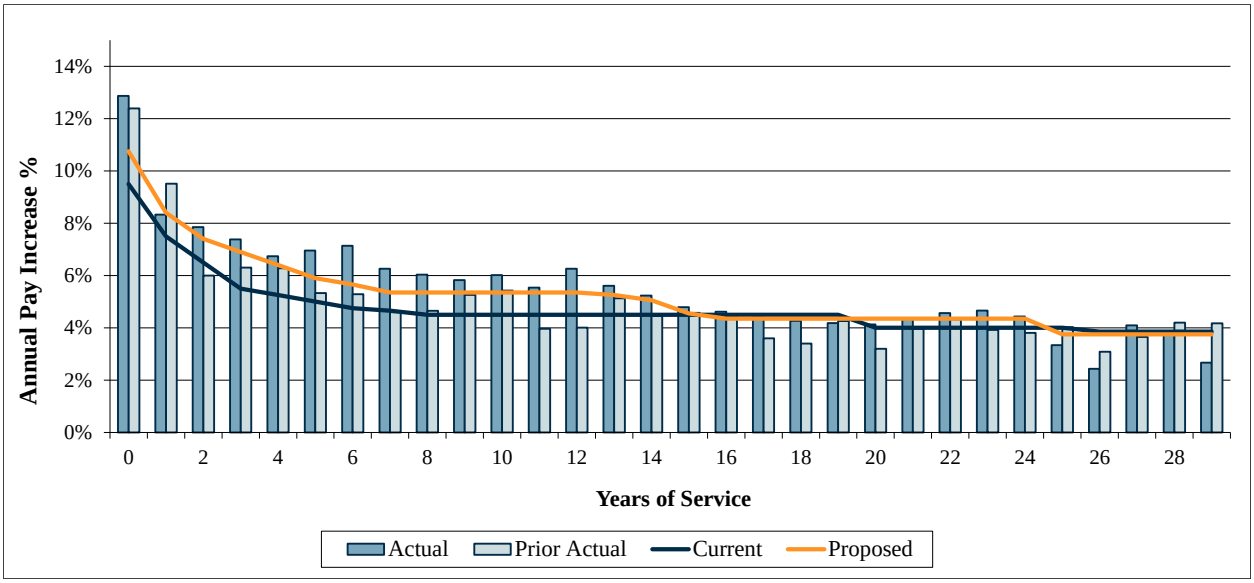
Average Increase in Salaries

Calendar Year	Actual	Expected	Difference
2020	4.97%	5.42%	(0.45%)
2021	5.87%	5.28%	0.59%
2022	6.20%	5.31%	0.89%
2023	8.14%	5.42%	2.72%
2024	7.73%	5.43%	2.30%
All years	6.64%	5.38%	1.26%

Actual inflation was higher than the current assumption of 2.25% over this period so we would expect actual salary increases to also be higher than the current individual salary increase assumption. This was the case over this study period, as actual salary increases for the five-year period were 6.64%, 1.26% higher than the expected 5.38% salary increase. This can partly be explained by the higher inflation experienced during the five-year study period. However, as we

have seen with other Teacher/School systems throughout the country, salary increases have been much higher in the recent past, specifically in 2023 and 2024, as seen above.

The goal was to develop an assumption that reflects the trends observed in the current study period, but also considers the experience of the prior period, as the prior period was pre-Covid and may be more indicative of longer experience. The proposed salary increase assumption results in an A/E ratio of 108% for the current study period. The proposed salary increase assumption results in an A/E ratio of 102% for the prior study period. **We recommend the current assumption be changed to the proposed assumption shown in the following graph:**



DEMOGRAPHIC ASSUMPTIONS

Actuarial Standard of Practice (ASOP) No. 27 provides guidance to actuaries regarding the selection of assumptions for measuring pension obligations. Each individual demographic assumption should satisfy the criteria of ASOP 27. In selecting demographic assumptions, the actuary should also consider: the internal consistency between the assumptions, materiality, cost effectiveness, and the combined effect of all assumptions. At each measurement date, the actuary should consider whether the selected assumptions continue to be reasonable, but the actuary is not required to do a complete assumption study at each measurement date. In our opinion, the demographic assumptions recommended in this report have been developed in accordance with ASOP 27.

Overview of Analysis

The purpose of a study of demographic experience is to compare what actually happened to the individual members of the System during the study period (calendar years 2020 through 2024) with what was expected to happen, based on the actuarial assumptions. A single five-year period is a relatively short observation period, particularly given the size of the group. Therefore, we have considered the results of the prior Experience Study when deemed appropriate.

The membership of KCPSRS is relatively small which creates additional challenges in evaluating the observed data and setting assumptions. A small sample size can lead to volatility in the observed experience for the demographic assumptions especially since the data is usually parsed into smaller groups based on age and/or service. In addition, with the limited data observed, the credibility of the data can be questionable. While the actual experience cannot be ignored, it creates reason for caution in relying only on the observed data. Professional judgment is frequently a major factor in arriving at the recommendations.

Studies of demographic experience generally involve three steps:

- First, the number of members changing membership status, called decrements, during the study is tabulated by age, duration, gender, group, and membership class (active, retired, etc.).
- Next, the number of members expected to change status is calculated by multiplying certain membership statistics, called exposure, by the expected rates of decrement.
- Finally, the number of actual decrements is compared with the number of expected decrements. The comparison is called the actual to expected ratio (A/E Ratio) and is expressed as a percentage.

SECTION 4 – DEMOGRAPHIC ASSUMPTIONS

In general, if the actual experience differs significantly from the overall expected results, or if the pattern of actual decrements, or rates of decrement, by age, sex, or duration deviates significantly from the expected pattern, new assumptions are considered. Recommended revisions are normally not an exact representation of the experience during the observation period. Judgement is required to anticipate future experience from past trends and current evidence, including a determination of the amount of weight to assign to the most recent experience.

In our analysis, we use a methodology to analyze the experience that we call a liability-weighted approach. The liability is approximated by using the member's compensation and years of service to estimate the member's benefit level. The exposure and actual occurrences are then multiplied by the benefit level to provide the liability-weighted experience. For retiree mortality, the weight is simply the benefit amount. This approach is particularly insightful when analyzing experience in a non-homogenous group. While we reviewed experience on both a count and liability-weighted basis, we have generally found the liability-weighted experience to be a better basis to use to set assumptions. Therefore, we assign more credibility to the liability-weighted results in evaluating experience and developing new assumptions, if necessary.

Revised rates of decrement are tested by using them to recalculate the expected number of decrements during the study period, and the results are shown as revised A/E Ratios.

ASOP 27 states that the actuary should use professional judgement to estimate possible future outcomes, based on past experience and future expectations, and select assumptions based upon application of that professional judgement. The actuary should select reasonable demographic assumptions in light of the particular characteristics of the defined benefit plan that is the subject of the measurement. A reasonable assumption is one that is expected to appropriately model the contingency being measured and is not anticipated to produce significant cumulative actuarial gains or losses over the measurement period.

Pursuant to ASOP 27 the actuary should follow the following steps in selecting the demographic assumptions:

1. Identify the types of assumptions. Types of demographic assumptions include but are not limited to retirement, mortality, termination of employment, disability, election of optional forms of payment, administrative expenses, family composition, and treatment of missing or incomplete data. The actuary should consider the purpose and nature of the measurement, the materiality of each assumption, and the characteristics of the covered group in determining which types of assumptions should be incorporated into the actuarial model.

2. Consider the relevant assumption universe. The relevant assumption universe includes experience studies or published tables based on the experience of other representative populations, the experience of the plan sponsor, the effects of plan design, and general trends.

3. Consider the assumption format. The assumption format includes whether assumptions are based on parameters such as gender, age or service. The actuary should consider the impact the format may have on the results, the availability of relevant information, the potential to model anticipated plan experience, and the size of the covered population.

4. Select the specific assumptions. In selecting an assumption, the actuary should consider the potential impact of future plan design as well as the factors listed above.

5. Evaluate the reasonableness of the selected assumption. The assumption should be expected to appropriately model the contingency being measured. The assumption should not be anticipated to produce significant cumulative actuarial gains or losses over the measurement period.

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SECTION 5 – RETIREE MORTALITY

MORTALITY

One of the most important demographic assumptions in the valuation is the mortality assumption. The post-retirement mortality rates used in the actuarial valuation project the percentage of retirees who are expected to die in a given future year. Of all of the demographic assumptions, the mortality assumption typically has the most significant impact on liability projections because it projects the duration of retirement benefit payments. If members live longer than expected, the true cost of future benefit obligations will be understated.

We anticipate that mortality tables will need to be updated periodically even if we are anticipating some increase in longevity. Because of potential differences in mortality, we analyze results by gender (males and females) and by status (healthy retirees, 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 to the standard, published mortality tables in order to better match the observed mortality rates of a specific group:

(1) Age adjustments
(2) Benefit Size (Above or Below Median)
(3) Scaling of rates

The first of these adjustments is an age adjustment that can be either a “setback” or a “set forward”. A one-year age set forward treats all members as if they were one year older than they truly are when applying the rates in the mortality table. So, a one year set forward would treat a 61-year-old retiree as if he will exhibit the mortality of a 62-year-old in the standard mortality table.

The second adjustment is based on the average benefit size. We know there is a correlation between the size of benefits and the longevity of the group, i.e., those with higher benefit amounts tend to live longer. Selecting a table using the benefit level of the group is expected to better anticipate the longevity of the underlying population.

A third adjustment, which requires a significant amount of data, 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 two or even all three of these methods to develop an appropriate table to model the mortality of the specific plan population.

The issue of future mortality improvement is one that the actuarial profession has become increasingly focused on studying and monitoring. ASOP 27 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.

Based upon the long-term trend of mortality improvement, actuaries seek to account for future improvements in longevity. There are two widely used ways to reflect future improvements in mortality:

- Static table with "margin"
- Generational mortality

The first approach to reflecting mortality improvements is by using a static mortality table with "margin." Under this approach, a mortality assumption is selected with rates of death that are lower than actual observed rates. As a result, the A/E ratio is over 100% so there is room for mortality to improve without creating actuarial losses. This approach is mandated by the Internal Revenue Service for determining minimum funding amounts for corporate pension plans as mortality improvements are projected seven years for retirees and 15 years for actives. This is the current method used by KCPSRS.

