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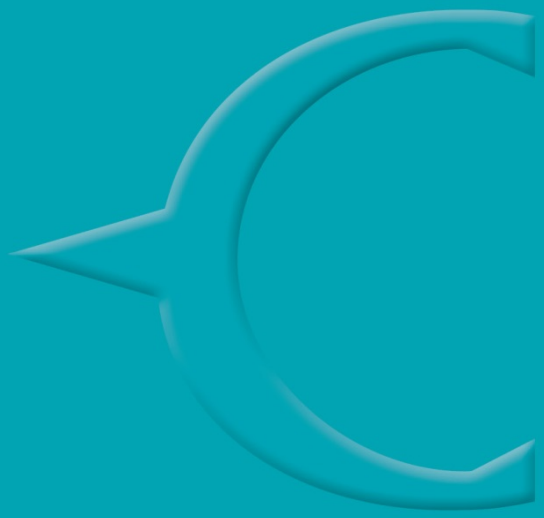

San Joaquin County Employees' Retirement Association

Actuarial Experience Study for January 1, 2016 through December 31, 2018

Produced by Cheiron

August 2019

www.cheiron.us 1.877.CHEIRON (243.4766)

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August 12, 2019

Board of Retirement
San Joaquin County Employees' Retirement Association
6 South El Dorado St, Suite 400
Stockton, CA 95202

Dear Members of the Board:

The purpose of this report is to provide the results of an Actuarial Experience Study of the San Joaquin County Employees' Retirement Association (SJCERA) covering actuarial experience from January 1, 2016 through December 31, 2018. This report is for the use of the SJCERA Retirement Board in selecting assumptions to be used in actuarial valuations beginning January 1, 2019.

In preparing our report, we relied on information (some oral and some written) supplied by SJCERA. This information includes, but is not limited to, the plan provisions, employee data, and financial information. We performed an informal examination of the obvious characteristics of the data for reasonableness and consistency in accordance with Actuarial Standard of Practice No. 23.

This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys and our firm does not provide any legal services or advice.

This report was prepared for the SJCERA Retirement Board for the purposes described herein. This report is not intended to benefit any other party, and Cheiron assumes no duty or liability to any such party.

If you have any questions about the report or would like additional information, please let us know.

Sincerely,
Cheiron

Graham A. Schmidt, ASA, FCA, MAAA, EA
Consulting Actuary

Timothy S. Doyle, ASA, MAAA, EA
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Consulting Actuary

SECTION I – EXECUTIVE SUMMARY

Actuarial assumptions (economic and demographic) are intended to be long-term in nature, and should be both individually reasonable and consistent in the aggregate. The purpose of this experience study is to evaluate whether or not the current assumptions adequately reflect the long-term expectations for SJCERA, and if not, to recommend adjustments. It is important to note that frequent and significant changes in the actuarial assumptions are not typically recommended, unless there are known fundamental changes in expectations of the economy, or with respect to SJCERA's membership or assets that would warrant such frequent or significant changes.

SUMMARY OF ECONOMIC ASSUMPTION ANALYSIS

The specific economic assumptions analyzed in this report are price inflation, wage inflation, COLA growth, and the discount rate. These assumptions have a significant impact on the contribution rates in the short-term and the risk of negative outcomes in the long-term.

The Retirement Board elected to maintain the economic assumptions used in the last actuarial valuation, which include a 7.25% long-term rate of return on Plan assets, an annual increase in prices measured by the Consumer Price Index (CPI) of 2.90%, a real return on assets of 4.35%, an annual wage increase equal to 25 basis points greater than price increases (3.15% in total), and a post-retirement COLA average growth rate of 2.60%.

The real return assumption is consistent with the long-term capital market assumptions from a survey of investment consultants. Other data presented in this report indicate that the discount rate and other economic assumptions adopted by the Retirement Board are reasonable.

However, it is important to disclose the potential cost impact of the lower short-term expected returns from Pension Consulting Alliance / Meketa (PCA/Meketa), the Plan's investment consultants, as well as other investment consultants. PCA/Meketa's assumptions indicated a 6.26% expected nominal 10-year geometric return for the current portfolio, which reflects a 4.01% expected real return with 2.25% inflation. If these projections are realized, the Plan would experience a pattern of actuarial losses from the assets in the near term, though they may be partially offset by liability gains if wage and COLA inflation rates are below the assumed rates (3.15% and 2.60%, respectively) over the same time period.

Finally, the expected asset returns were calculated based on SJCERA's current target asset allocation. We understand that the Board is in the process of considering changes to the strategic asset allocation that may result in a small increase in expected returns.

SECTION I – EXECUTIVE SUMMARY

SUMMARY OF DEMOGRAPHIC ASSUMPTION ANALYSIS

This experience study specifically analyzes and makes the following recommendations for the demographic assumptions.

- **Merit salary increases** – Increases to rates for General members with less than 15 years of service, and those with 30+ years, and increases to rates for Safety members with less than five years of service.
- **Retirement rates** – Small adjustments made to rates at various age and service levels.
- **Termination rates** – Minor adjustments made at various service levels for Safety members only. Increased percentage of members assumed to take a reciprocal benefit at some service levels.
- **Disability rates** – No changes in rates recommended; minor changes in how rates are applied to General members with less than five years of service.
- **Mortality rates** – Adjusted Pub2010 base tables, with generational improvement for all members.
- **Other assumptions** – Minor changes to other assumptions, including Safety deferral age and spouse age difference.

The body of this report provides additional detail and support for our conclusions and recommendations.

COST OF DEMOGRAPHIC ASSUMPTION CHANGES

Among the demographic assumptions, the recommended changes to mortality and merit salary increase assumptions have the largest impact on contribution rates. This table summarizes the estimated cost impact – for the General, Safety, and combined membership - of the recommended changes to demographic assumptions contained in this report.

Preliminary Summary of Changes in Plan Cost from Assumption Changes
$ in Millions, Numbers May Not Add Due to Rounding

	General Employer Cost	General Employer Contribution Rate (% Payroll)	Safety Employer Cost	Safety Employer Contribution Rate (% Payroll)	Total Employer Cost	Employer Contribution Rate (% Payroll)
Baseline Cost as of January 1, 2019	$ **161.5**	**40.58%**	$ **58.1**	**80.15%**	$ **223.6**	**46.68%**
Change in Cost Due to:						
Salary Merit / Longevity Scale	2.9	0.73%	0.1	0.06%	3.0	0.62%
Mortality Rates	1.9	0.47%	0.6	0.89%	2.5	0.54%
Retirement Rates	(0.0)	(0.01%)	(0.4)	(0.49%)	(0.4)	(0.08%)
Termination Rates	0.1	0.05%	(0.2)	(0.28%)	(0.1)	(0.01%)
Disability Rates	0.1	0.04%	(0.0)	0.00%	0.1	0.04%
Deferral Age Changes	(0.0)	0.00%	(0.2)	(0.26%)	(0.2)	(0.05%)
Sps Age Difference Changes	(0.3)	(0.08%)	(0.1)	(0.20%)	(0.4)	(0.09%)
New Employee Contribution Rates	(0.7)	(0.19%)	(0.1)	(0.11%)	(0.8)	(0.19%)
Total Change due to Demographic Assump	4.1	1.01%	(0.2)	(0.39%)	3.8	0.78%
Total Cost as of January 1, 2019 After Assumption Changes	$ **165.5**	**41.59%**	$ **57.8**	**79.76%**	$ **223.4**	**47.46%**

SECTION II – ECONOMIC ASSUMPTIONS
PRICE INFLATION

The economic assumptions used in actuarial valuations are intended to be long-term in nature, and should be both individually reasonable and consistent with each other. The specific assumptions analyzed in this report are:

- **Price inflation** – used indirectly as an underlying component of other economic assumptions.
- **Wage inflation** – across the board wage growth used to project benefits and to amortize the unfunded liability as a level percentage of expected payroll.
- **COLA growth** – rate at which inflation-linked post-retirement COLAs are expected to change.
- **Discount rate** – used both to project long-term asset growth and to discount future cash flows in calculating the liabilities and costs of the Plan.

In order to develop recommendations for each of these assumptions, we considered historical data, both nationally and for the Plan, and expectations for the future, as expressed by the Plan's and other external investment consultants and the Board.

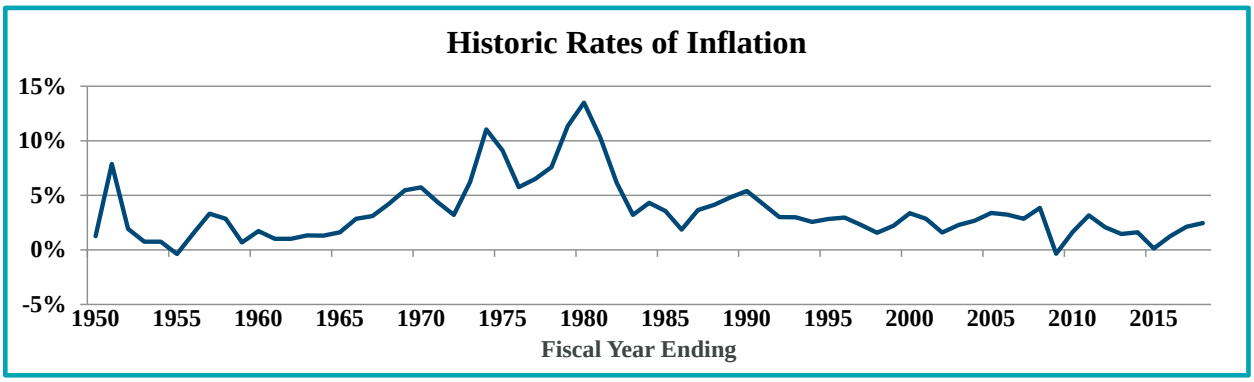
PRICE INFLATION

Long-term price inflation rates are the foundation of other economic assumptions. In a growing economy, wages and investments are expected to grow at the underlying inflation rate plus some additional real growth rate, whether it reflects productivity in terms of wages or risk premiums in terms of investments.

Historical Data

Chart II-1 below shows inflation for the U.S. by individual year since 1950.

Chart II-1



SECTION II – ECONOMIC ASSUMPTIONS

PRICE INFLATION

Over the 50 years ending December 2018, the geometric average inflation rate for the U.S. has been about 4.0%, but this average is heavily influenced by the high inflation rates in the 1970s and early 1980s. Over the last 30 years, the geometric average inflation rate has been 2.5%, and only about 1.8% over the past 10 years.

Future Expectations

A measure of the market consensus of expected future inflation rates is the difference in yields between conventional treasury bonds and Treasury Inflation-Protected Securities (TIPS) at the same maturity. Table II-1 shows the yields on both types of bonds and the break-even inflation rate as of December 2018. Break-even inflation is the level of inflation needed for an investment in TIPS to "break even" with an investment in conventional treasury bonds of the same maturity.

Table II-1

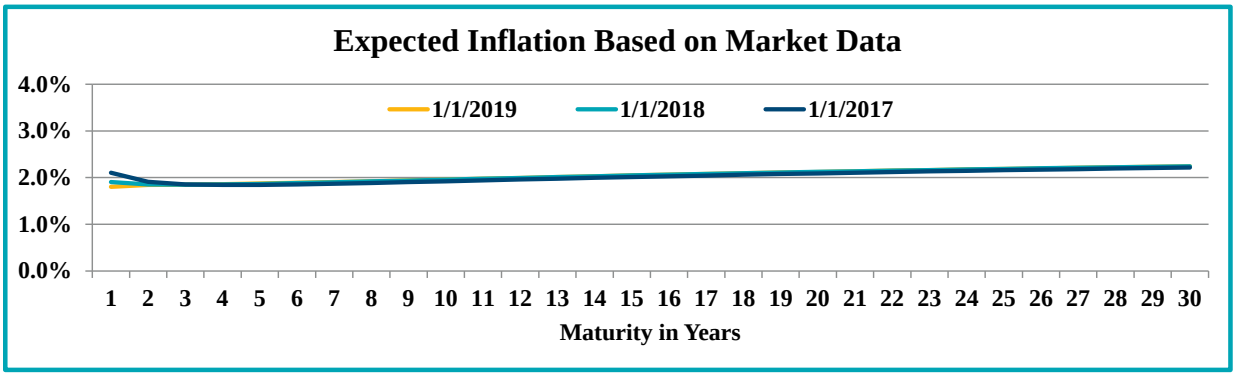
Break-Even Inflation Based on Treasury Bond Yields

Time to Maturity	Conventional Yield	TIPS Yield	Break Even Inflation
5 Years	2.33%	0.49%	1.84%
10 Years	2.53%	0.60%	1.93%
20 Years	2.76%	0.79%	1.97%

Data Source Federal Reserve, Constant Maturity Yields, Monthly Series

The Federal Reserve Bank of Cleveland publishes a forecast of inflation based primarily on this same data, as well as additional information such as inflation swaps and surveys of professional forecasters. Chart II-2 shows a summary of their published expectations as of the last three valuation dates.

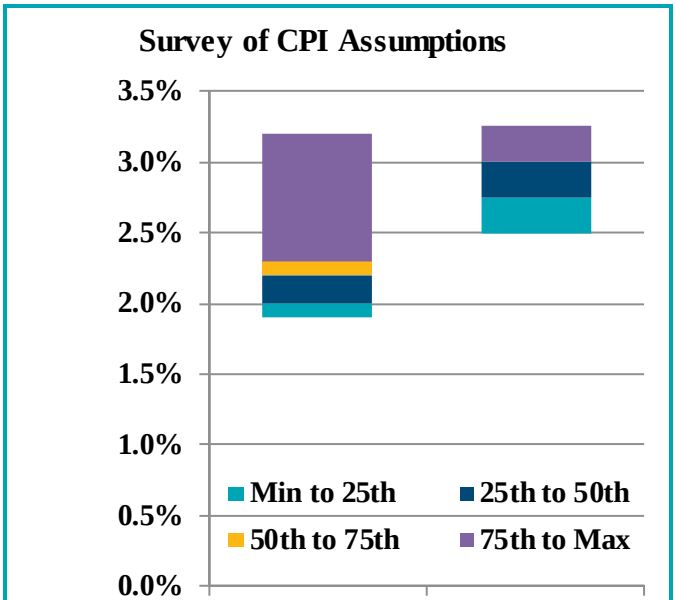
Chart II-2



SECTION II – ECONOMIC ASSUMPTIONS
PRICE INFLATION

The Federal Reserve Bank of Philadelphia publishes a quarterly survey of professional economic forecasters. Chart II-3 shows the distribution of the professionals forecasts for average inflation over the next 10 years compared to assumptions used by California public pension plans.

Chart II-3



	Economic Forecasters	California Plans
Minimum	1.90%	2.50%
25th Percentile	2.00%	2.75%
50th Percentile	2.20%	3.00%
75th Percentile	2.30%	3.00%
Maximum	3.20%	3.25%

Finally, PCA, the Board's investment consultant, uses an inflation assumption of 2.25%, similar to that of many other investment consultants. A 2018 survey of investment consultants published by Horizon Actuarial Services indicated an average inflation assumption of 2.24% for the next 10 years, and 2.49% over the next 20 years.

Based on all of these considerations, we believe a reasonable range for long-term price inflation for use in the Plan's actuarial valuations is between 2.0% and 3.25%. Therefore, we believe the Board's recent action to maintain the assumption of 2.90% is reasonable. If, at the time of the next review of economic assumptions, the markets and forecasters continue to indicate lower expectations of future inflation, a reduction in the assumption should be considered.

WAGE INFLATION

Wage inflation can be thought of as the annual across-the-board increase in wages. Individuals often receive salary increases in excess of the wage inflation rate, and we study these increases as a part of the merit salary scale assumption. Wage inflation generally exceeds price inflation by some margin reflecting the history of increased purchasing power.

Wage inflation is used in the actuarial valuation as the minimum expected salary increase for an individual and, for purposes of amortizing the unfunded actuarial liability, the rate at which payroll is expected to grow over the long term, assuming a stable active member population.

From 2002 through 2018, national wage inflation averaged approximately 2.69% compared to annual price inflation of 2.10%, making wage increases more than 0.5% above inflation. However, over the same time period the increase in the median real wage was only 0.3% per year, as much of the growth in wages was clustered at the top end of the wage scale. Wage inflation dropped significantly in 2008 and 2009, and there were smaller declines in national average wage growth in 2013 and 2016.

It is acceptable to assume some additional level of base payroll increase beyond general inflation. Potential reasons contributing to the increase may include the presence of strong union representation in the collective bargaining process, competition in hiring among other similar employers, and regional factors – such as the local inflation index exceeding the national average, as has sometimes proven the case in parts of California. Also, the Social Security Administration projects real wage growth of 0.6% - 1.8% going forward in their Social Security solvency projections. However, governmental entities remain under financial stress, and other areas of employee compensation – most notably health care costs and pension contributions – have continued to increase faster than the CPI.

Cheiron agrees with the Board's recent action to maintain a small non-inflationary base payroll growth assumption of 0.25% annually. As a result, the annual expected increase in base payroll will remain at 3.15%. This rate is applied to all continuing active members and to starting pay for new entrants when projections of future populations are required. This rate is also used in the calculation of the unfunded liability amortization payment as a level percentage of payroll.

COLA GROWTH

Members of SJCERA are eligible to receive automatic Cost of Living Adjustments (COLAs) based on the growth in the Bay Area Consumer Price Index (CPI-U) and a 3% cap on the annual COLA increase. Any increase in the CPI above the maximum increase can be banked for future years in which the change in the CPI is below the maximum increase.

SECTION II – ECONOMIC ASSUMPTIONS

WAGE INFLATION AND COLA GROWTH

It is necessary to determine an assumed rate of COLA growth, reflecting both inflation (i.e. the growth in the CPI), and the interaction of the CPI with the COLA cap and banking mechanism. Simulations of inflation show us that the average growth in the COLA is expected to be below the cap, even if the expected increase in the CPI is equal to or higher than the cap itself. This is because if there is not a significant bank already in existence (such as in the early years of retirement) and there are years in which inflation is below the cap, this shortfall will not be made up in future years.

We have produced statistical simulations of inflation and then modeled how the COLA maxima and the banking process interact with the changes in CPI. For a given long-term estimate of inflation, we used a 30% autocorrelation factor with 1.5% annual inflation volatility. A starting inflation level of 3.50% was used in the simulations, to reflect the most recent level of Bay Area inflation.

Based on the results of these simulations, and using the 2.90% inflation assumption adopted by the Board, which we believe to be reasonable, we recommended maintaining the 2.60% COLA growth assumption used in the prior actuarial valuation.

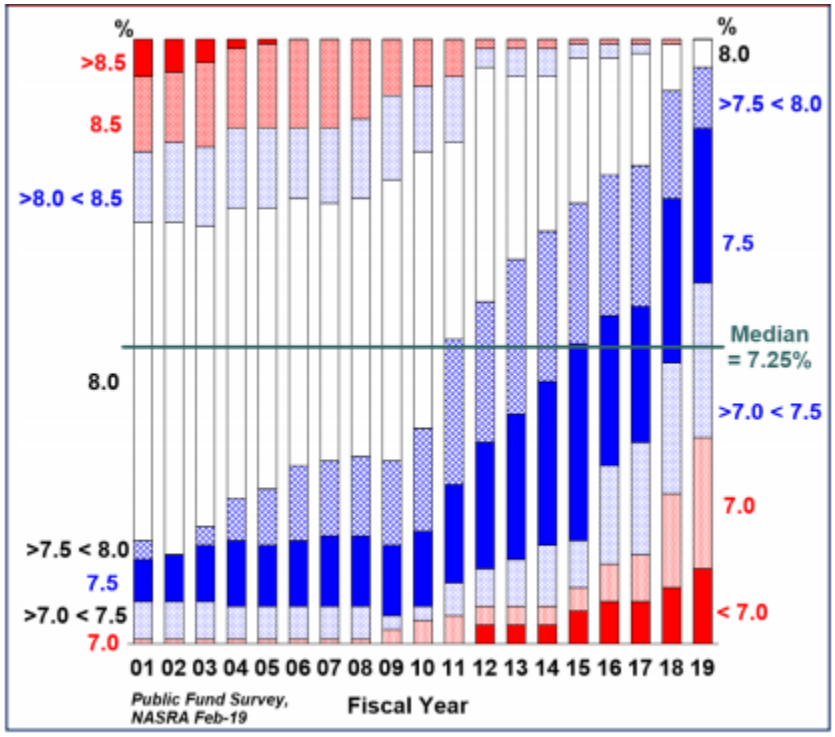
DISCOUNT RATE

The discount rate assumption is generally the most significant of all the assumptions employed in actuarial valuations. The discount rate is based on the long-term expected return on plan investments. In the short-term, a higher discount rate results in lower expected contributions. However, over the long term, actual contributions will depend on actual investment returns and not the discount rate (or expected investment returns). If actual investment returns are lower than expected, contribution rates will increase in the future. It is important to set a realistic discount rate so that projections of future contributions for budgeting purposes will not be biased, particularly to be too low.

Other Large Public Retirement Plans

Based on the Public Fund Survey, developed by the National Association of State Retirement Administrators (NASRA) covering most of the largest public retirement systems in the country, there has been a general movement over at least the last decade to reduce the discount rate used in actuarial valuations. Chart II-4 below shows the change in the distribution of assumptions since 2001. The median assumption is now 7.25% and the number of plans using a discount rate of 7.5% or lower has increased significantly.

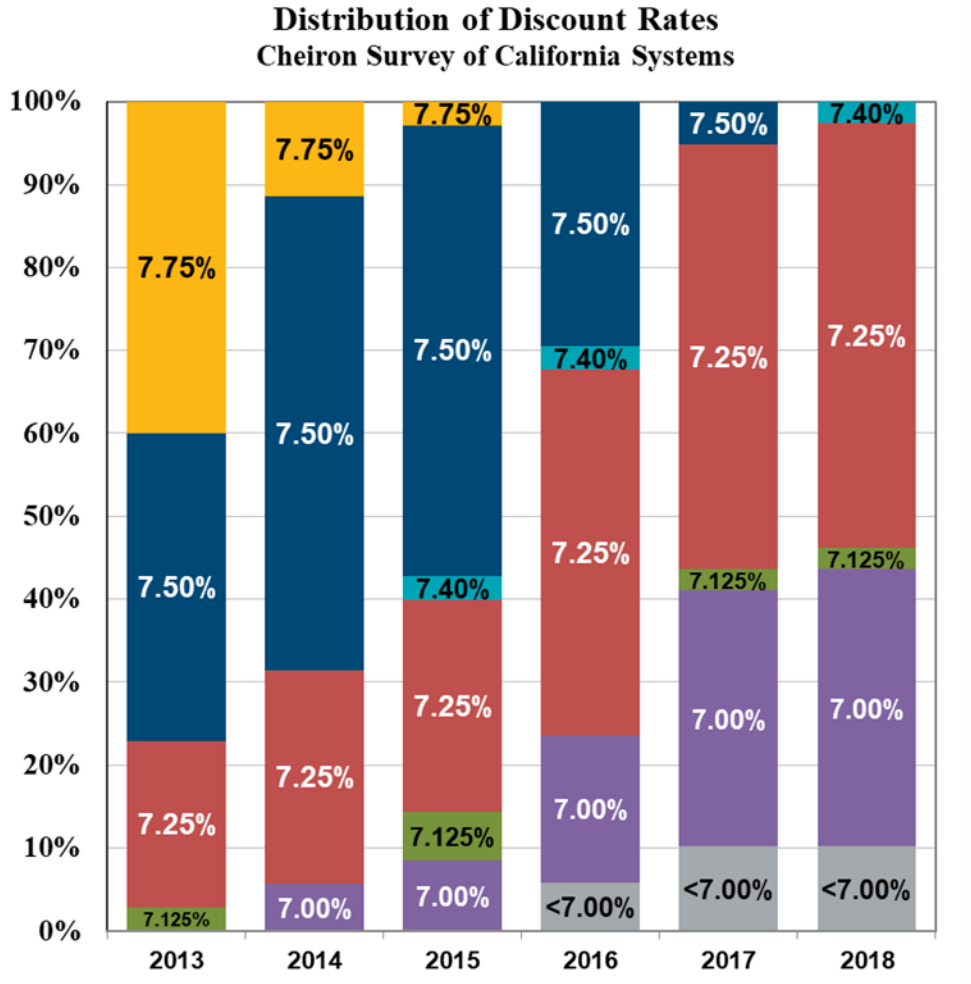
Chart II-4
Change in Distribution of Public Pension Investment Return Assumptions.
FY 01 to FY 19



SECTION II – ECONOMIC ASSUMPTIONS
DISCOUNT RATE

Our survey of California retirement systems has the same median assumption of 7.25%, with 20 of the 39 systems using the median rate and only one system above the median rate. Chart II-5 below shows the change in discount rate assumptions for California systems from 2013 to 2018.

Chart II-5



Target Asset Allocation and Future Expectations

The discount rate assumption depends on the anticipated average level of inflation and the anticipated average *real rate of return.* The real rate of return is the investment return in excess of underlying inflation. The expected average real rate of return is heavily dependent on asset mix: the portion of assets in stocks, bonds, and other asset classes.

SECTION II – ECONOMIC ASSUMPTIONS
DISCOUNT RATE

Table II-2 below shows the expected nominal geometric return based on the Board's current target asset allocation and the 10-year capital market assumptions provided by the Plan's investment consultant (PCA/Meketa), another investment consultant active in the California public plan market (Verus), and a survey of multiple investment consultants published by Horizon Actuarial Services (based on both a 10 and 20 year time horizon). The table also shows the underlying inflation assumption used by each investment consultant in the development of their capital market assumptions and computes the expected real rate of return (investment return in excess of inflation).

Table II-2

SJCERA Target Portfolio Return Expectations

Source	Nominal	Inflation	Real
PCA / Meketa	6.26%	2.25%	4.01%
Verus	6.50%	2.00%	4.50%
Horizon (Survey, 10-year)	6.46%	2.24%	4.22%
Horizon (Survey, 20-year)	7.42%	2.47%	4.95%
Average	6.66%	2.24%	4.42%

The average expected geometric real return (i.e. the return above inflation) of these assumptions is 4.42%, which is above the Board's current real return assumption of 4.35%.

Based on these capital market assumptions, we also calculated the potential distribution of returns over the periods as shown in Table II-3

Table II-3

Expected Distribution of Average Annual Passive Investment Returns

	PCA / Meketa (10 years)		Verus (10 years)		Horizon Survey (20 years)	
Percentile	Nominal	Real	Nominal	Real	Nominal	Real
95th	11.41%	9.41%	11.42%	9.42%	10.90%	8.43%
75th	8.34%	6.34%	8.49%	6.49%	8.84%	6.37%
50th	6.26%	**4.26%**	6.50%	**4.50%**	7.42%	**4.95%**
25th	4.21%	2.21%	4.55%	2.55%	6.03%	3.56%
5th	1.34%	-0.66%	1.80%	-0.20%	4.05%	1.58%

SECTION II – ECONOMIC ASSUMPTIONS

DISCOUNT RATE

As of the 2013 valuation, the expected rate of return is expressed net of investment, but not administrative expenses. The returns above were modeled based on the expected returns of the portfolio benchmark indices, which are expected to have minimal expenses. The actuarial standards on selecting a return assumption (ASOP 27) state that in general superior or inferior returns (net of fees) should not be assumed for active versus passive management, therefore we do not recommend a significant adjustment to the modeled returns for the fees of the asset managers. However, a slight margin is appropriate to reflect the investment-related expenses other than those of the investment managers, which would include the investment advisor and custodian.