The most direct approach, referred to as generational mortality, 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 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. 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 2045 has a longer life expectancy than a member who turns age 65 in 2025. When using generational mortality, the A/E ratios for the observed experience are usually set near 100% as future mortality improvements will be reflected directly in the actuarial valuation process.

KCPSRS does not have enough members for its mortality experience to be considered fully "credible". As a result, we look to relevant large-scale studies of mortality to set this assumption. In 2019, the Society of Actuaries released a family of mortality tables based entirely on public retirement plan data for the first time (Pub-2010 Mortality Tables). Different mortality tables were developed for general government employees and retirees, public safety employees and retirees, and teacher employees and retirees. This set of mortality tables, based on public plan data, was updated and new mortality tables were published earlier this year, the Pub-2016 Mortality Tables. The same sets of tables were published again this time. We have typically found that these tables are a better fit for public plans. We are currently using the Pub-2010 Below Median Mortality Tables for General Employees with the most recent MP Scale used to project mortality improvements for retirees seven years and actives 15 years. We recommend moving to the Pub-2016 Below Median Mortality Table for General Employees using generational mortality improvements with the MP2021 Scale (the most recent mortality improvement scale).

SECTION 5 – RETIREE MORTALITY

Healthy Retirees: Although there is insufficient data to provide credible results, we did analyze retiree mortality experience. In examining the results of the Experience Study, if the A/E Ratio is greater than 100%, the assumptions have predicted fewer deaths than actually occurred (indicating longer lifetimes than expected) and with an A/E Ratio less than 100%, the assumptions have predicted more deaths than have actually occurred (shorter lifetimes than expected).

We also analyzed experience on a liability-weighted basis where the exposures and deaths are multiplied by the monthly retirement benefit amount. This helps to reflect any differences that arise from better mortality experience among those with larger benefits. 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 liability-weighted approach is an important factor in developing a mortality assumption to value plan obligations. In addition, the mortality rates in the mortality tables are developed using the liability-weighted approach so we want to be consistent in the application of the table to our data. While we have completed an analysis of actual experience to that anticipated by the assumptions, it does not have sufficient credibility to warrant adjustments to the standard tables.

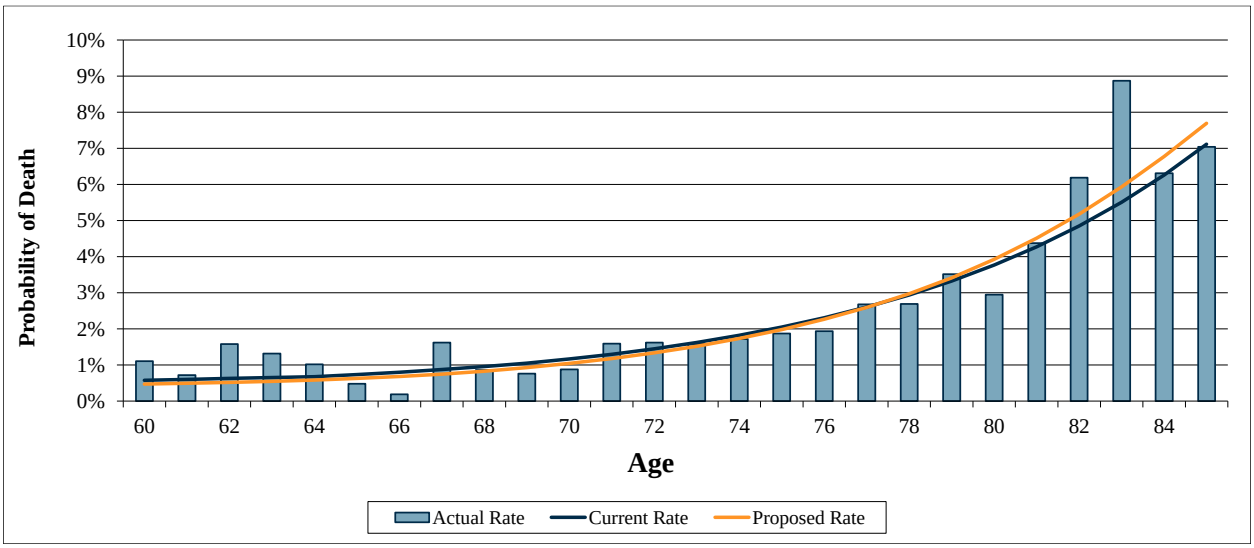
The aggregate observed experience for healthy (not disabled) male and female retirees, from ages 60 to 85, during the study period is shown in the following chart.

All Healthy Retirees					
		Observations		A/E Ratio Current (Count)	A/E Ratio Current (Weighted)
	Exposure	Actual	Expected		
Males	4,194	116	114	102%	103%
Females	12,286	270	253	107%	104%
Total	**16,480**	**386**	**367**	**105%**	**N/A**

Females: The actual experience indicates that the current assumption for female retirees is anticipating fewer deaths than occurred, i.e., the A/E ratio is 107% on a count basis. It is slightly closer to 100% on a liability-weighted basis. We would note however that this study period included Covid, which had an impact on the number of deaths. We analyzed the liability-weighted data by year and observed more deaths than expected in 2020 and 2021, but fewer deaths than expected in 2022, 2023 and 2024. Overall, the fit is reasonable, but we would still like to move to the new Pub-2016 Mortality Tables, which expect slightly higher mortality at age 80 and above.

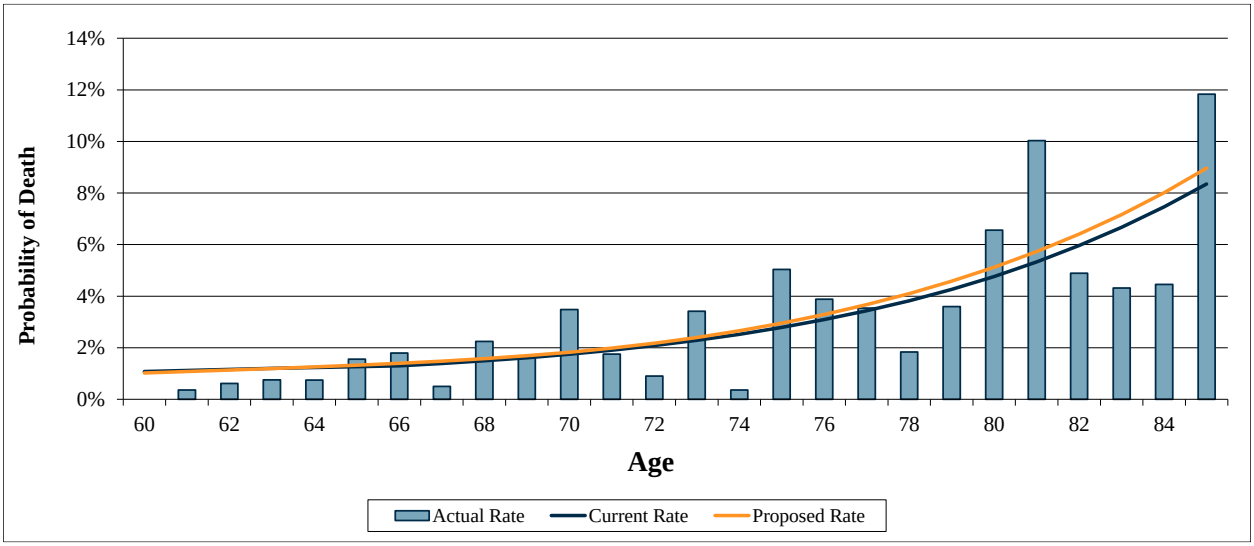
We recommend using the Pub-2016 General Members (Below Median) Retiree Female Mortality Table set forward one year projected generationally using Scale MP-2021. This mortality assumption provides a reasonably good overall fit to the observed data at all ages and results in an A/E ratio of 106%:

KCPSRS Female Retiree Mortality



Males: The actual experience for males indicates that the current assumption is anticipating fewer deaths than actually occurred on a count basis, i.e., the A/E ratio is greater than 100%. Given the size of the group, the A/E ratio of 102% is a bit misleading as the difference in the number of actual and expected deaths is only two. Looking at the liability-weighted results, the A/E ratio is 103%. There is far less data for males compared to females so these results have very limited credibility. We prefer to use a consistent set of mortality tables for both males and females. **Our recommendation is the Pub-2016 General Members (Below Median) Retiree Male Mortality Table with no age adjustment projected generationally using Scale MP-2021.** The proposed assumption is shown below and the resulting A/E ratio is 98%.

KCPSRS Male Retiree Mortality



The liability-weighted A/E ratio using the recommended assumptions over the core retirement ages of 60 to 85 are summarized in the table below:

	Weighted A/E Ratio	
	Current	Proposed
Male	**103%**	**98%**
Female	**104%**	**106%**

Beneficiaries

The mortality of beneficiaries applies to the survivors of members who receive a joint and survivor option. There is insufficient data to use actual experience to set this assumption. Therefore, **we recommend using the Pub-2016 General Members Contingent Survivor Table (Below Median), with the same age adjustments as proposed for retirees projected generationally using Scale MP-2021.**

Post-retirement Mortality for Disabled Members

The valuation assumes that disabled members, in general, will not live as long as retired members who met the regular service retirement eligibility. In addition, future life expectancies for disabled members are not expected to increase as significantly as the future life expectancies for healthy retirees.

Because of the limited number of exposures and deaths for disabled members, it makes sense to use the standard disabled table that is the companion to the annuitant mortality table. **We recommend using the Pub-2016 Non-Safety Members Disabled Retiree Table, using the same age adjustments as proposed for retirees, without any projected mortality improvements.**

SECTION 6 – ACTIVE MORTALITY

The active member mortality assumption models eligibility for death benefits prior to retirement. Because the probability of death prior to retirement is very low, this assumption has a much smaller impact on the valuation results than the post-retirement mortality assumption. Further, because it is a comparatively rare event, it is difficult to get meaningful analysis from a group of this size. For example, there were 24 active member deaths in the five-year study period with the number being as high as 7 in one year and as low as 3.

There is clearly insufficient data upon which to develop or analyze the assumption. In such a situation, it is common practice to utilize the same set of mortality tables for active mortality as is used for retiree mortality. The Pub-2016 family of mortality tables has both annuitant mortality tables (recommended earlier as the underlying table for retirees) and employee mortality tables. Since the retiree mortality assumption is based on the Pub-2016 General Members Below Median Healthy Annuitant Tables with age adjustments, we propose using those tables for the active mortality assumption. **Based on this approach, we recommend using the Pub-2016 General Members (Below Median) Employee Male Mortality Table, with no age adjustment, and the Pub-2016 General Members (Below Median) Employee Female Mortality Table, with a one-year age set forward, both projected generationally using Scale MP-2021.**

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SECTION 7 – RETIREMENT

The valuation uses several different assumptions to anticipate when retirement benefits will commence for members. One of the most significant factors affecting retirement patterns is, not surprisingly, the provisions governing when a member is eligible to retire. Additionally, provisions regarding eligibility for special benefits, subsidies, options, or any other special features may also influence retirement patterns. KCPSRS' membership is covered by two different benefit structures (referred to as "Plans"). Plan B members were hired prior to January 1, 2014, and Plan C members were hired on or after January 1, 2014. Given the effective date for Plan C members, only Plan B members were included in this study. However, retirement assumptions are necessary for members of both Plan C and Plan B.

Plan B members may retire with an unreduced benefit after reaching age 60 and having five or more years of service or having at least 75 credits (the member's age plus service is at least 75). Early (reduced) retirement is available to members who are at least age 55 with five years of service. Plan C members may retire with an unreduced benefit after reaching age 62 and having five or more years of service or having at least 80 credits. Because of the different eligibility between the plans, we believe the retirement pattern may be different between the plans. However, due to the lack of experience for Plan C members, only Plan B was studied, and Plan C retirement rates were adjusted accordingly based on professional judgment. We believe the next experience study may have enough credible data to review Plan C separately.

In this report, the focus is to set an assumption as to when members will retire. An important consideration is when they are eligible to start receiving benefits. "First eligible" is the term that is typically used when the member first becomes eligible to receive an unreduced benefit. "Ultimate retirement" refers to any point in time after the first year a member becomes eligible to retire with unreduced retirement benefits. Currently, there are separate retirement rates for first eligibility and ultimate rates of retirement.

A summary of the actual and expected experience during the study period for retirement is shown in the table below:

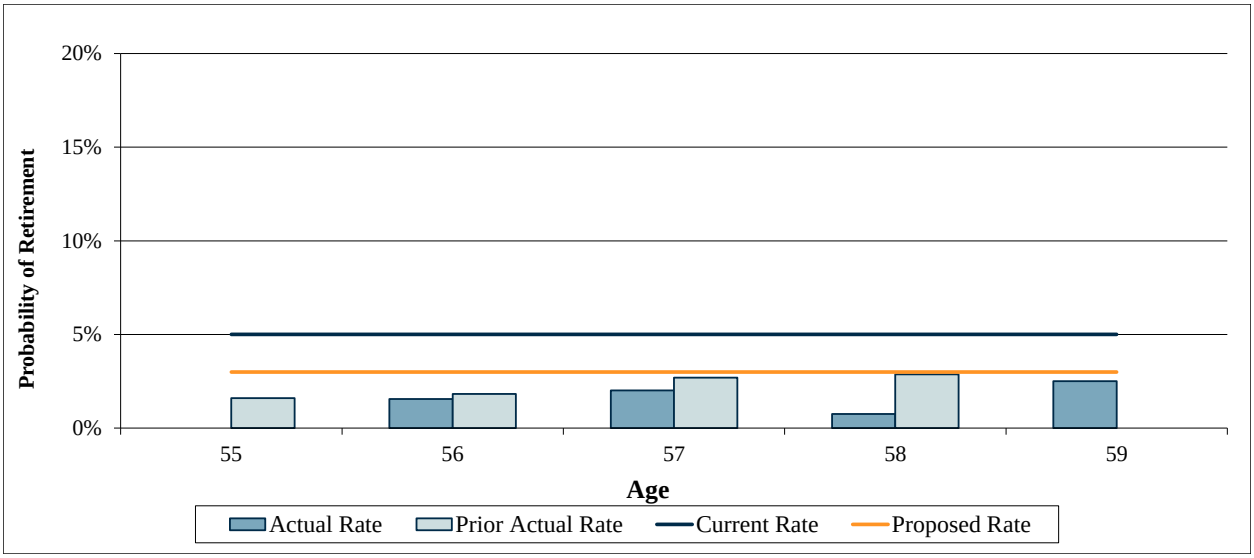
Retirement Experience

				A/E Ratio	
	Exposures	**Actual**	**Expected**	**Count**	**Weighted**
Early	417	5	21	24%	27%
First eligible	244	18	36	50%	47%
Ultimate	2,240	338	426	79%	80%
Total	**2,901**	**361**	**483**	**75%**	**N/A**

Early Retirement

The current assumption for the occurrence of retirement under the early retirement provisions is 5% at ages 55 through 59. There were 5 Plan B early retirements in the five-year study period and 21 were expected, resulting in an A/E ratio of 24%. The A/E ratio on a liability-weighted basis was consistent at 27%.

Even though the sample size is small, the A/E ratios in each year were consistently below 100%. In addition, the prior experience study also had a very low A/E ratio of 25%. The current study period reflects a continued trend of lower utilization of the early retirement provisions. Based on the observed data, we recommend lowering of the early retirement assumption again, but want to avoid over-adjusting. Therefore, we recommend moving only part of the way toward the observed experience by lowering the rate from 5% to 3% at ages 55 to 59. Our recommended assumption (orange line) is shown in the graph below and results in an A/E ratio of 44% on a liability-weighted basis.



Since there is insufficient data upon which to base an assumption for Plan C members, the assumption for Plan B members will be extended through age 61 for Plan C retirement rates. When there is sufficient actual experience to provide credible results, the assumption may need to be revised but for now this is a reasonable approach.

First Eligible

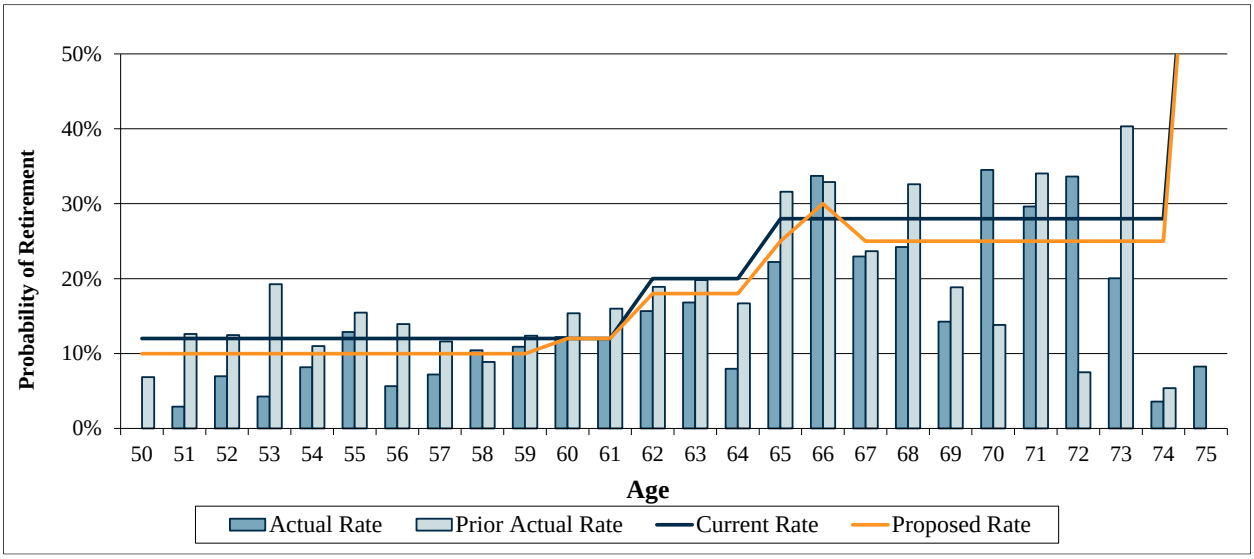
Based on the current assumption for ages 50 through 70, there were 18 retirements by members when first eligible in the five-year study period and 36 were expected, resulting in an A/E ratio of 50%. The A/E ratio on a liability-weighted basis was 47%. The number of retirements at first eligibility were much lower than observed in the prior study (18 vs. 50 retirements). The number of exposures was also much lower (244 vs. 363 exposures). When the number of exposures decreases, it reduces the credibility of the data. Due to this, we looked at those members that were first eligible and compared that data to the unreduced retirement – ultimate assumptions (next section). We found that the first eligible experience was very similar to the ultimate assumptions. Therefore, **we recommend eliminating the first eligible assumption**, which will provide more credible data for the ultimate assumption and simplify the retirement assumption without losing any accuracy.

Unreduced Retirement - Ultimate

Based on the current assumption for ages 50 through 75, there were 338 retirements by members after their initial eligibility for unreduced retirement has been met, whereas 426 were expected, resulting in an A/E ratio of 79%. The A/E ratio on a liability-weighted basis was similar at 80%.

As mentioned above, we recommend eliminating the first eligible assumption. By doing this, those members that were first eligible for unreduced retirement will now be included in the ultimate retirement assumption. This adds more credibility to the data including more exposures and retirements and, in our opinion, does not hinder the accuracy of the assumption, as the experience for both groups was similar.

Combining data for all Plan B members eligible for an unreduced benefit and using the proposed retirement rates shown in the following graph (orange line), produces an A/E ratio of 86%. This improves the fit of the observed experience, while only moving partway to be cautious of the study period that included Covid.



Retirement from Vested Termination

When a vested member terminates from the System, they are entitled to receive a benefit in the future, if their member contribution balance is not withdrawn. Therefore, a specific assumption is needed to anticipate when those members will elect to commence their retirement benefits. The current assumption is that terminated vested Plan B members will begin receiving benefits at age 60 and Plan C members will begin receiving benefits at age 62 (the respective ages at which members can receive unreduced benefits).

Over the study period, there were 127 terminated vested Plan B members that began receiving benefits. The average age of these members was 60.7. In the last study, the average age was 60.3. Note that Plan C is too recent to have very many terminated vested members who have retired, but it seems reasonable to assume a similar pattern will occur, i.e., most will retire at the age the retirement benefit is first unreduced. Based on this information, we recommend **the current assumptions be retained**.