The current real return assumption of 4.35% is consistent with the Verus and Horizon Survey capital market assumptions, including a small adjustment for investment-related expenses as described above, though slightly higher than the PCA/Meketa assumptions. After combining the real return with the inflation assumption of 2.90%, we find the current discount rate of 7.25% to be a reasonable assumption. However, there are a number of factors that suggest that the near-term expected rate of return should be discussed.

- Many investment consultants expect poor rates of return in the immediate and near-term future. They reason that there is little in the way of yields on fixed income, and that the equity markets are fully valued.
- If PCA/Meketa and much of the investment community are correct in their projections, we can expect returns below the 7.25% assumed rate for a number of years. This will result in actuarial losses and increases in employer contribution rates. However, these losses may be partially offset by gains on the liabilities from price and wage inflation below the assumed level (2.90% and 3.15%, respectively)
- We believe that near- and mid-term return projections should be considered along with long-term projections. Fund performance is usually measured over five to 10 years; longer measurement periods are often considered less relevant because of the potential for changes in the economy and in the investment markets.

We recommend that the Board and staff continue to conduct at least a brief discussion of this assumption annually, in consultation with the Plan's actuary and investment consultant, to determine if further changes are appropriate.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MERIT SALARY INCREASES

Demographic assumptions are used to predict membership behavior, including rates of retirement, termination, disability, and mortality. These assumptions are based primarily on the historical experience of SJCERA, with some adjustments where future experience is expected to differ from historical experience and with deference to standard tables where SJCERA experience is not fully credible and a standard table is available. For purposes of this study, merit salary increases are also considered a demographic assumption because the assumption is based primarily on SJCERA's historical experience.

MERIT SALARY INCREASES

Salary increases consist of three components: increases due to cost of living maintenance (inflation), increases related to non-inflationary pressures on base pay (such as productivity increases), and increases in individual pay due to merit, promotion, and longevity. Increases due to cost of living and non-inflationary base pay factors were addressed in an earlier section of this report.

The merit salary increase assumption is analyzed by employee group and by service. Generally, newer employees are more likely to earn a step increase or receive a promotion, so their salary increases tend to be greater than those for longer service employees are. A longitudinal approach was used to analyze the merit increases for this study.

A *longitudinal* study reviews the average increase in pay for each level of service. To analyze the merit component, we subtracted the Plan's real wage growth from the total pay increases experienced by each member during the experience study period. We have computed the real wage growth by calculating the increase in the average salary across all active members (calculated separately for General and Safety) each year, and adjusting for changes in the average service level.

Charts III-1 and III-3 on the following pages analyze the pay patterns for General and Safety members, respectively. The charts show the current assumption (red line) compared to the actual experience (blue line) and the proposed assumption (green line).

Charts III-2 and III-4 summarize the current and proposed salary increase assumptions at each key year of service.

It is important to note that the data may have been skewed by negative increases in some years. Therefore, as with any assumption change, there is movement in the direction of data, but not necessarily the entire way.

We have proposed new assumptions with higher increases for General members with less than 15 years of service, and for General members with more than 30 years of service. The ultimate rate is changed from 0.00% to 0.50%.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MERIT SALARY INCREASES

Chart III-1: General

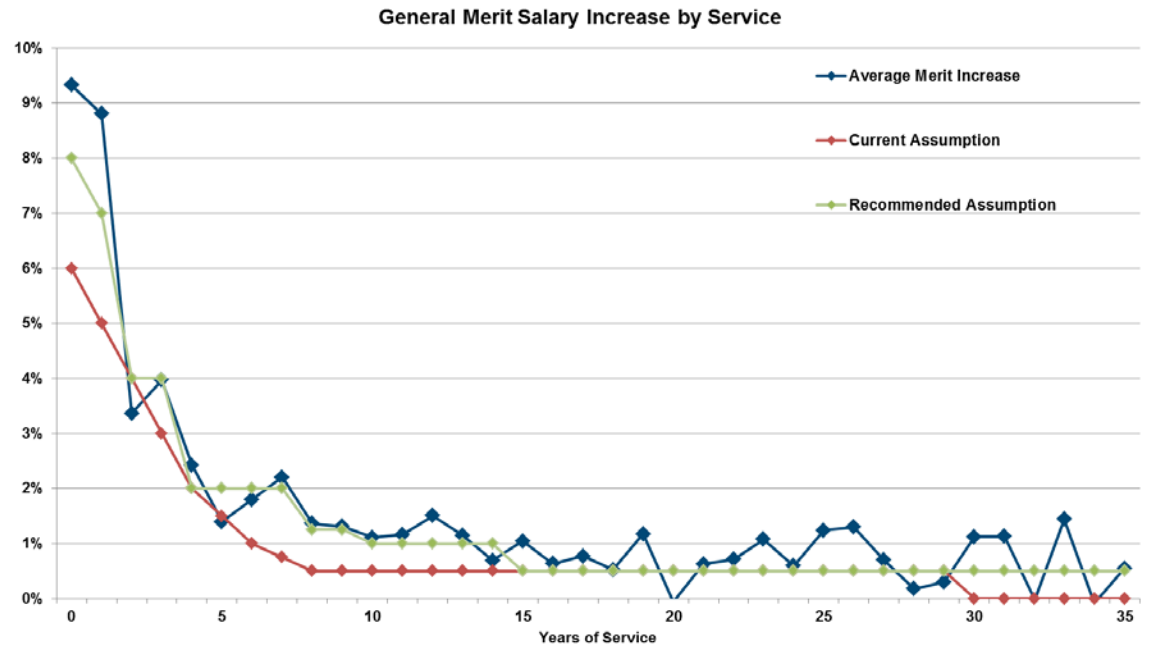


Chart III-2: General

Merit Salary Increases General		
Age	Current	Recommended
0	6.00%	8.00%
1	5.00%	7.00%
2	4.00%	4.00%
3	3.00%	4.00%
4	2.00%	2.00%
5	1.50%	2.00%
6	1.00%	2.00%
7	0.75%	2.00%
8-9	0.50%	1.25%
10-14	0.50%	1.00%
15-29	0.50%	0.50%
30+	0.00%	0.50%

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MERIT SALARY INCREASES

We have proposed higher rates for Safety members with less than five years of service, and otherwise maintain the prior assumption.

An argument could be made for even higher early career increases for both General and Safety, but data in the first year of service is subject to volatility due to the annualization of pay. We also reviewed early career actual pay patterns and they appear reasonable compared to assumptions.

The revised assumptions for both the General and Safety groups provide a better fit to the data under a longitudinal approach.

Chart III-3: Safety

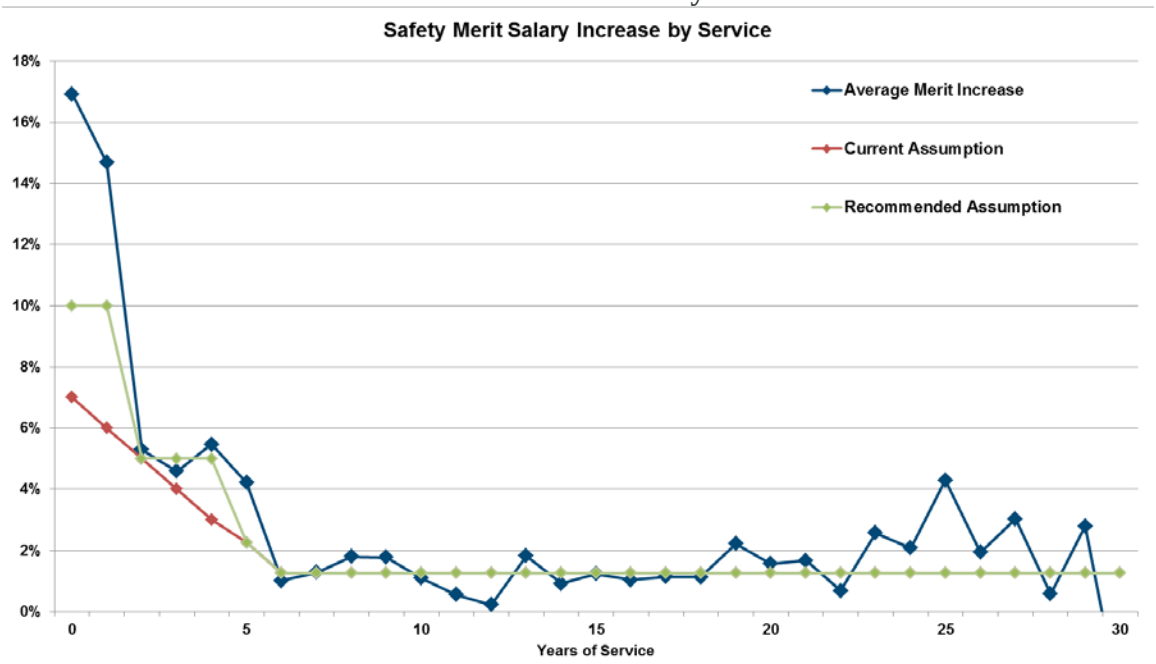


Chart III-4: Safety

Merit Salary Increases Safety		
Age	Current	Recommended
0	7.00%	10.00%
1	6.00%	10.00%
2	5.00%	5.00%
3	4.00%	5.00%
4	3.00%	5.00%
5	2.25%	2.25%
6	1.25%	1.25%
7	1.25%	1.25%
8	1.25%	1.25%
9	1.25%	1.25%
10+	1.25%	1.25%

ANALYSIS OF OTHER DEMOGRAPHIC ASSUMPTIONS

For all of the remaining demographic assumptions, we determined the ratio of the actual number of decrements for each membership group compared to the expected number of decrements (A/E ratio or actual-to-expected ratio). If the assumption is perfect, this ratio will be 100%. Otherwise, any recommended assumption change should move from the current A/E ratio towards 100% unless future experience is expected to be different than the experience during the period of study.

We also calculate an r-squared statistic for each assumption. R-squared measures how well the assumption fits the actual data and can be thought of as the percentage of the variation in actual data explained by the assumption. Ideally, r-squared would equal 1.00 although this is never the case. Any recommended assumption change should increase the r-squared compared to the current assumption making it closer to 1.00 unless the pattern of future decrements is expected to be different from the pattern experienced during the period of study.

In addition, we calculated the 90% confidence interval, which represents the range within which the true decrement rate during the experience study period fell with 90% confidence. (If there is insufficient data to calculate a confidence interval, the confidence interval is shown as the entire range of the graph.) We generally propose assumption changes when the current assumption is outside the 90% confidence interval of the observed experience. However, adjustments are made to account for differences between future expectations and historical experience and to account for the past experience represented by the current assumption. For mortality rates, we compare SJCERA's experience to that of a standard table and adjust the tables to bring the proposed assumption closer to an A/E ratio of 100%.

Finally, since the amount of data that is available over a three year period to analyze the decrements is somewhat limited, we have added data from the prior study where noted to add more credibility to these calculations.

RETIREMENT RATES

The current retirement rates vary by age and service and are applied to all members who are eligible to retire. Generally, at any given age, members with more service are generally more likely to retire than members with fewer years of service. SJCERA is not large enough to justify assumptions for each age and service combination. We continue to recommend separate assumptions by age and gender for each of the following three service groups for General members:

- Members with 5-9 years of service,
- Member with 10-29 years of service,
- Members with 30 or more years of service.

SECTION III – DEMOGRAPHIC ASSUMPTIONS

RETIREMENT RATES

We continue to recommend separate assumptions by age for each of the following two service groups for Safety members:

- Members with less than 20 years of service,
- Members with 20 or more years of service.

Retirement data for all members between January 1, 2016 and December 31, 2018 was somewhat limited, so we have added data from the prior study, January 1, 2013 through December 31, 2015, to add more credibility to these calculations.

We continue to recommend using the same assumptions for Tier I and II members, with the exception that the rates will only be applied once the member is eligible for retirement. For example, the retirement rates for the Tier II General members will not be applied until the member has reached age 52.

Although some have speculated that the reduced multipliers reflected in the Tier II benefits may result in members working longer than they would have under the Tier I benefit formulas, we do not yet have any plan experience to support a different set of assumptions. In addition, our initial modeling of the Tier II benefits revealed that the actuarially determined contribution rates required to fund these benefits are relatively insensitive to the actual retirement rates, as a result of the early retirement reductions reflected in the benefit formulas.

Table III-R1 shows the calculation of actual-to-expected ratios and the r-squared statistic for General female members with between five and nine years of service. Chart III-R1 shows the information graphically along with the 90% confidence interval.

The data shows lower actual retirement rates than expected under the current assumption. The proposed assumption decreases the aggregate assumed rate of retirement and increases the aggregate A/E ratio from 90% to 96%. The r-squared also increases from 0.26 to 0.92.