Miscellaneous Assumptions

There are two minor assumptions that are used in the valuation process. For simplicity, we have included the discussion here since the most significant impact of these assumptions is on the retirement liability.

Marriage Assumption

The current assumption is that 100% of members are married. KCPSRS has certain payment forms that continue to the spouse upon the member's death if elected by the member at retirement. The census data provided to us for the annual valuation does not include marital status and even if it did, marital status on the valuation date is not necessarily a valid predictor of marital status at retirement. Beneficiary information is only reported for those retirees that receive a joint and survivor form of payment. With data supplied in this manner, there is no credible way to review this assumption. However, the impact of this assumption is quite small and the use of 100% marriage assumption means the survivor provisions are valued conservatively. **In our professional judgement, we believe the current assumption is reasonable and should be retained.**

Age of Beneficiary

Joint and survivor annuity benefit amounts are dependent on the member's and beneficiary's ages. The current assumption is that males are four years older than females. There is insufficient data to accurately assess this assumption, but **we find it reasonable and consistent with assumptions used by other public plans. We recommend it be retained.**

Actuarial Reduction Factors

Given the recommendation for a change to the mortality assumption, and the Board's consideration of lowering the investment return assumption, **we recommend the Board update the actuarial factors used for optional forms of payment as well as early retirement reduction factors.** If the Board's decision is to incrementally lower the investment return assumption, we would recommend multiple sets of factors correlating with the investment return assumption.

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SECTION 8 – DISABILITY

One of the types of pre-retirement benefits provided to members is a disability benefit. Typically, the frequency of the occurrence of disability is dependent upon the membership type and the nature of the benefits provided. For KCPSRS, the occurrence of disability is quite rare. Over the current five-year study period, there were 0 disabilities. In the prior four-year study period, there were 2 disabilities.

In the prior experience study, we recommended eliminating the disability assumption. We believe this is still appropriate and **we recommend retaining the current assumption of no disabilities**.

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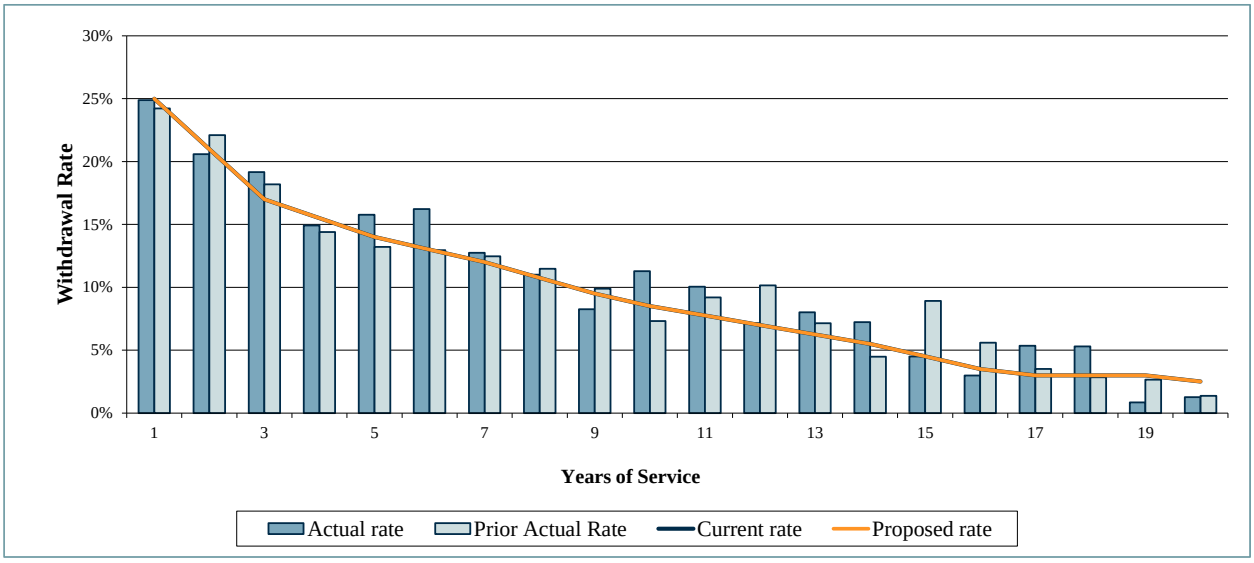
SECTION 9 – TERMINATION OF EMPLOYMENT (WITHDRAWAL)

Not all active members on the valuation date are expected to continue working until retirement. Therefore, a termination of employment assumption is used to anticipate the probability that a member will leave covered employment at some point in the future. In analyzing the actual experience during the study period, the number of terminations includes all members who were reported as having terminated employment. Some of these members subsequently receive refunds of their contributions, some return to active membership, and some leave their contributions with the System until retirement and receive a monthly benefit. As discussed earlier in this report, an explicit assumption is made regarding the age at retirement of such terminated vested members. Non-vested members are assumed to elect a refund of their employee contribution account balance.

This section of the report summarizes the results of our study of terminations of employment for reasons other than death, retirement, or disability. The current assumption used in the valuation is a service-based assumption that applies to both males and females.

The current assumption produces an A/E ratio of 104% on a count basis and 108% on a liability-weighted basis over the study period for durations one through 20. While the overall A/E ratio is reasonable given the size of the group, we did see significant variation from year to year. During the five-year study period the A/E ratios ranged from 74% (in 2020) to 131% (in 2022). These results align with trends throughout the country where very few people were leaving employment in 2020 due to the pandemic. This trend was followed by the Great Resignation in 2021 and 2022 where many people were leaving or changing jobs.

Given that the A/E ratio was still reasonable, and due to the volatility during the study period, **we recommend no change to the termination assumption.**



Election of a Deferred Annuity Benefit/Refund

Some vested members who terminate active employment elect to receive a distribution of their member contribution balance, forfeiting their right to receive monthly benefits in the future, while others wait and elect an annuity at retirement eligibility. The current assumption is that a terminating member who is vested will elect the most valuable option, i.e., the option with the higher present value (using the valuation assumptions for investment return and mortality). While actual experience may vary, this approach is reasonable and protects KCPSRS against experience losses from the actual elections by members. **We recommend the current assumption be maintained.**

APPENDIX A – CURRENT ASSUMPTIONS AND METHODS

ACTUARIAL COST METHOD

The actuarial cost method is a procedure for allocating the actuarial present value of pension benefits and expenses to time periods. The method used for the valuation is known as the Entry Age Normal actuarial cost method and has the following characteristics:

(i) The annual normal costs for each individual active member are sufficient to accumulate the value of the member's pension at time of retirement.

(ii) Each annual normal cost is a constant percentage of the member's year-by-year projected covered compensation.

The Entry Age Normal actuarial cost method allocates the actuarial present value of each member's projected benefits on a level basis over the member's assumed pensionable compensation rates between the entry age of the member and the assumed exit ages.

The portion of the actuarial present value allocated to the valuation year is called the normal cost. The portion of the actuarial present value not provided for by the actuarial present value of future normal costs is called actuarial accrued liability. Deducting actuarial assets from the actuarial accrued liability determines the unfunded actuarial accrued liability or (surplus). Effective with the January 1, 2017 valuation, the existing UAAL on that date is amortized over a closed 30-year period and subsequent pieces of UAAL, arising from actuarial gains and losses each year, will be amortized over a closed 20-year period. The amortization payments on each of the UAAL bases will be determined on a level percentage of payroll basis.

For contribution rates beginning July 1, 2021 and later, there is an 18-month lag between the valuation date in which the employer contribution rates are determined and the effective date of those contribution rates. Therefore, the unfunded actuarial accrued liability is projected from the valuation date to July 1 of the year in which the contribution rate will apply based on the scheduled statutory contribution rates and expected payroll in the intervening years to better approximate the UAAL at that point in time.

CALCULATION OF THE ACTUARIAL VALUE OF ASSETS

The actuarial value of assets is based on a five-year smoothing method and is determined by spreading the effect of each year's investment return in excess of or below the expected return. The Market Value of assets on the valuation date is reduced by the sum of the following:

I. 80% of the return to be spread during the first year preceding the valuation date,
II. 60% of the return to be spread during the second year preceding the valuation date,
III. 40% of the return to be spread during the third year preceding the valuation date, and
IV. 20% of the return to be spread during the fourth year preceding the valuation date.

APPENDIX A – CURRENT ASSUMPTIONS AND METHODS

ACTUARIAL ASSUMPTIONS

System contribution requirements and actuarial present values are calculated by applying assumptions to the benefit provisions and membership information of the System, using the actuarial cost method.

The principal areas of risk which require assumptions about future activities of the System are:

(i) Long-term rates of investment return to be generated by the assets of the System

(ii) Patterns of salary increases to members

(iii) Rates of mortality among active members, retirees and beneficiaries

(iv) Rates of termination of active members

(v) The age patterns of actual retirements

APPENDIX A – CURRENT ASSUMPTIONS AND METHODS

Investment Return Assumption (net of investment expenses): 7.25% per year, compounded annually (2.25% long-term price inflation and a 5.00% real rate of return).

Price Inflation: 2.25%

General Wage Growth (Wage Inflation): 2.85%

Payroll Growth Assumption: 2.85% per year.

Interest Crediting Rate on Member Accounts: 2.50% per year.

Salary Increase Rates: Rates vary by years of service.

Rates by Service				
Years	Inflation	Productivity	Merit	Total
<1	2.25%	0.60%	6.65%	9.50%
1	2.25	0.60	4.65	7.50
2	2.25	0.60	3.65	6.50
3	2.25	0.60	2.65	5.50
4	2.25	0.60	2.40	5.25
5	2.25	0.60	2.15	5.00
6	2.25	0.60	1.90	4.75
7	2.25	0.60	1.80	4.65
8 – 19	2.25	0.60	1.65	4.50
20 – 25	2.25	0.60	1.15	4.00
26+	2.25	0.60	1.00	3.85

Mortality Table: This assumption is used to measure the probabilities of members dying and the probabilities of each pension payment being made after retirement.

Healthy Retirees: Pub-2010 General Members (Below Median) Retiree Mortality Table with a one-year age setback for males and a one-year age set forward for females, projected 7 years from valuation date using most recent MP-Scale.