See Appendices A and B for a full listing of the proposed and prior rates. The ultimate retirement age remains at 70.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Chart III-R1 -General

General - Female Retirement Rates For 5 to 9 Years of Service

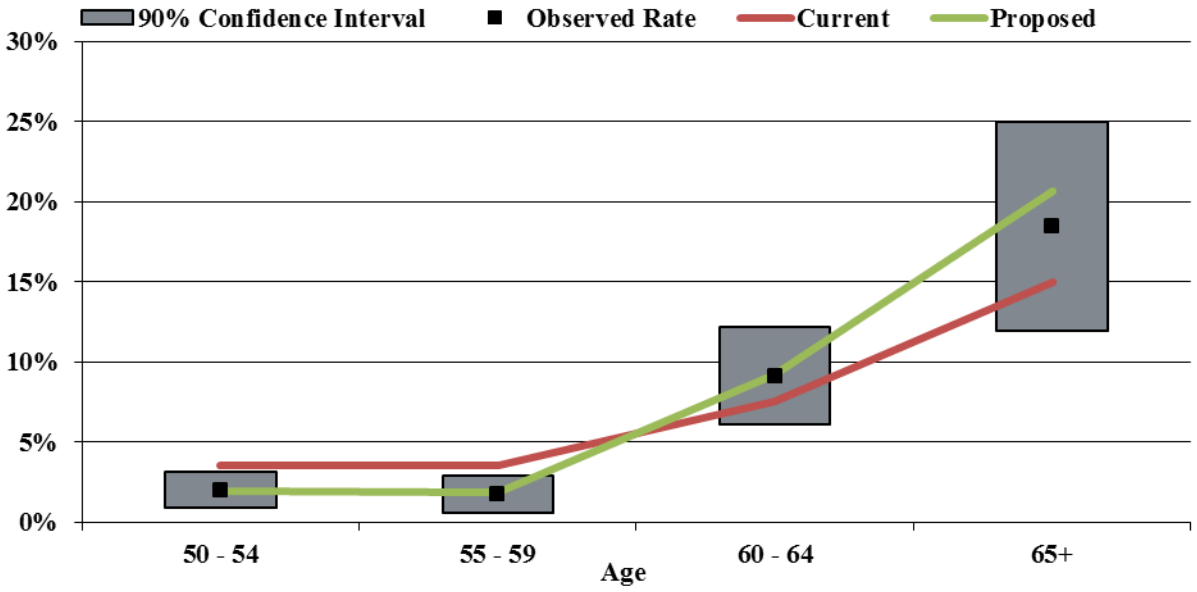


Table III-R1 – General

Female Retirement Rates - 5-9 Years of Service						
		Retirements			Actual to Expected Ratios	
Age	Exposures	Actual	Current	Recommended	Current	Recommended
50 - 54	451	9	16	9	57%	105%
55 - 59	344	6	12	6	50%	95%
60 - 64	230	21	17	21	122%	99%
65+	92	17	14	19	123%	89%
Total	**1,117**	**53**	**59**	**55**	**90%**	**96%**
R-squared			**0.2609**	**0.9238**		

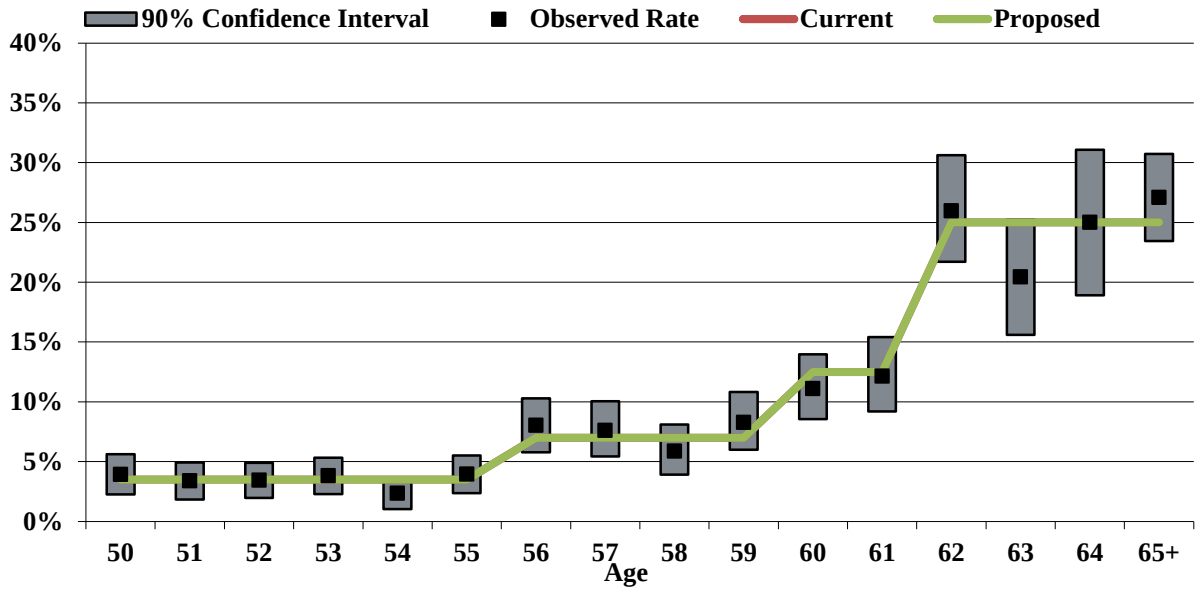
SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Table III-R2 shows the calculation of actual-to-expected ratios and the r-squared statistic for General female members with service between 10 and 29 years, and Chart III-R2 shows the information graphically along with the 90% confidence interval.

The data shows actual retirement rates nearly equal to expected under the current assumption. We do not propose any changes to the assumption, thereby maintaining an aggregate A/E ratio of 100% and an r-squared of 0.93.

See Appendices A and B for a full listing of the rates. The ultimate retirement age remains at 70.

Chart III-R2 - General



SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Table III-R2 – General

Female Retirement Rates - 10-29 Years of Service						
		Retirements			Actual to Expected Ratios	
Age	Exposures	Actual	Current	Recommended	Current	Recommended
50	356	14	12	12	112%	112%
51	385	13	13	13	96%	96%
52	408	14	14	14	98%	98%
53	394	15	14	14	109%	109%
54	385	9	13	13	67%	67%
55	381	15	13	13	112%	112%
56	399	32	28	28	115%	115%
57	368	28	26	26	109%	109%
58	358	21	25	25	84%	84%
59	351	29	25	25	118%	118%
60	351	39	44	44	89%	89%
61	305	37	38	38	97%	97%
62	258	67	65	65	104%	104%
63	186	38	47	47	82%	82%
64	148	37	37	37	100%	100%
65+	384	104	96	96	108%	108%
Total	**5,417**	**512**	**510**	**510**	**100%**	**100%**
R-squared			**0.9298**	**0.9298**		

On the following page, Table III-R3 shows the calculation of actual-to-expected ratios and the r-squared statistic for General female members with 30 or more years of service. Chart III-R3 shows the information graphically along with the 90% confidence interval.

The data shows slightly higher actual retirement rates than expected under the current assumption. The proposed assumption increases the aggregate assumed rate of retirement and decreases the aggregate A/E ratio from 102% to 100%. The r-squared increases from 0.84 to 0.92.

See Appendices A and B for a full listing of the proposed and prior rates. The ultimate retirement age remains at 70.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Chart III-R3 - General

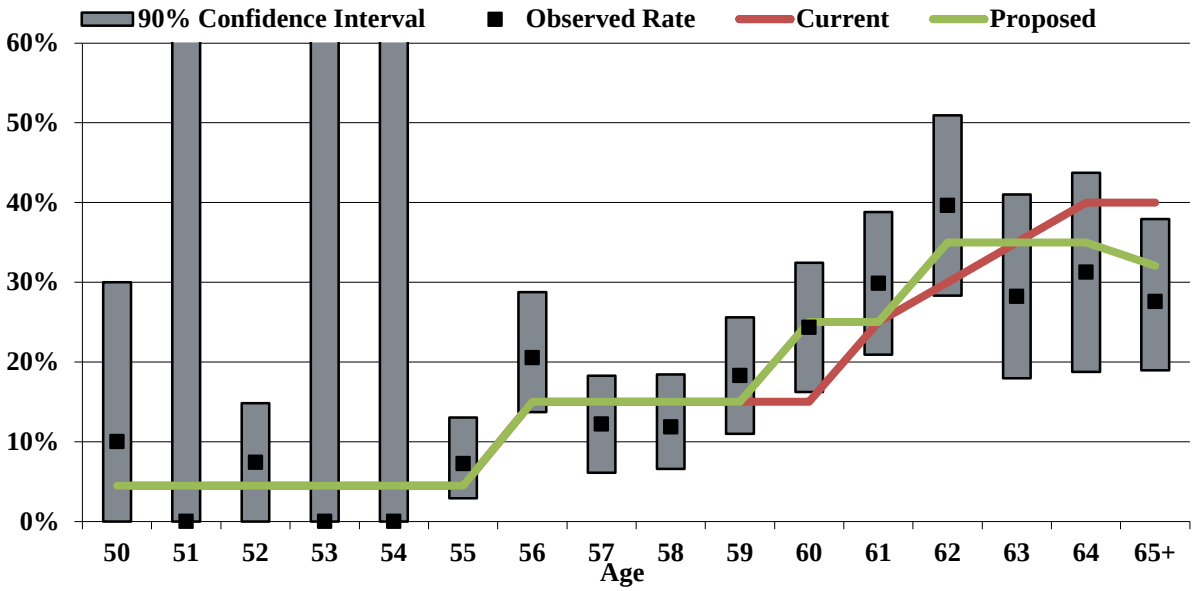


Table III-R3 – General

General - Female Retirement Rates For 30 or More Years of Service						
		Retirements			Actual to Expected Ratios	
Age	Exposures	Actual	Current	Recommended	Current	Recommended
50	10	1	0	0	222%	222%
51	14	0	1	1	0%	0%
52	27	2	1	1	165%	165%
53	38	0	2	2	0%	0%
54	52	0	2	2	0%	0%
55	69	5	3	3	161%	161%
56	73	15	11	11	137%	137%
57	82	10	12	12	81%	81%
58	76	9	11	11	79%	79%
59	82	15	12	12	122%	122%
60	74	18	11	19	162%	97%
61	67	20	17	17	119%	119%
62	53	21	16	19	132%	113%
63	39	11	14	14	81%	81%
64	32	10	13	11	78%	89%
65+	58	16	23	19	69%	86%
Total	**846**	**153**	**150**	**154**	**102%**	**100%**
R-squared			**0.8423**	**0.9188**		

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Table III-R4 shows the calculation of actual-to-expected ratios and the r-squared statistic for General male members with between five-nine years of service. Chart III-R4 shows the information graphically along with the 90% confidence interval.

The data shows higher actual retirement rates than expected under the current assumption. The proposed assumption increases the aggregate assumed rate of retirement and decreases the aggregate A/E ratio from 108% to 96%. The r-squared increases from 0.51 to 0.81.

See Appendices A and B for a full listing of the proposed and prior rates. The ultimate retirement age remains at 70.

Chart III-R4 - General

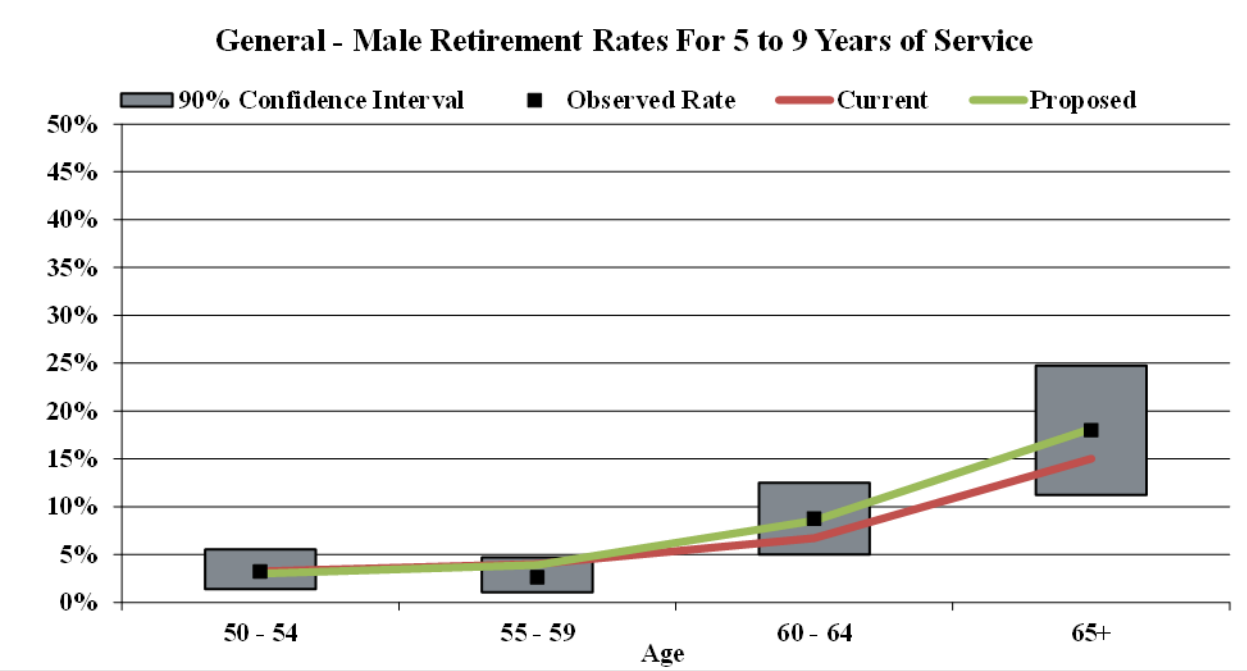


Table III-R4 – General

Male Retirement Rates - 5-9 Years of Service						
		Retirements			Actual to Expected Ratios	
Age	Exposures	Actual	Current	Recommended	Current	Recommended
50 - 54	218	7	7	7	99%	107%
55 - 59	192	5	8	7	65%	67%
60 - 64	160	14	11	14	130%	102%
65+	89	16	13	16	120%	99%
Total	**659**	**42**	**39**	**44**	**108%**	**96%**
R-squared			**0.5147**	**0.8080**		

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Table III-R5 shows the calculation of actual-to-expected ratios and the r-squared statistic for General male members with service between 10 and 29 years, and Chart III-R5 shows the information graphically along with the 90% confidence interval.

The data shows lower actual retirement rates than expected under the current assumption. The proposed assumption decreases the aggregate assumed rate of retirement and increases the aggregate A/E ratio from 88% to 100%. The r-squared increases from 0.77 to 0.92.

See Appendices A and B for a full listing of the proposed and prior rates. The ultimate retirement age remains at 70.

Chart III-R5

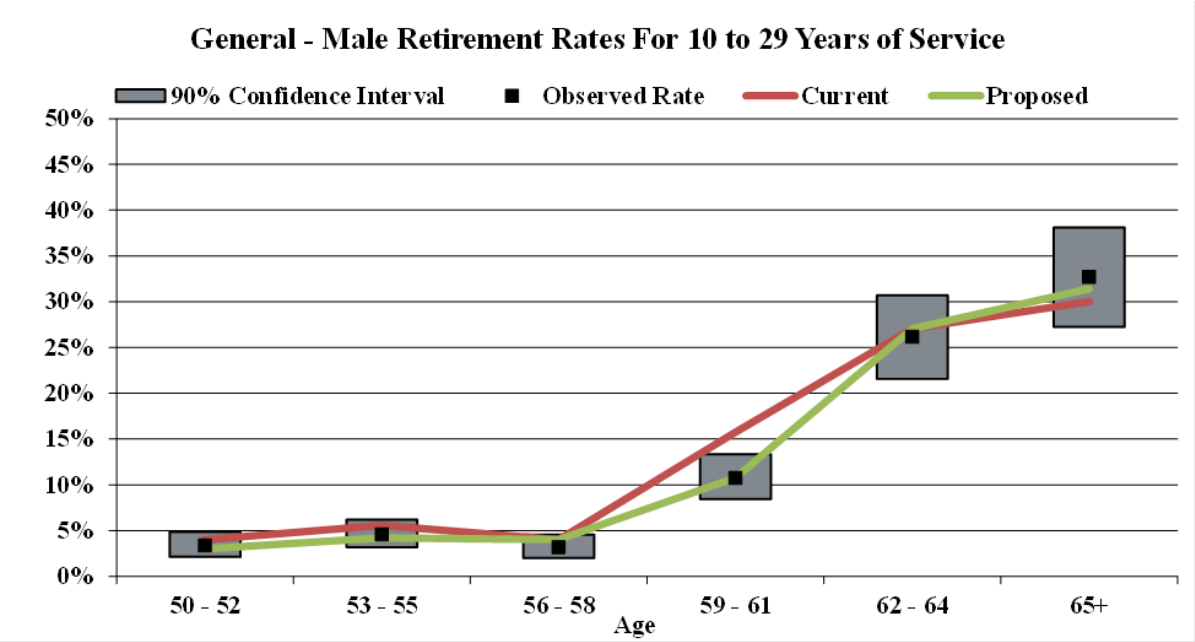


Table III-R5 – General

Male Retirement Rates - 10-29 Years of Service						
		Retirements			Actual to Expected Ratios	
Age	Exposures	Actual	Current	Recommended	Current	Recommended
50 - 52	474	16	19	14	84%	113%
53 - 55	502	23	28	21	82%	109%
56 - 58	504	16	20	20	79%	79%
59 - 61	428	46	67	46	68%	100%
62 - 64	241	63	65	65	97%	97%
65+	202	66	61	63	109%	104%
Total	**2,351**	**230**	**260**	**230**	**88%**	**100%**
R-squared			**0.7701**	**0.9230**		

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Table III-R6 shows the calculation of actual-to-expected ratios and the r-squared statistic for General male members with 30 or more years of service. Chart III-R6 shows the information graphically along with the 90% confidence interval.

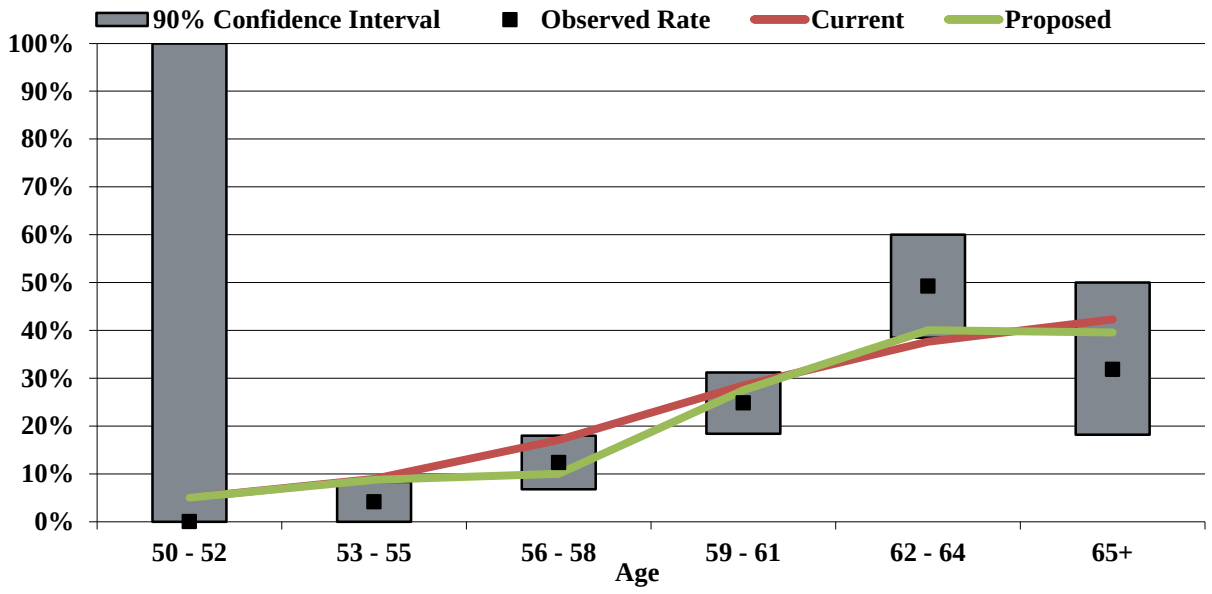
The data shows lower actual retirement rates than expected under the current assumption. The proposed assumption decreases the aggregate assumed rate of retirement and increases the aggregate A/E ratio from 93% to 100%. The r-squared increases from 0.84 to 0.93.

See Appendices A and B for a full listing of the proposed and prior rates. The ultimate retirement age remains at 70.

Table III-R6 - General

Male Retirement Rates - 30+ Years of Service						
		Retirements			Actual to Expected Ratios	
Age	Exposures	Actual	Current	Recommended	Current	Recommended
50 - 52	12	0	1	1	0%	0%
53 - 55	48	2	4	4	47%	48%
56 - 58	89	11	15	9	72%	124%
59 - 61	125	31	36	34	87%	90%
62 - 64	65	32	24	26	131%	123%
65+	22	7	9	9	75%	80%
Total	**361**	**83**	**90**	**83**	**93%**	**100%**
R-squared			**0.8403**	**0.9336**		

Chart III-R6 - General



SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

We note that the current Safety retirement assumptions are split between those with less than 20 years of service and those with at least 20 years of service, with those having greater service levels assumed to experience higher retirement rates at the same age. The same pattern continues to hold in the recent retirement data; therefore, we have not recommended any changes to this approach.

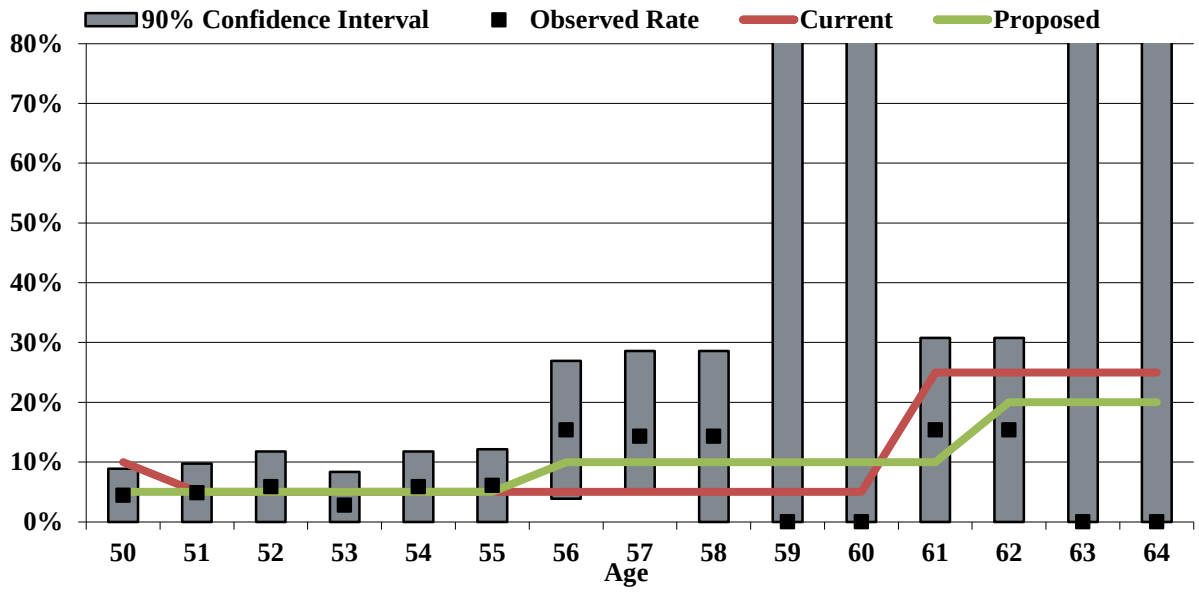
Table III-R7 shows the calculation of actual-to-expected ratios and the r-squared statistic for Safety members with service between five and 19 years, and Chart III-R7 shows the information graphically along with the 90% confidence interval.

The data shows lower actual retirement rates than expected under the current assumption. The proposed assumption decreases the aggregate assumed rate of retirement and increases the aggregate A/E ratio from 81% to 86%. The r-squared increases from 0.001 to 0.156.

See Appendices A and B for a full listing of the proposed and prior rates. The ultimate retirement age remains at 65.

Chart III-R7 - Safety

Safety Retirement Rates For 5 to 19 Years of Service



SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Table III-R7 – Safety

Safety Retirement Rates For 5 to 19 Years of Service						
		Retirements			Actual to Expected Ratios	
Age	Exposures	Actual	Current	Recommended	Current	Recommended
50	45	2	5	2	44%	89%
51	41	2	2	2	98%	98%
52	34	2	2	2	118%	118%
53	36	1	2	2	56%	56%
54	34	2	2	2	118%	118%
55	33	2	2	2	121%	121%
56	26	4	1	3	308%	154%
57	21	3	1	2	286%	143%
58	14	2	1	1	286%	143%
59	13	0	1	1	0%	0%
60	14	0	1	1	0%	0%
61	13	2	3	1	62%	154%
62	13	2	3	3	62%	77%
63	9	0	2	2	0%	0%
64	12	0	3	2	0%	0%
Total	**358**	**24**	**30**	**28**	**81%**	**86%**
R-squared			**0.0006**	**0.1563**		

Table III-R8 shows the calculation of actual-to-expected ratios and the r-squared statistic for Safety members with service more than 20 years, and Chart III-R7 shows the information graphically along with the 90% confidence interval.

The data shows lower actual retirement rates than expected under the current assumption. The proposed assumption decreases the aggregate assumed rate of retirement and increases the aggregate A/E ratio from 93% to 100%. The r-squared increases from 0.50 to 0.81.