Beneficiaries: Pub-2010 General Members (Below Median) Contingent Survivor Mortality Table with a one-year age setback for males and a one-year age set forward for females, projected 7 years from valuation date using most recent MP-Scale.

Disabled Retirees: Pub-2010 Non-Safety Disabled Retiree Mortality Table with a one-year age setback for males and a one-year age set forward for females.

Active Members: Pub-2010 General Members (Below Median) Employee Mortality Table with a one-year age setback for males and a one-year age set forward for females, projected 15 years from valuation date using most recent MP-Scale.

Rates of Retirement: These rates are used to measure the probability of eligible members retiring under the regular retirement provisions. The age-related rates used are shown in the tables below.

The first year of normal retirement eligibility is the earlier of age 60 and 5 years of creditable service or 75 credits for Plan B members, and the earlier of age 62 and 5 years of creditable service or 80 credits for Plan C members.

Retirement Rates When Eligible for Unreduced Benefits		
Age	First Eligible Rate	Ultimate Rate
45 – 52	12%	12%
53 – 54	15	12
55	20	12
56 – 61	15	12
62	15	20
63	30	20
64	20	20
65	20	28
66 – 74	30	28
75	100	100

Retirement Rates When Eligible for Reduced Benefits	
Age	Rate
55 – 59	5%

Terminated vested members are assumed to begin receiving their benefits upon reaching age 60 if they participated in Plan B and age 62 if they participated in Plan C.

Rates of Separation from Active Membership: This assumption measures the probability of a member terminating employment. The rates do not apply to members who are eligible to retire. Rates vary by service. Sample rates are as follows:

Years	Rate
<1	26.0%
1	25.0
5	14.0
10	8.5
15	4.5
20	2.5
25+	1.0

Forfeiture of Vested Benefits: Members terminating in vested status are given the option of taking a refund of their accumulated member contributions (and thereby forfeiting the employer-provided benefit) or deferring their vested benefit. Active members who terminate in the future with a vested benefit are assumed to take a deferred vested annuity, unless a refund of contributions and interest is greater than the actuarial present value of their vested deferred benefit.

Rates of Disability: None.

Active Member Group Size: Assumed to remain constant.

Future Benefit Increases or Additional Benefits: When funding is adequate, the Board may authorize cost of living adjustments (COLAs), as noted in the summary of plan provisions. In the past, the Board has also sometimes granted an additional monthly payment to retirees (13th check). This valuation assumes that no future COLAs and no future 13th checks will be awarded.

MISCELLANEOUS AND TECHNICAL ASSUMPTIONS

Marriage Assumption: All members are assumed to be married for purposes of death benefits. In each case, the male was assumed to be 4 years older than the female.

Decrement Timing: Decrements of all types are assumed to occur mid-year.

Administrative Expense: The actuarial contribution rate includes an explicit component for administrative expenses, based on the actual administrative expenses for the prior year.

Missing Gender: Records that are missing a gender are assumed to be female if the record belongs to a member and male if the record belongs to a beneficiary.

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APPENDIX B – PROPOSED ASSUMPTIONS AND METHODS

ACTUARIAL COST METHOD

The actuarial cost method is a procedure for allocating the actuarial present value of pension benefits and expenses to time periods. The method used for the valuation is known as the Entry Age Normal actuarial cost method and has the following characteristics:

(iii) The annual normal costs for each individual active member are sufficient to accumulate the value of the member's pension at time of retirement.

(iv) Each annual normal cost is a constant percentage of the member's year-by-year projected covered compensation.

The Entry Age Normal actuarial cost method allocates the actuarial present value of each member's projected benefits on a level basis over the member's assumed pensionable compensation rates between the entry age of the member and the assumed exit ages.

The portion of the actuarial present value allocated to the valuation year is called the normal cost. The portion of the actuarial present value not provided for by the actuarial present value of future normal costs is called actuarial accrued liability. Deducting actuarial assets from the actuarial accrued liability determines the unfunded actuarial accrued liability or (surplus). Effective with the January 1, 2017 valuation, the existing UAAL on that date is amortized over a closed 30-year period and subsequent pieces of UAAL, arising from actuarial gains and losses each year, will be amortized over a closed 20-year period. The amortization payments on each of the UAAL bases will be determined on a level percentage of payroll basis.

For contribution rates beginning July 1, 2021 and later, there is an 18-month lag between the valuation date in which the employer contribution rates are determined and the effective date of those contribution rates. Therefore, the unfunded actuarial accrued liability is projected from the valuation date to July 1 of the year in which the contribution rate will apply based on the scheduled statutory contribution rates and expected payroll in the intervening years to better approximate the UAAL at that point in time.

CALCULATION OF THE ACTUARIAL VALUE OF ASSETS

The actuarial value of assets is based on a five-year smoothing method and is determined by spreading the effect of each year's investment return in excess of or below the expected return. The Market Value of assets on the valuation date is reduced by the sum of the following:

V. 80% of the return to be spread during the first year preceding the valuation date,
VI. 60% of the return to be spread during the second year preceding the valuation date,
VII. 40% of the return to be spread during the third year preceding the valuation date, and
VIII. 20% of the return to be spread during the fourth year preceding the valuation date.

APPENDIX B – PROPOSED ASSUMPTIONS AND METHODS

ACTUARIAL ASSUMPTIONS

System contribution requirements and actuarial present values are calculated by applying assumptions to the benefit provisions and membership information of the System, using the actuarial cost method.

The principal areas of risk which require assumptions about future activities of the System are:

(i) Long-term rates of investment return to be generated by the assets of the System

(ii) Patterns of salary increases to members

(iii) Rates of mortality among active members, retirees and beneficiaries

(iv) Rates of termination of active members

(v) The age patterns of actual retirements

APPENDIX B – PROPOSED ASSUMPTIONS AND METHODS

Investment Return Assumption (net of investment expenses): 7.25% per year, compounded annually (2.50% long-term price inflation and a 4.75% real rate of return).

Price Inflation: 2.50%

General Wage Growth (Wage Inflation): 3.25%

Payroll Growth Assumption: 3.00% per year.

Interest Crediting Rate on Member Accounts: 3.00% per year.

Salary Increase Rates: Rates vary by years of service.

Rates by Service				
Years	**Inflation**	**Productivity**	**Merit**	**Total**
<1	2.50%	0.75%	7.50%	10.75%
1	2.50	0.75	5.15	8.40
2	2.50	0.75	4.15	7.40
3	2.50	0.75	3.65	6.90
4	2.50	0.75	3.15	6.40
5	2.50	0.75	2.65	5.90
6	2.50	0.75	2.40	5.65
7 – 12	2.50	0.75	2.10	5.35
13	2.50	0.75	2.00	5.25
14	2.50	0.75	1.80	5.05
15	2.50	0.75	1.30	4.55
16 – 24	2.50	0.75	1.10	4.35
25+	2.50	0.75	0.50	3.75

Mortality Table: This assumption is used to measure the probabilities of members dying and the probabilities of each pension payment being made after retirement.

Healthy Retirees: Pub-2016 General Members (Below Median) Retiree Mortality Table with a one-year age set forward for females, projected generationally using Scale MP-2021.

Beneficiaries: Pub-2016 General Members (Below Median) Contingent Survivor Mortality Table with a one-year age set forward for females, projected generationally using Scale MP-2021.

Disabled Retirees: Pub-2016 Non-Safety Disabled Retiree Mortality Table with a one-year age set forward for females.

Active Members: Pub-2016 General Members (Below Median) Employee Mortality Table with a one-year age set forward for females, projected generationally using Scale MP-2021.

Rates of Retirement: These rates are used to measure the probability of eligible members retiring under the regular retirement provisions. The age-related rates used are shown in the tables below.

The first year of normal retirement eligibility is the earlier of age 60 and 5 years of creditable service or 75 credits for Plan B members, and the earlier of age 62 and 5 years of creditable service or 80 credits for Plan C members.

Retirement Rates When Eligible for Unreduced Benefits	
Age	Rate
45 – 59	10%
60 – 61	12
62 – 64	18
65	25
66	30
67 – 74	25
75	100

Retirement Rates When Eligible for Reduced Benefits	
Age	Rate
55 – 59	3%

Terminated vested members are assumed to begin receiving their benefits upon reaching age 60 if they participated in Plan B and age 62 if they participated in Plan C.

Rates of Separation from Active Membership: This assumption measures the probability of a member terminating employment. The rates do not apply to members who are eligible to retire. Rates vary by service. Sample rates are as follows:

Years	Rate
<1	26.0%
1	25.0
5	14.0
10	8.5
15	4.5
20	2.5
25+	1.0

Forfeiture of Vested Benefits: Members terminating in vested status are given the option of taking a refund of their accumulated member contributions (and thereby forfeiting the employer-provided benefit) or deferring their vested benefit. Active members who terminate in the future with a vested benefit are assumed to take a deferred vested annuity, unless a refund of contributions and interest is greater than the actuarial present value of their vested deferred benefit.

Rates of Disability: None.

Active Member Group Size: Assumed to remain constant.

Future Benefit Increases or Additional Benefits: When funding is adequate, the Board may authorize cost of living adjustments (COLAs), as noted in the summary of plan provisions. In the past, the Board has also sometimes granted an additional monthly payment to retirees (13th check). This valuation assumes that no future COLAs and no future 13th checks will be awarded.

MISCELLANEOUS AND TECHNICAL ASSUMPTIONS

Marriage Assumption: All members are assumed to be married for purposes of death benefits. In each case, the male was assumed to be 4 years older than the female.

Decrement Timing: Decrements of all types are assumed to occur mid-year.

Administrative Expense: The actuarial contribution rate includes an explicit component for administrative expenses, based on the actual administrative expenses for the prior year.

Missing Gender: Records that are missing a gender are assumed to be female if the record belongs to a member and male if the record belongs to a beneficiary.