See Appendices A and B for a full listing of the proposed and prior rates. The ultimate retirement age remains at 65.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Chart III-R8 - Safety

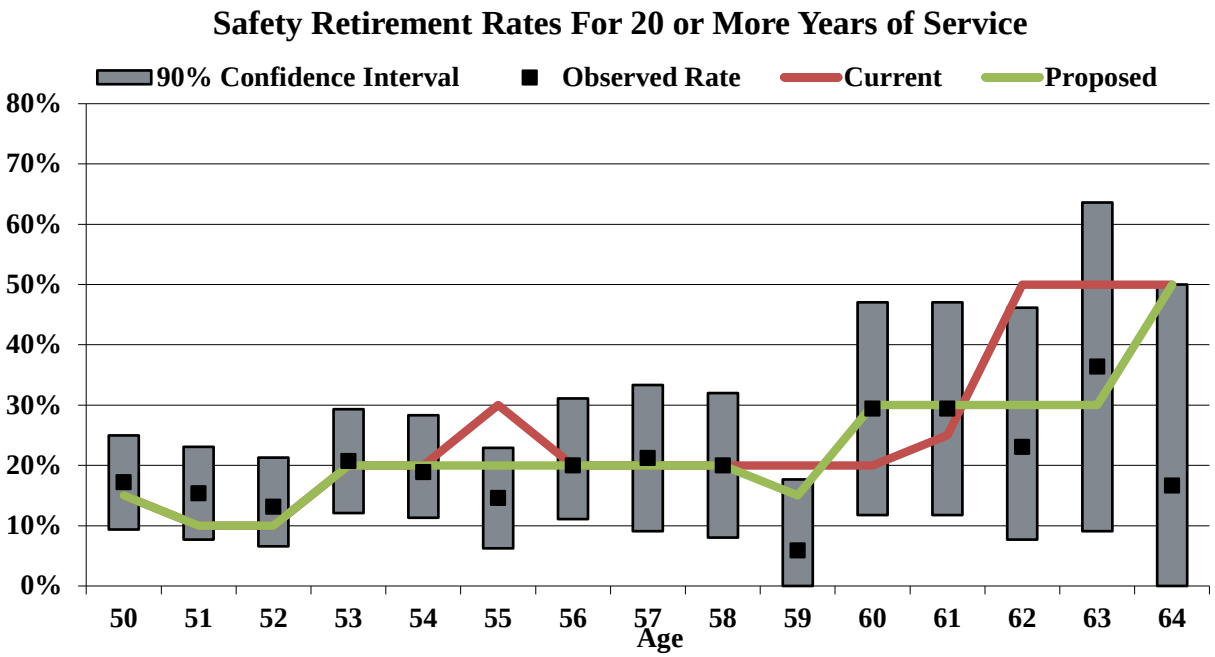


Table III-R8 – Safety

Safety Retirement Rates For 20 or More Years of Service						
		Retirements			Actual to Expected Ratios	
Age	Exposures	Actual	Current	Recommended	Current	Recommended
50	64	11	10	10	115%	115%
51	65	10	7	7	154%	154%
52	61	8	6	6	131%	131%
53	58	12	12	12	103%	103%
54	53	10	11	11	94%	94%
55	48	7	14	10	49%	73%
56	45	9	9	9	100%	100%
57	33	7	7	7	106%	106%
58	25	5	5	5	100%	100%
59	17	1	3	3	29%	39%
60	17	5	3	5	147%	98%
61	17	5	4	5	118%	98%
62	13	3	7	4	46%	77%
63	11	4	6	3	73%	121%
64	6	1	3	3	33%	33%
Total	**533**	**98**	**105**	**98**	**93%**	**100%**
R-squared			**0.4952**	**0.8094**		

SECTION III – DEMOGRAPHIC ASSUMPTIONS
TERMINATION RATES

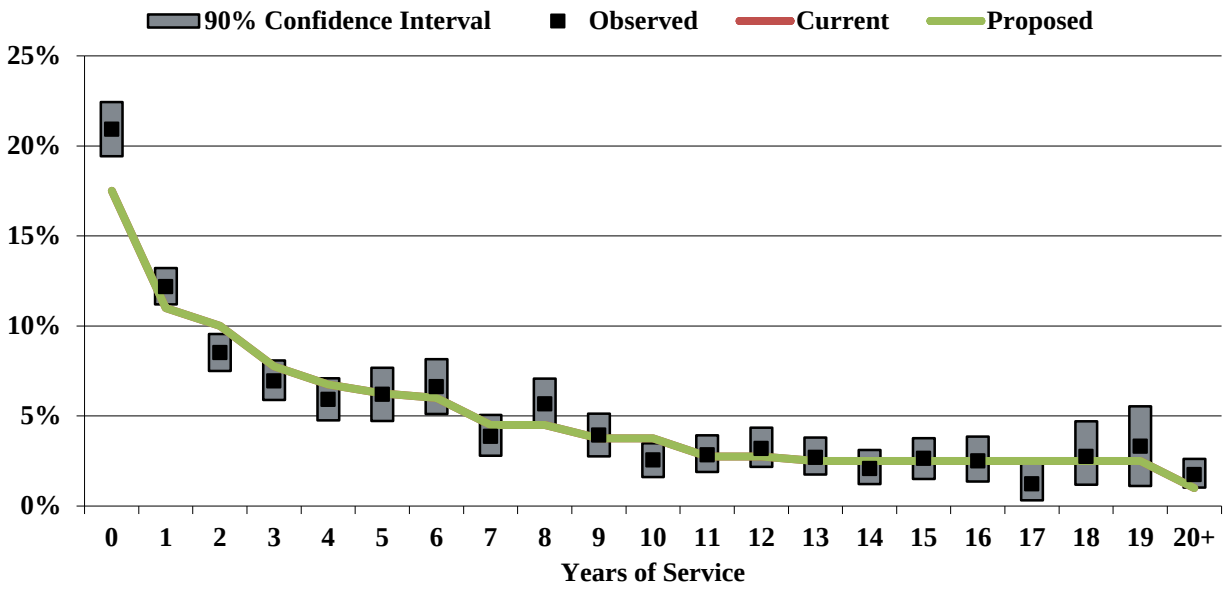
Termination rates reflect the frequency at which active members leave employment for reasons other than retirement, death, or disability. Currently, the termination rates are based on service for both Safety and General members. We have found that the rate of termination is more related to years of service rather than age. This methodology also avoids under-weighting the liabilities that can occur with using age-based rates only. The termination rates do not apply once members are eligible for a service retirement benefit. As with the retirement rate analysis, we have added data from the prior study to add more credibility to these calculations.

Table III-T1 on the following page shows the calculation of actual-to-expected ratios and the r-squared statistic for General members, and Chart III-T1 shows the information graphically along with the 90% confidence interval. The data shows slightly higher actual termination rates than expected under the current assumption, but we are recommending no change in the General termination rates. The current assumptions result in an aggregate A/E ratio of 104%, while the r-squared is 0.98.

See Appendices A and B for a full listing of the proposed and prior rates.

Chart III-T1

Termination Rates - General: All Years of Service



SECTION III – DEMOGRAPHIC ASSUMPTIONS
TERMINATION RATES

Table III-T1

Termination Rates - General: All Years of Service						
		Terminations			Actual to Expected Ratios	
Service	Exposures	Actual	Current	Recommended	Current	Recommended
0	2,002	419	350	350	120%	120%
1	2,831	345	311	311	111%	111%
2	1,949	166	195	195	85%	85%
3	1,411	98	109	109	90%	90%
4	1,115	66	75	75	88%	88%
5	742	46	46	46	99%	99%
6	724	48	43	43	110%	110%
7	752	29	34	34	86%	86%
8	777	44	35	35	126%	126%
9	762	30	29	29	105%	105%
10	746	19	28	28	68%	68%
11	740	21	20	20	103%	103%
12	691	22	19	19	116%	116%
13	633	17	16	16	107%	107%
14	580	12	15	15	83%	83%
15	532	14	13	13	105%	105%
16	442	11	11	11	100%	100%
17	325	4	8	8	49%	49%
18	255	7	6	6	110%	110%
19	181	6	5	5	133%	133%
20+	688	12	7	7	174%	174%
Total	**18,878**	**1,436**	**1,376**	**1,376**	**104%**	**104%**
Confidence Interval %			**71.4%**	**71.4%**		
R-squared			**0.9843**	**0.9843**		

Table III-T2 on the next page shows the calculation of actual-to-expected ratios and the r-squared statistic for Safety members, and Chart III-T2 shows the information graphically along with the 90% confidence interval.

The data shows higher actual termination rates than expected under the current assumption. In aggregate, the proposed assumptions increase the assumed rates of termination. The proposal decreases the aggregate A/E ratio from 112% to 102%. The r-squared increases from 0.69 to 0.80.

See Appendices A and B for a full listing of the proposed and prior rates.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
TERMINATION RATES

Chart III-T2

Termination Rates - Safety: All Years of Service

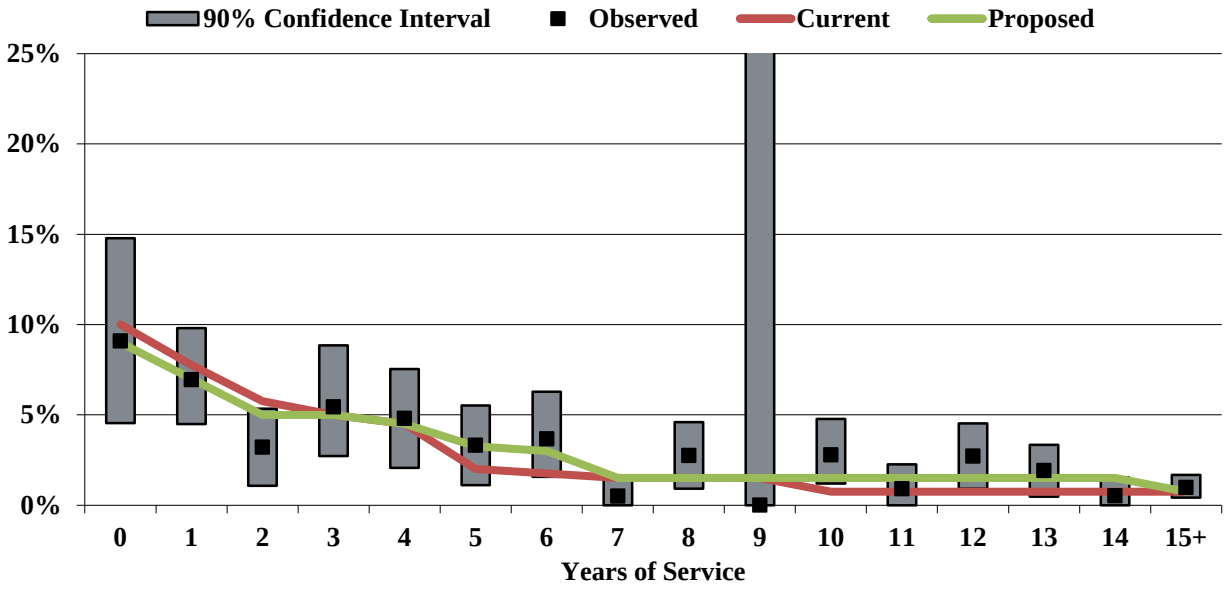


Table III-T2

Termination Rates - Safety: All Years of Service						
		Terminations			Actual to Expected Ratios	
Service	Exposures	Actual	Current	Recommended	Current	Recommended
0	88	8	9	8	91%	101%
1	245	17	19	17	90%	99%
2	187	6	11	9	56%	64%
3	147	8	7	7	109%	109%
4	146	7	7	7	107%	107%
5	181	6	4	6	166%	102%
6	191	7	3	6	209%	122%
7	199	1	3	3	34%	34%
8	218	6	3	3	183%	183%
9	234	0	4	4	0%	0%
10	251	7	2	4	372%	186%
11	222	2	2	3	120%	60%
12	221	6	2	3	362%	181%
13	210	4	2	3	254%	127%
14	196	1	1	3	68%	34%
15+	718	7	5	5	130%	130%
Total	**3,654**	**93**	**83**	**92**	**112%**	**102%**
Confidence Interval %			**81.3%**	**100.0%**		
R-squared			**0.6934**	**0.7980**		

SECTION III – DEMOGRAPHIC ASSUMPTIONS
TERMINATION RATES

Refund Rates and Reciprocity

When a vested member terminates employment, they have the option of receiving a refund of contributions with interest or a deferred annuity. If a member terminates employment and works for a reciprocal employer, the member's retirement benefit is ultimately based on the member's service with SJCERA and the highest Final Compensation based on employment with any reciprocal employer.

Table III-T3 shows the results of our analysis of refunds for General and Safety members, for the period from January 1, 2013 through December 31, 2018. We are recommending increases to the refund assumptions for Safety members with five or more years of service.

Table III-T3

Service	Total Terminations	Refunds	% of Total	Current Assumption	Proposed Assumption
General					
0 - 4	1,106	606	54.8%	60.0%	60.0%
5 - 14	288	82	28.5%	30.0%	30.0%
15+	54	7	13.0%	10.0%	10.0%
Total	1,448	695	48.0%		
Safety					
0 - 4	46	24	52.2%	60.0%	60.0%
5 - 9	20	6	30.0%	10.0%	30.0%
10+	27	5	18.5%	0.0%	15.0%
Total	93	35	37.6%		

Table III-T4 on the next page shows the results of our analysis of members who have retired from a deferred status, for the period from January 1, 2013 through December 31, 2018. We recommend increasing the reciprocity assumption for General members with less than five years of service or 15 or more years of service, and for Safety members with less than five years of service.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
TERMINATION RATES

Table III-T4

Service	Total Vested Retirees	Reciprocal Retirees	% of Total	Current Assumption	Proposed Assumption
General					
0 - 4	46	41	89.1%	25.0%	75.0%
5 - 14	160	40	25.0%	25.0%	25.0%
15+	59	22	37.3%	25.0%	30.0%
Total	265	103			
Safety					
0 - 4	11	8	72.7%	50.0%	66.7%
5 - 9	12	5	41.7%	50.0%	50.0%
10+	12	4	33.3%	50.0%	50.0%
Total	35	17			

Table III-T5 shows the results of our analysis of the age at which vested terminated and transferred members with outgoing reciprocity decide to retire. The current assumptions are that vested terminated General members will commence payment at age 58, and that vested terminated Safety members will commence payment at age 50. We are not recommending any changes to the General assumptions, but are recommending a change to the Safety assumptions from a commencement age of 50 to 53 for reciprocal retirees. We do not recommend increasing the age at retirement for the vested terminated Safety members since there is no financial incentive for them to delay retirement.