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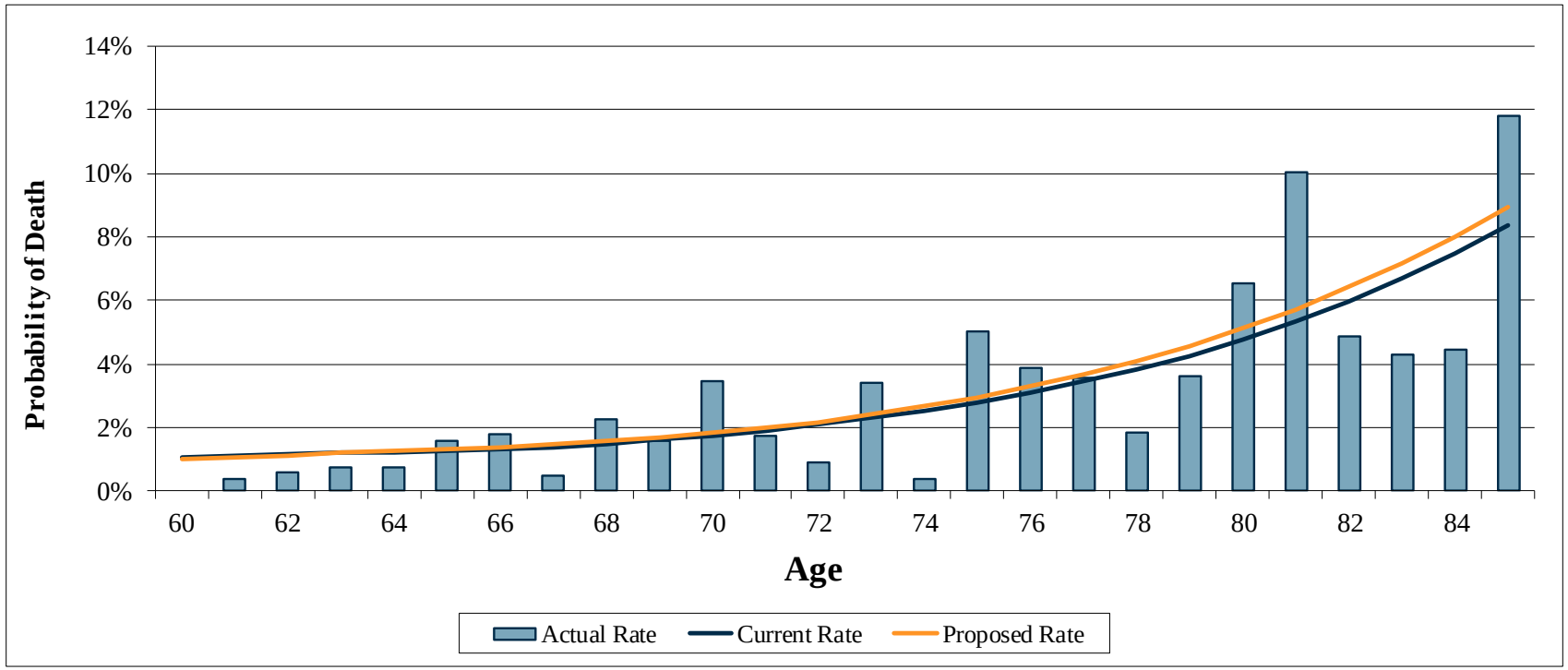
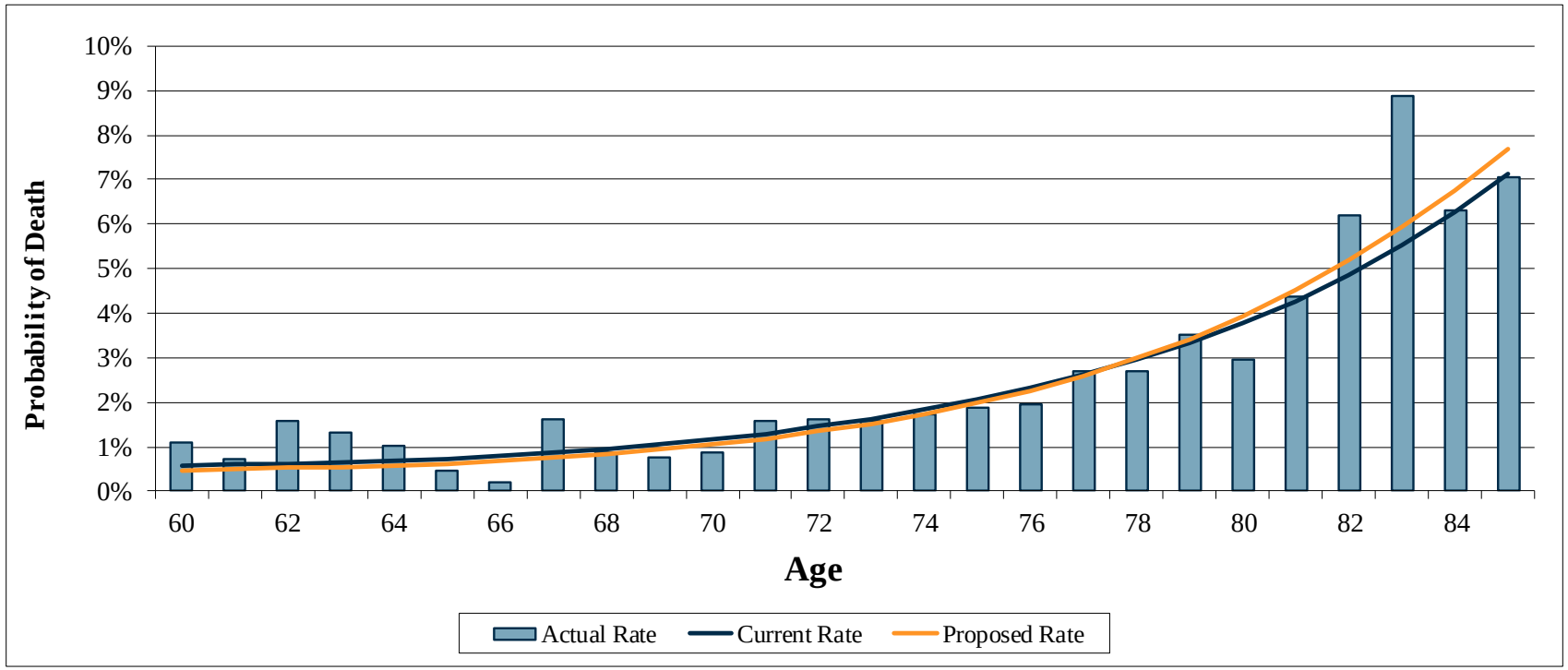
EXHIBIT C-1
Retiree Mortality – Males



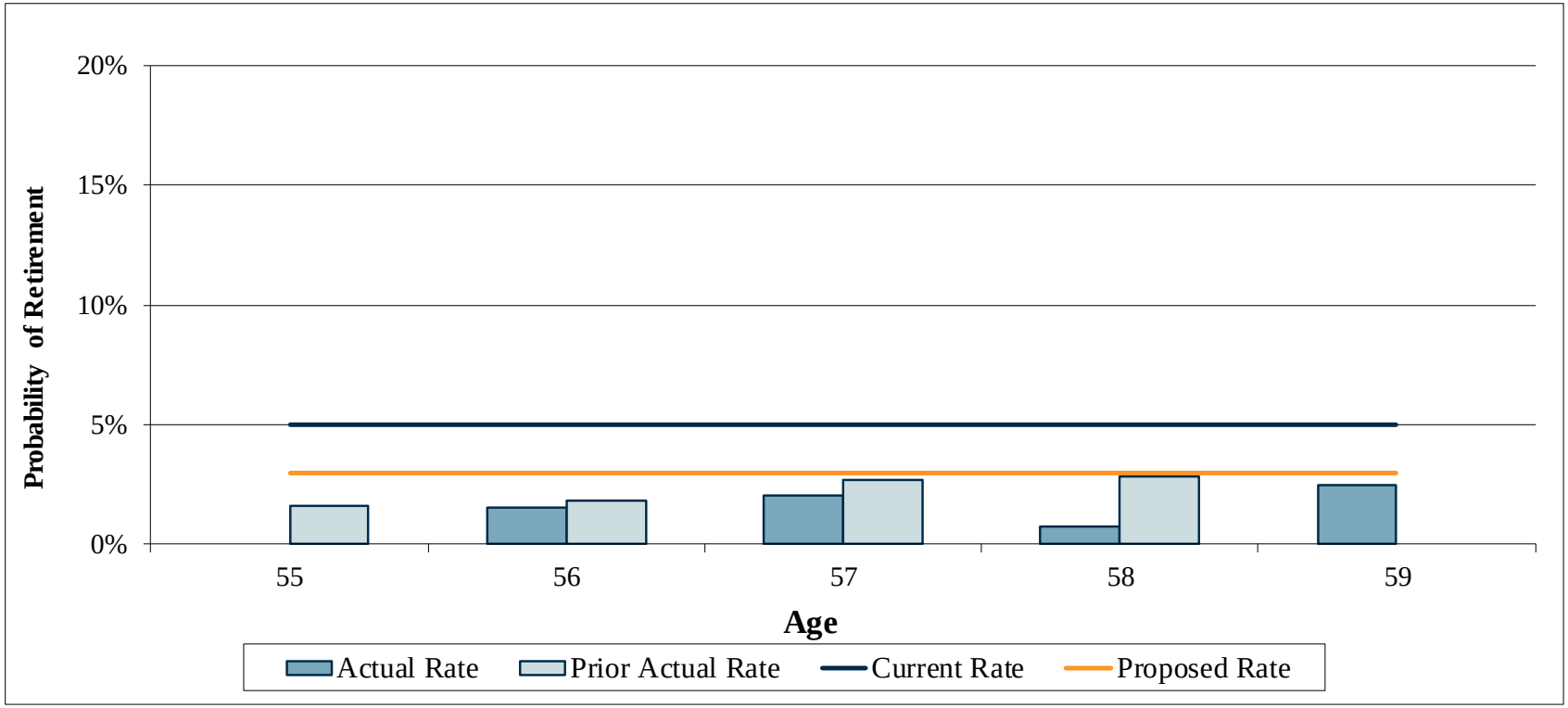
	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions
Weighted Count	186,302	180,279	190,953
Actual/Expected		103%	98%

EXHIBIT C-2
Retiree Mortality – Females



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions
Weighted Count	440,091	421,926	416,190
Actual/Expected		104%	106%

EXHIBIT C-3
Early Retirement

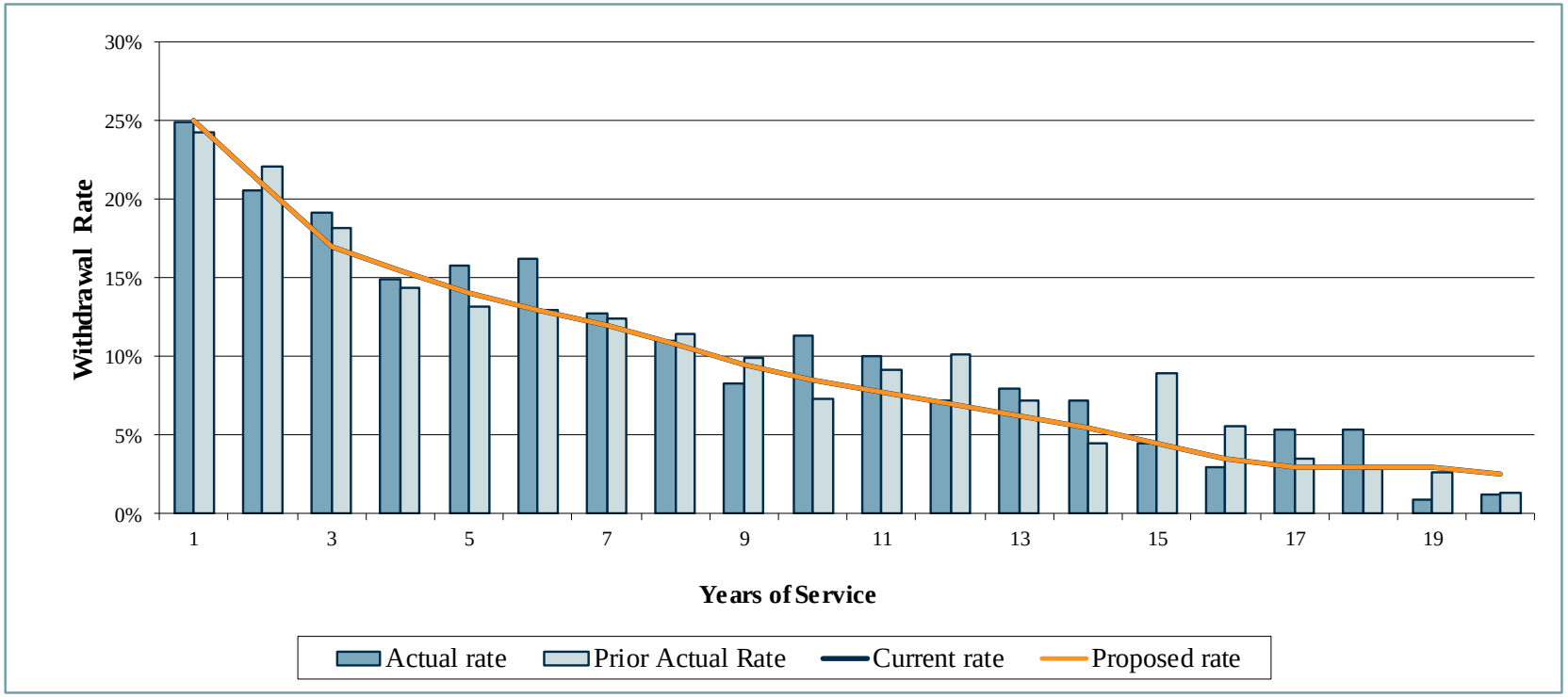


		Actual	Expected - Current Assumptions	Expected - Proposed Assumptions
Current Study	Weighted Count	4	16	10
	Actual/Expected		27%	44%
Prior Study	Weighted Count	6	15	9
	Actual/Expected		40%	67%

EXHIBIT C-4
Unreduced Retirement

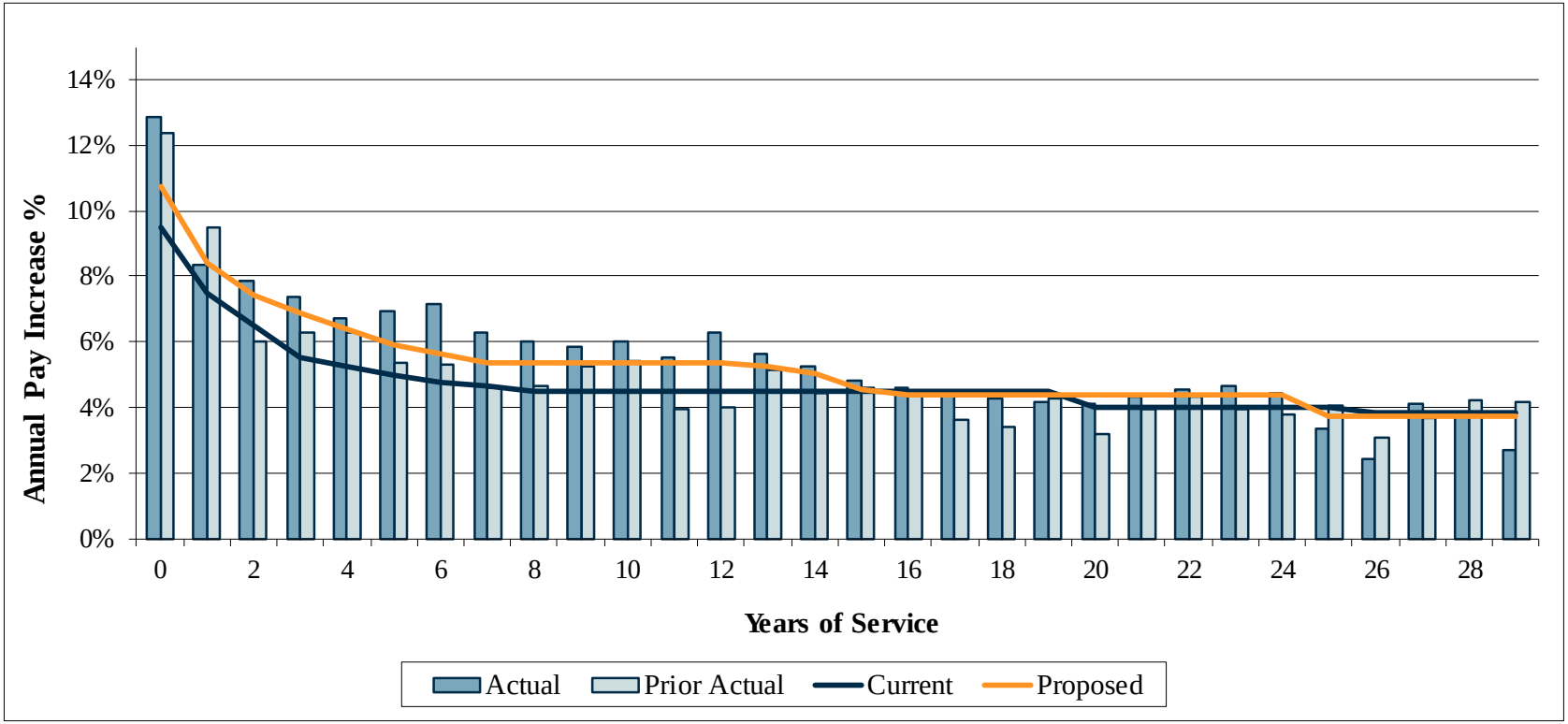
		Actual	Expected - Proposed Assumptions
Current Study	Weighted Count	522	604
	Actual/Expected		86%
Prior Study	Weighted Count	543	474
	Actual/Expected		115%

EXHIBIT C-5
Termination of Employment



		Actual	Expected - Current Assumptions	Expected - Proposed Assumptions
Current Study	Weighted Count	525	488	488
	Actual/Expected		108%	108%
Prior Study	Weighted Count	300	287	287
	Actual/Expected		105%	105%

EXHIBIT C-6
Salary Scale



		Actual	Expected - Current Assumptions	Expected - Proposed Assumptions
Current Study	Average Increase	6.64%	5.38%	6.18%
	Actual/Expected		124%	108%
Prior Study	Average Increase	5.73%	5.31%	5.65%
	Actual/Expected		108%	102%

EXHIBIT D-1
Retiree Mortality – Males

Age	Exposure	Actual Deaths	Actual Rate	Current Expected	Current Rate	Proposed Expected	Proposed Rate
60	133,621	-	0.000%	1,440.3	1.078%	1,360.5	1.018%
61	156,742	570	0.364%	1,759.7	1.123%	1,689.8	1.078%
62	187,455	1,147	0.612%	2,179.6	1.163%	2,131.0	1.137%
63	213,964	1,607	0.751%	2,564.9	1.199%	2,558.3	1.196%
64	244,575	1,836	0.751%	3,014.2	1.232%	3,074.3	1.257%
65	267,032	4,166	1.560%	3,376.6	1.264%	3,530.2	1.322%
66	296,196	5,312	1.794%	3,846.5	1.299%	4,128.8	1.394%
67	268,596	1,350	0.503%	3,728.0	1.388%	3,969.0	1.478%
68	312,606	7,022	2.246%	4,664.1	1.492%	4,921.6	1.574%
69	307,768	4,929	1.601%	4,959.4	1.611%	5,197.0	1.689%
70	320,841	11,175	3.483%	5,612.3	1.749%	5,850.1	1.823%
71	347,801	6,110	1.757%	6,632.6	1.907%	6,902.9	1.985%
72	356,748	3,229	0.905%	7,441.9	2.086%	7,758.0	2.175%
73	389,047	13,299	3.418%	8,909.0	2.290%	9,327.7	2.398%
74	360,891	1,314	0.364%	9,106.6	2.523%	9,586.4	2.656%
75	358,167	18,031	5.034%	9,989.8	2.789%	10,576.1	2.953%
76	291,711	11,329	3.883%	9,019.1	3.092%	9,594.8	3.289%
77	289,269	10,248	3.543%	9,940.1	3.436%	10,617.0	3.670%
78	232,319	4,268	1.837%	8,887.6	3.826%	9,525.7	4.100%
79	219,224	7,888	3.598%	9,352.3	4.266%	10,046.5	4.583%
80	216,727	14,221	6.562%	10,324.3	4.764%	11,102.6	5.123%
81	196,746	19,731	10.029%	10,480.5	5.327%	11,273.6	5.730%
82	174,009	8,504	4.887%	10,377.0	5.963%	11,152.8	6.409%
83	158,142	6,829	4.319%	10,554.4	6.674%	11,333.2	7.167%
84	149,598	6,669	4.458%	11,172.3	7.468%	11,990.8	8.015%
85	131,143	15,517	11.832%	10,945.7	8.346%	11,754.8	8.963%
	6,580,936	186,302	2.831%	180,278.9	2.739%	190,953.5	2.902%