Table III-T5

Average Retirement Age for Retirees from Vested Status								
	General				Safety			
	Reciprocity		Vested		Reciprocity		Vested	
Calendar Year	# of New Retirees	Retirement Age	# of New Retirees	Retirement Age	# of New Retirees	Retirement Age	# of New Retirees	Retirement Age
2013	19	59.8	26	56.3	5	51.0	3	50.0
2014	18	62.3	20	60.5	1	50.0	0	0.0
2015	17	60.9	26	56.8	3	52.3	2	50.0
2016	14	58.1	22	60.1	1	55.6	3	62.6
2017	17	59.9	28	60.0	3	52.8	8	51.0
2018	18	60.1	40	57.4	4	56.0	2	52.6
Total	103	60.3	162	58.3	17	52.9	18	52.8

SECTION III – DEMOGRAPHIC ASSUMPTIONS

TERMINATION RATES

As stated earlier, if a member terminates employment and works for a reciprocal employer, the member's retirement benefit is ultimately computed using the highest Final Compensation based on employment any reciprocal employer. We recommend that the assumption used to project pay during employment with the reciprocal employer continue to be based on the wage growth assumption, compounded by the ultimate merit pay increase assumption described earlier in this report. Therefore, the recommended total pay growth assumptions for members in reciprocal status remain at 3.67% for General members and 4.44% for Safety members.

Upon further review of the data, we also continue to recommend projecting salary increases for reciprocal members from the year of the members' most recent reported salary to their assumed retirement age.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
DISABILITY RATES

This section analyzes the incidence of disability by the age of the employee. There are separate sets of assumptions for nonservice-connected disabilities and service-connected disabilities. Service-connected disability rates for Safety members are unisex, while all General rates and Safety nonservice-connected disability rates vary by gender. The disability decrement is only applied after members are eligible for disability benefits.

The amount of disability experience is fairly limited. To improve the credibility of the data, we have aggregated the experience of the past three years with that of the prior experience study (2013-2015). There are only 109 disabilities during the last six years for Safety and General members combined.

Table III-D1 on the following page shows the calculation of actual-to-expected ratios and the r-squared statistic for all disabilities for General members, and Chart III-D1 shows the information graphically. The 90% confidence interval is not shown because of a lack of credible data.

The data shows actual disability rates that are lower than the current assumption. The current assumption has an A/E ratio of 62%. The r-squared is 0.57. The current assumption is somewhat conservative, but disability rates do not have a significant impact on General cost.

We are not proposing any change to the disability assumption rates for General members, but if disability incidence remains low at the next experience study, reductions in disability rates may be considered. However, we are recommending a small change in the assumptions related to the incidence of duty-related vs. non-duty related disabilities. Previously, it was assumed that 20% of male and 75% of female General disabilities were non-service related, except that all disabilities for General members with less than five years of service were assumed to be service-related. We have recommended revising the assumption such that 20% of male and 75% of female disabilities with less than five years of service are also assumed to be non-service related, in which case the members will be eligible to receive a refund of contributions.

See Appendix A or B for a full listing of the rates.

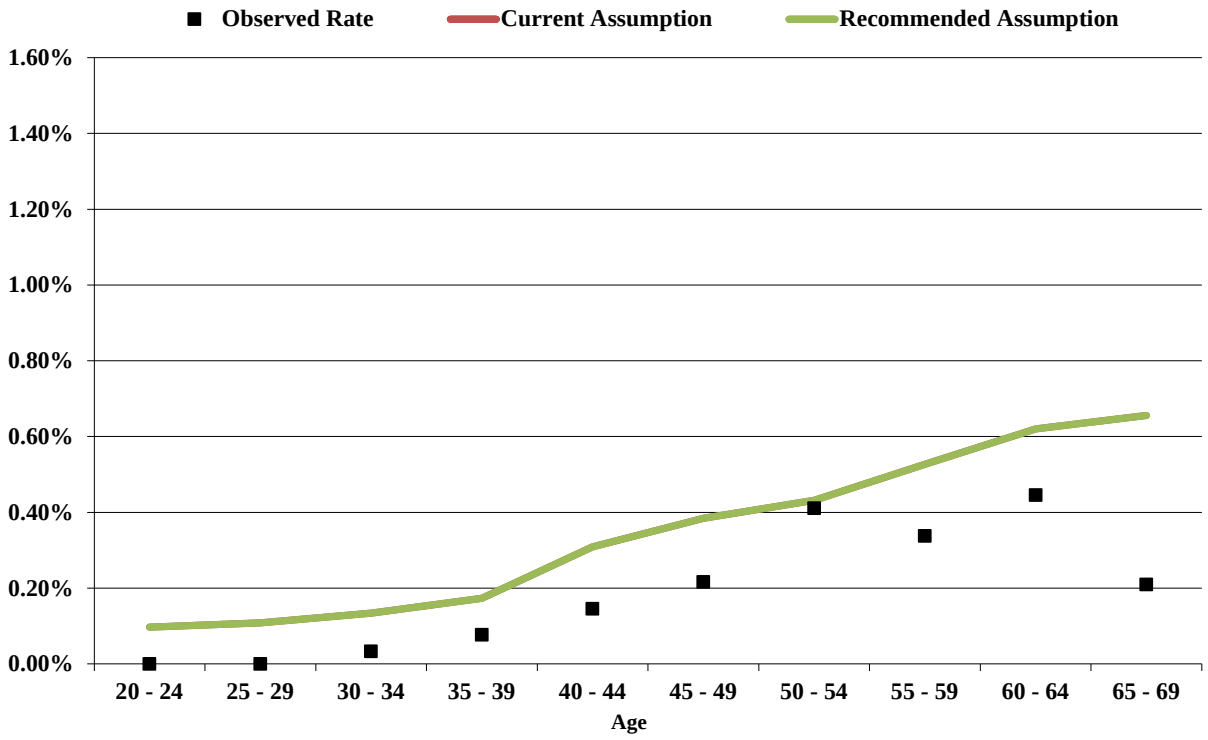
SECTION III – DEMOGRAPHIC ASSUMPTIONS
DISABILITY RATES

Table III-D1

General Disability Incidence Rates						
Age Band	Exposures	Disabilities			Actual to Expected Ratios	
		Actual	Current	Recommended	Current	Recommended
20 - 24	198	0	0	0	0%	0%
25 - 29	1,591	0	2	2	0%	0%
30 - 34	3,025	1	4	4	25%	25%
35 - 39	3,911	3	7	7	44%	44%
40 - 44	4,129	6	13	13	47%	47%
45 - 49	4,160	9	16	16	56%	56%
50 - 54	4,381	18	19	19	95%	95%
55 - 59	4,441	15	23	23	64%	64%
60 - 64	2,918	13	18	18	72%	72%
65 - 69	956	2	6	6	32%	32%
70 +	65	0	0	0	0%	0%
Total	**29,775**	**67**	**108**	**108**	**62%**	**62%**
R-squared			**0.5688**	**0.5688**		

Chart III-D1

General Disability Incidence



SECTION III – DEMOGRAPHIC ASSUMPTIONS
DISABILITY RATES

Table III-D2 on the next page shows the calculation of actual-to-expected ratios and the r-squared statistic for Safety members, and Chart III-D2 shows the information graphically. The 90% confidence interval is not shown because of a lack of credible data.

The data shows that the number of disabilities are higher than the number expected under the current assumption. However, we are not proposing any changes to the total disability assumption for Safety members. The current assumption has an A/E ratio of 126%. The r-squared is 0.46.

As of January 1, 2019, there are 227 disabled Safety retirees. 93.4% (212 out of 227) of disabled Safety retirees are retired due to service-connected disabilities. We are continuing to recommend that 95% of Safety disabilities are assumed to be service-connected, and to assume a refund of contributions for nonservice-connected disabilities before a member reaches five years of service.

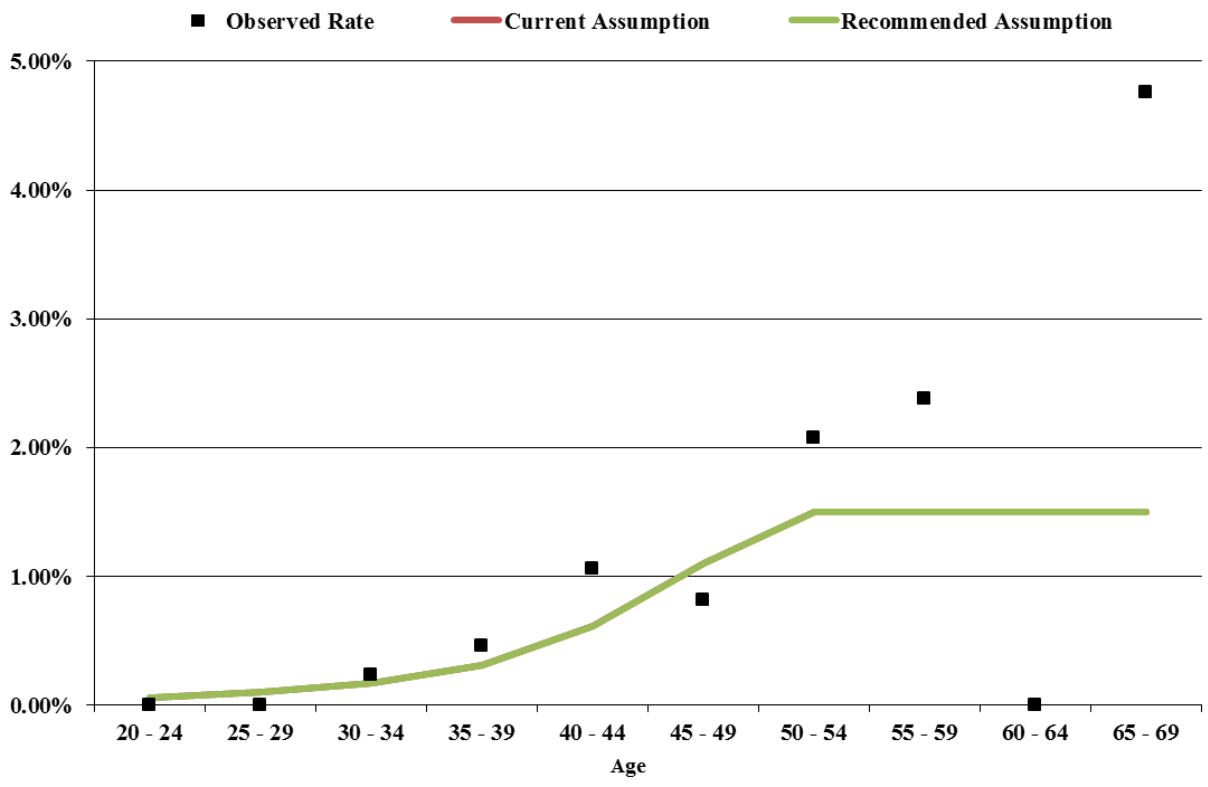
See Appendix A or B for a full listing of the rates.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
DISABILITY RATES

Table III-D2

Safety Disability Incidence Rates						
Age Band	Exposures	Disabilities			Actual to Expected Ratios	
		Actual	Current	Recommended	Current	Recommended
20 - 24	76	0	0	0	0%	0%
25 - 29	387	0	0	0	0%	0%
30 - 34	868	2	1	1	135%	135%
35 - 39	880	4	3	3	147%	147%
40 - 44	943	10	6	6	175%	175%
45 - 49	738	6	8	8	74%	74%
50 - 54	529	11	8	8	139%	139%
55 - 59	294	7	4	4	159%	159%
60 - 64	131	0	2	2	0%	0%
65 - 69	42	2	1	1	317%	317%
70 +	0	0	0	0	0%	0%
Total	**4,888**	**42**	**33**	**33**	**126%**	**126%**
R-squared			**0.4598**	**0.4598**		

Chart III-D2



SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

Post-retirement mortality assumptions are typically developed separately by gender for both healthy annuitants and disabled annuitants. Pre-retirement mortality assumptions are developed separately for males and females. Unlike most of the other demographic assumptions that rely exclusively on the experience of the plan, for mortality, standard mortality tables and projection scales serve as the primary basis for the assumption.

The Retirement Plans Experience Committee (RPEC) of the SOA recently completed an extensive mortality study and published a new set of mortality tables for U.S. public pension plans, the Pub-2010 Mortality Tables, with separate tables for teachers, safety members, and other public employees. The experience covered 35 public systems with 78 plans. Since benefits for retirees and salaries for active members are a significant predictor of mortality differences, separate tables were also developed for Above-Median and Below-Median. RPEC also published the most recent mortality improvement projection scale, MP-2018. We used these tables as the basis for our analysis.

The steps in our analysis are as follows:

1. Select a standard mortality table that is, based on experience, most closely matching the anticipated experience of SJCERA.
2. Compare actual SJCERA experience to what would have been predicted by the selected standard table for the period of the experience study.
3. Adjust the standard table either fully or partially depending on the level of credibility for SJCERA experience. This adjusted table is called the base table.
4. Select an appropriate standard mortality improvement projection scale and apply it to the base table.

As we have done in prior experience studies, we have combined the experience of the past three years with that of the prior three-year period in order to have a more robust dataset to review.

In the prior study, SJCERA elected to use the following assumptions:

Active members

- CalPERS Preretirement Non-Industrial Mortality, with no adjustment (General and Safety).
- CalPERS Preretirement Industrial Mortality, with no adjustment (Safety only).

Healthy retirees and beneficiaries

- CalPERS Healthy Annuitant Mortality, adjusted 110% by for Safety and no adjustment for General.

Disabled members

- CalPERS Industrially Disabled Annuitant Mortality, with no adjustment (Safety only)
- CalPERS Non-Industrially Disabled Annuitant Mortality, adjusted by 105% (General only).

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

We also recommended projecting these base tables generationally using the MP-2015 mortality improvement scale described above for all types of mortality.

Since the prior study, the Society of Actuaries' Retirement Plans Experience Committee (RPEC) has released a new mortality improvement scale, Scale MP-2018, which reflects three more years of data than was used in the development of Scale MP-2015.