EXHIBIT D-2
Retiree Mortality – Females

Age	Exposure	Actual Deaths	Actual Rate	Current Expected	Current Rate	Proposed Expected	Proposed Rate
60	370,261	4,105	1.109%	2,144.6	0.579%	1,739.7	0.470%
61	452,064	3,245	0.718%	2,726.3	0.603%	2,236.2	0.495%
62	483,860	7,657	1.583%	3,038.7	0.628%	2,518.1	0.520%
63	539,110	7,108	1.318%	3,521.9	0.653%	2,959.9	0.549%
64	615,040	6,258	1.018%	4,175.9	0.679%	3,593.7	0.584%
65	710,268	3,408	0.480%	5,228.4	0.736%	4,460.5	0.628%
66	808,575	1,531	0.189%	6,466.2	0.800%	5,520.6	0.683%
67	974,036	15,774	1.619%	8,502.1	0.873%	7,296.6	0.749%
68	1,059,407	9,141	0.863%	10,134.3	0.957%	8,805.2	0.831%
69	1,103,946	8,438	0.764%	11,630.6	1.054%	10,245.9	0.928%
70	1,150,672	10,136	0.881%	13,427.8	1.167%	12,010.7	1.044%
71	1,240,621	19,772	1.594%	16,092.2	1.297%	14,628.9	1.179%
72	1,260,109	20,414	1.620%	18,254.6	1.449%	16,851.5	1.337%
73	1,247,052	19,745	1.583%	20,238.8	1.623%	18,973.7	1.521%
74	1,199,582	20,641	1.721%	21,859.6	1.822%	20,817.8	1.735%
75	1,165,064	21,830	1.874%	23,888.4	2.050%	23,092.9	1.982%
76	1,128,713	21,887	1.939%	26,062.6	2.309%	25,588.9	2.267%
77	1,052,384	28,212	2.681%	27,420.2	2.606%	27,322.2	2.596%
78	951,919	25,595	2.689%	28,013.7	2.943%	28,330.1	2.976%
79	836,726	29,399	3.514%	27,848.1	3.328%	28,588.6	3.417%
80	737,915	21,740	2.946%	27,816.9	3.770%	28,973.3	3.926%
81	588,837	25,760	4.375%	25,169.8	4.274%	26,577.4	4.514%
82	489,480	30,291	6.188%	23,749.0	4.852%	25,363.5	5.182%
83	402,366	35,695	8.871%	22,169.7	5.510%	23,882.9	5.936%
84	340,617	21,504	6.313%	21,325.1	6.261%	23,075.1	6.775%
85	295,386	20,807	7.044%	21,020.1	7.116%	22,735.8	7.697%
	21,204,009	440,091	2.076%	421,925.6	1.990%	416,189.7	1.963%

EXHIBIT D-3
Early Retirement

Age	Exposure	Actual Retirements	Actual Rate	Current Expected	Current Rate	Proposed Expected	Proposed Rate
55	68	-	0.000%	3.4	5.000%	2.0	3.000%
56	70	1	1.556%	3.5	5.000%	2.1	3.000%
57	64	1	2.018%	3.2	5.000%	1.9	3.000%
58	61	0	0.758%	3.0	5.000%	1.8	3.000%
59	54	1	2.508%	2.7	5.000%	1.6	3.000%
	317	4	1.326%	15.9	5.000%	9.5	3.000%

Note: The actual and expected results shown are based on a liability-weighted analysis of experience.

EXHIBIT D-4
Unreduced Retirement

Age	Exposure	Actual Retirements	Actual Rate	Current Expected	Current Rate	Proposed Expected	Proposed Rate
50	57	-	0.000%	6.8	12.000%	5.7	10.000%
51	77	2	2.907%	9.2	12.000%	7.7	10.000%
52	80	6	6.974%	9.6	12.000%	8.0	10.000%
53	105	4	4.257%	12.6	12.000%	10.5	10.000%
54	123	10	8.177%	14.7	12.000%	12.3	10.000%
55	149	19	12.892%	17.9	12.000%	14.9	10.000%
56	143	8	5.664%	17.1	12.000%	14.3	10.000%
57	195	14	7.215%	23.5	12.000%	19.5	10.000%
58	218	23	10.439%	26.2	12.000%	21.8	10.000%
59	238	26	10.900%	28.6	12.000%	23.8	10.000%
60	280	34	12.202%	33.6	12.000%	33.6	12.000%
61	293	35	11.939%	35.2	12.000%	35.2	12.000%
62	274	43	15.679%	54.8	20.000%	49.4	18.000%
63	242	41	16.832%	48.3	20.000%	43.5	18.000%
64	222	18	7.968%	44.4	20.000%	40.0	18.000%
65	222	49	22.237%	62.1	28.000%	55.4	25.000%
66	179	60	33.710%	50.1	28.000%	53.7	30.000%
67	123	28	22.954%	34.3	28.000%	30.6	25.000%
68	100	24	24.239%	28.0	28.000%	25.0	25.000%
69	88	13	14.258%	24.8	28.000%	22.1	25.000%
70	90	31	34.499%	25.2	28.000%	22.5	25.000%
71	59	17	29.640%	16.4	28.000%	14.6	25.000%
72	28	10	33.628%	8.0	28.000%	7.1	25.000%
73	21	4	20.053%	5.8	28.000%	5.2	25.000%
74	23	1	3.584%	6.4	28.000%	5.7	25.000%
75	22	2	8.270%	22.1	100.000%	22.1	100.000%
	3,650	522	14.309%	665.7	18.235%	604.2	16.551%

Note: The actual and expected results shown are based on a liability-weighted analysis of experience.

EXHIBIT D-5
Termination of Employment

Duration	Exposure	Actual Terminations	Actual Rate	Current Expected	Current Rate	Proposed Expected	Proposed Rate
1	163	41	24.878%	40.8	25.000%	40.8	25.000%
2	256	53	20.592%	53.7	21.000%	53.7	21.000%
3	298	57	19.157%	50.6	17.000%	50.6	17.000%
4	341	51	14.920%	52.9	15.500%	52.9	15.500%
5	366	58	15.767%	51.2	14.000%	51.2	14.000%
6	306	50	16.227%	39.8	13.000%	39.8	13.000%
7	311	40	12.747%	37.3	12.000%	37.3	12.000%
8	308	34	10.995%	33.1	10.750%	33.1	10.750%
9	301	25	8.261%	28.6	9.500%	28.6	9.500%
10	280	32	11.275%	23.8	8.500%	23.8	8.500%
11	244	25	10.049%	18.9	7.750%	18.9	7.750%
12	185	13	7.136%	13.0	7.000%	13.0	7.000%
13	153	12	8.005%	9.6	6.250%	9.6	6.250%
14	137	10	7.229%	7.5	5.500%	7.5	5.500%
15	132	6	4.492%	5.9	4.500%	5.9	4.500%
16	133	4	2.982%	4.7	3.500%	4.7	3.500%
17	139	7	5.349%	4.2	3.000%	4.2	3.000%
18	114	6	5.300%	3.4	3.000%	3.4	3.000%
19	152	1	0.851%	4.6	3.000%	4.6	3.000%
20	176	2	1.253%	4.4	2.500%	4.4	2.500%
	4,493	525	11.685%	487.8	10.857%	487.8	10.857%

Note: The actual and expected results shown are based on a liability-weighted analysis of experience.

EXHIBIT D-6
Salary Scale

Duration	Initial Salary (Millions)	Subsequent Salary (Millions)	Actual Rate	Current Expected (Millions)	Current Rate	Proposed Expected (Millions)	Proposed Rate
0	14.6	16.4	12.87%	15.9	9.50%	16.1	10.75%
1	122.4	132.6	8.33%	131.6	7.50%	132.7	8.40%
2	101.5	109.5	7.84%	108.1	6.50%	109.1	7.40%
3	80.0	85.9	7.38%	84.4	5.50%	85.5	6.90%
4	72.3	77.2	6.74%	76.1	5.25%	76.9	6.40%
5	63.9	68.4	6.95%	67.1	5.00%	67.7	5.90%
6	53.0	56.8	7.13%	55.5	4.75%	56.0	5.65%
7	48.6	51.7	6.25%	50.9	4.65%	51.2	5.35%
8	43.7	46.4	6.03%	45.7	4.50%	46.1	5.35%
9	39.1	41.4	5.82%	40.9	4.50%	41.2	5.35%
10	33.5	35.5	6.01%	35.0	4.50%	35.3	5.35%
11	26.2	27.7	5.53%	27.4	4.50%	27.6	5.35%
12	20.3	21.6	6.25%	21.3	4.50%	21.4	5.35%
13	16.3	17.2	5.61%	17.0	4.50%	17.2	5.25%
14	14.9	15.7	5.23%	15.6	4.50%	15.6	5.05%
15	13.5	14.1	4.79%	14.1	4.50%	14.1	4.55%
16	13.3	13.9	4.61%	13.9	4.50%	13.9	4.35%
17	12.5	13.0	4.42%	13.0	4.50%	13.0	4.35%
18	11.0	11.4	4.26%	11.5	4.50%	11.5	4.35%
19	13.1	13.7	4.18%	13.7	4.50%	13.7	4.35%
20	13.3	13.9	4.13%	13.9	4.00%	13.9	4.35%
21	11.8	12.3	4.34%	12.3	4.00%	12.3	4.35%
22	9.8	10.2	4.56%	10.2	4.00%	10.2	4.35%
23	9.6	10.0	4.66%	10.0	4.00%	10.0	4.35%
24	8.5	8.9	4.43%	8.9	4.00%	8.9	4.35%
25	7.4	7.7	3.33%	7.7	4.00%	7.7	3.75%
26	6.2	6.4	2.43%	6.5	3.85%	6.4	3.75%
27	6.8	7.1	4.09%	7.1	3.85%	7.1	3.75%
28	5.0	5.2	3.83%	5.2	3.85%	5.2	3.75%
29	4.1	4.2	2.67%	4.3	3.85%	4.3	3.75%
	896.5	956.1	6.64%	944.7	5.38%	951.9	6.18%