MP-2018 represents the Society of Actuaries' most advanced actuarial methodology in incorporating mortality improvement trends with actual recent mortality rates, by using rates that vary not only by age but also by calendar year – known as a two-dimensional approach to projecting mortality improvements. Scale MP-2018 was designed with the intent of being applied to mortality on a generational basis. The effect of this is to build in an automatic expectation of future improvements in mortality. Recent reports issued by RPEC suggest that using generational mortality is a preferable approach, as it allows for an explicit declaration of the amount of future mortality improvement included in the assumptions.

RPEC has also recently released a new set of base mortality rate tables – the Pub-2010 Mortality Tables, which are based on a recent study of US defined benefit public plan mortality experience. The experience covered 35 public systems with 78 plans from calendar years 2008-2013, which included approximately 46 million exposures and 580 thousand deaths.

SJCERA's experience over the past six years matches well with the new Pub2010 rates, after applying the improvement projections from the base year of the tables (2010) using the new MP-2018 mortality improvement projections through the mid-point of the six-year period (2016).

Even with the use of six years of data, the SJCERA experience is only partially credible, based on standard statistical theory. We therefore recommend partially adjusting the Pub2010 base tables to fit SJCERA's experience to develop a new base table. The rates for each age in the standard table are adjusted by a factor, where the factor is determined by multiplying the actual-to-expected ratio for the group (such as male retirees) by a credibility factor which will bring the A/E results closer – but not all the way – to 100%.

Based on these adjustments, we are recommending the following base mortality table assumptions:

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

Active members

- Public General 2010 Above-Median Income - PUBG-2010(A) – Employee Mortality Table, adjusted by 105% for General female members and no adjustment for General male members
- Public Safety - 2010 PUBS-2010 – Employee Mortality Table, adjusted by 98% for Safety male members and by 106% for Safety female members (with 10% of active Safety member deaths assumed to occur in the line of duty)

Healthy retirees and beneficiaries

- Public General 2010 Above-Median Income - PUBG-2010(A) - Retiree Mortality Table, adjusted by 104% for General female members and no adjustment for General male members
- Public Safety 2010 – PUBS-2010 - Retiree Mortality Table, adjusted by 102% for Safety male members and by 105% for Safety female members

Disabled members

- Public General 2010 - PUBG-2010 - Disabled Annuitant Mortality Table, adjusted by 104% for General male members and adjusted by 107% for General female members
- Public Safety 2010 – PUBS-2010 - Disabled Annuitant Mortality Table, adjusted by 104% for Safety male members and by 98% for Safety female members

We also recommend projecting these base tables generationally using the MP-2018 mortality improvement scale described above for all types of mortality.

As shown in Table III-M1 on the following page, our proposed mortality rates for healthy annuitants are close to recent experience, in particular for the General members. As described above, we applied a partial adjustment to the "Standard" PUB-2010 tables for each gender and status group, besides the active and healthy annuitant General males, to bring the A/E rates closer to 100%. However, these rates still reflect a margin for conservatism, because the SJCERA data cannot be considered fully credible, particularly for the disability mortality experience. To perform our comparisons, the applicable Pub2010 base rates were projected from their base year (2010) to the midpoint of the combined six-year study period (2016).

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

Table III-M1

Annuitant Mortality for all Groups										
				Weighted Deaths				Actual to Expected Ratios		
Annuitant Type	Exposures	Actual Deaths	Weighted Exposures	Actual	Current	Standard	Recommended	Current	Standard	Recommended
General Healthy Females	15,244	416	407,810,275	8,590,826	8,826,456	8,051,963	8,374,042	97%	107%	103%
General Healthy Males	7,951	259	287,742,094	6,607,960	7,646,207	6,628,420	6,628,420	86%	100%	100%
General Healthy Total	23,195	675	695,552,369	15,198,786	16,472,663	14,680,383	15,002,462	**92%**	**104%**	**101%**
Safety Healthy Females	1,254	33	58,060,471	1,207,895	1,010,566	955,460	1,003,232	120%	126%	120%
Safety Healthy Males	2,536	50	172,764,868	2,737,022	2,990,751	2,486,507	2,536,237	92%	110%	108%
Safety Healthy Total	3,790	83	230,825,339	3,944,917	4,001,317	3,441,967	3,539,470	**99%**	**115%**	**111%**
General Disabled Females	1,399	52	28,842,444	1,025,020	702,630	765,577	819,167	146%	134%	125%
General Disabled Males	761	29	19,531,812	771,533	646,500	630,428	655,645	119%	122%	118%
General Disabled Total	2,160	81	48,374,256	1,796,554	1,349,129	1,396,004	1,474,812	**133%**	**129%**	**122%**
Safety Disabled Females	345	1	13,833,919	18,128	111,780	108,470	106,301	16%	17%	17%
Safety Disabled Males	902	21	46,903,795	987,577	841,127	769,639	800,425	117%	128%	123%
Safety Disabled Total	1,247	22	60,737,714	1,005,706	952,907	878,109	906,725	**106%**	**115%**	**111%**
Total	**60,784**	**1,722**	**2,070,979,356**	**43,891,925**	**45,552,032**	**40,792,928**	**41,846,938**	**96%**	**108%**	**105%**

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

Rather than weighting the experience based on the number of members living and dying, we have weighted the experience based on benefit size (salary for current active members). This approach has been recommended by RPEC, since members with larger benefits are expected to live longer, and a benefit-weighted approach helps avoid underestimating the liabilities.

The match between the actual and expected experience across all statuses (active, retired, and disabled) is close under the proposed assumptions: 105%.

Mortality Assumptions for Employee Contribution Rates

For purposes of determining employee contribution rates, the use of generational mortality improvements is impractical from an administrative perspective. Therefore, we recommend using the base mortality tables described above (various SOA Pub2010 tables with SJCERA-specific adjustments) projected using Scale MP-2018 from 2010 to 2040 for General and from 2010 to 2041 for Safety Members. These static projections are intended to approximate generational mortality improvements. Adjustments of 100% for male and 104% for female General members and 102% for male and 105% for female Safety members are applied as well.

The projection periods are based upon the duration of active liabilities for the respective groups, and the period during which the associated employee contribution rates will be in use. The employee contribution rates are also blended using a male/female weighting of 29%/71% for General Members and 75% /25% for Safety members.

We anticipate that these mortality assumptions will be used to determine the employee contribution rates in effect for the period of January 1, 2020 through December 31, 2022. We also anticipate that the mortality assumptions for this purpose will be updated again after the next experience study covering the period from January 1, 2019 through December 31, 2021.

TERMINAL PAY

The prior experience study demonstrated that Sick Leave Bank service is unlikely to have a significant impact on benefits. We have updated our analysis for the current study period, and confirmed that this conclusion is still valid.

Table III-O1

	Count	Avg Years of Service	Avg Sick Leave Hours	Avg Add'l Service	Percent Increase
Eligible	119	22.1	799	0.4	1.74%
Ineligible	6,226	9.7	0	0.0	0.00%
Total	6,345	9.9	15	0.0	0.07%

We also performed a comparison of the actual versus expected final average pay used in the service retirement benefit calculations to confirm any other substantial/recurring terminal pay increases. For all service retirements which occurred over the past three years, we compared the actual final average pay used in the member's benefit calculation to the expected final average pay for that member reflected in the prior actuarial valuation (as an active member) and found no significant difference. Therefore, we do not recommend the application of any additional terminal pay increase.

Table III-O2

Year of Retirement	Retirements from Active Status	Total Final Average Pay	Expected Final Average Pay	Actual / Expected
General				
2016	184	1,151,436	1,148,871	100.2%
2017	173	1,111,665	1,130,235	98.4%
2018	207	1,397,087	1,394,033	100.2%
	564	3,660,188	3,673,138	99.6%
Safety				
2016	28	288,092	284,846	101.1%
2017	25	200,514	197,680	101.4%
2018	25	205,156	200,614	102.3%
Total	78	693,762	683,140	101.6%

FAMILY COMPOSITION

The current assumption is that 75% of active male and 55% of active female SJCERA participants will have beneficiaries eligible for an unreduced (i.e. subsidized) 60% Joint and Survivor allowance (100% for Duty Disability). Table III-O3 shows the results of the analysis during the experience study period for members who retired or became disabled. We are not recommending any changes to this assumption.

Table III-O3

Percent of Retired and Disabled Members with Spouses or Domestic Partners

Calendar Year	Disabled and Retirees	Females Eligible Spouses	Percent Eligible	Disabled and Retirees	Males Eligible Spouses	Percent Eligible
2013	116	56	48.3%	61	44	72.1%
2014	136	70	51.5%	92	61	66.3%
2015	114	65	57.0%	108	85	78.7%
2016	144	76	52.8%	87	69	79.3%
2017	143	76	53.1%	75	61	81.3%
2018	157	91	58.0%	87	63	72.4%
Total	810	434	53.6%	510	383	75.1%

The current assumption is the spouse of a male member is expected to be four years younger while the spouse of a female member is expected to be two years older. Table III-O4 compiles the average age difference for members who retired or became disabled during 2013 - 2018 between spouses and domestic partners. This information is used to predict spouse information for future retirees. We recommend changing the assumption so that the spouse of a male member is expected to be three years younger while maintaining the same assumption for the spouse of a female member.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
OTHER DEMOGRAPHIC ASSUMPTIONS

Table III-O4

Age Difference Between Retired or Disabled Members and Their Spouses or Domestic Partners								
	Females				Males			
Calendar Year	Eligible Spouses	Member Age	Spouse Age	Difference	Eligible Spouses	Member Age	Spouse Age	Difference
2013	54	60.28	61.62	(1.34)	37	61.97	58.81	3.16
2014	66	61.39	64.55	(3.16)	59	62.66	58.88	3.78
2015	65	60.20	62.38	(2.18)	81	60.56	56.21	4.35
2016	72	61.42	62.61	(1.19)	61	61.59	59.32	2.27
2017	71	62.01	63.31	(1.30)	53	62.30	58.83	3.47
2018	88	61.53	64.35	(2.82)	59	61.37	58.78	2.59
Total	416	61.20	63.24	(2.04)	350	61.64	58.31	3.34

PLAN EXPENSES

An allowance of $4,628,096 for Plan administrative expenses was included in the annual cost calculation in the prior valuation, and was expected to increase with CPI by 2.9% to $4,762,311. The Plan's administrative expenses, adjusted for actual CPI increases to the current year, have averaged close to this amount during the last three years. We recommend maintaining the Plan's assumed administrative expenses of $4,762,311 for 2019, to be split between employees and employers based on their share of the overall contributions. Expenses are expected to grow with the cost of living (by 2.90% per year) in future years.

Calendar Year	Admin Expense	Bay Area CPI	Admin Expense w/ CPI to 2019
2016	$ 4,369,744	3.09%	$ 4,834,072
2017	$ 4,118,578	3.22%	$ 4,419,599
2018	$ 4,865,082	3.96%	$ 5,057,636
Average	$ 4,451,135		$ 4,770,435

APPENDIX A – SUMMARY OF PROPOSED ASSUMPTIONS

The recommended assumptions were reviewed with the Board at their July 12, 2019 meeting. The demographic assumptions are based on an experience study covering the period from January 1, 2016 through December 31, 2018.

1. Rate of Return

Assets are assumed to earn 7.25% net of investment expenses.

2. Administrative Expenses

Administrative expenses are assumed to be $4,762,311 for the next year, to be split between employees and employers based on their share of the overall contributions. Expenses are expected to grow with the cost of living (by 2.90% per year.)

3. Cost of Living

The cost of living as measured by the Consumer Price Index (CPI) will increase at the rate of 2.90% per year.

4. Post Retirement COLA

Benefits are assumed to increase after retirement at the rate of 2.6% per year.

5. Increases in Pay

Assumed pay increases for active Members consist of increases due to base salary adjustments plus service-based increase due to longevity and promotion, as shown below:

Pay Increases Years of Service											
Base Increase	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%
Longevity & Promotion											
General	8.00%	7.00%	4.00%	4.00%	2.00%	2.00%	2.00%	2.00%	1.25%	1.00%	0.50%
Safety	10.00%	10.00%	5.00%	5.00%	5.00%	2.25%	1.25%	1.25%	1.25%	1.25%	1.25%
Total (Compound)											
General	11.40%	10.37%	7.28%	7.28%	5.21%	5.21%	5.21%	5.21%	4.44%	4.18%	3.67%
Safety	13.47%	13.47%	8.31%	8.31%	8.31%	5.47%	4.44%	4.44%	4.44%	4.44%	4.44%

APPENDIX A – SUMMARY OF PROPOSED ASSUMPTIONS

6. Family Composition

Percentage married for all active members who retire, become disabled, or die during active service is shown in the following table. Male members are assumed to be three years older than their spouses, and female members are assumed to be two years younger than their spouses.

Percentage Married	
Gender	Percentage
Males	75%
Females	55%

7. Rates of Termination

Sample rates of termination are show in the following table.

Rates of Termination*		
Years of Service	General	Safety
0	17.50%	9.00%
1	11.00%	7.00%
2	10.00%	5.00%
3	7.75%	5.00%
4	6.75%	4.50%
5	6.25%	3.25%
6	6.00%	3.00%
7	4.50%	1.50%
8	4.50%	1.50%
9	3.75%	1.50%
10	3.75%	1.50%
11-12	2.75%	1.50%
13-19	2.50%	1.50%
20-29	1.00%	0.00%
30+	0.00%	0.00%

* Termination rates do not apply once a member is eligible for retirement.

8. Withdrawal

Rates of withdrawal apply to active Members who terminate their employment and withdraw their member contributions, forfeiting entitlement to future Plan benefits.

60% of all General Member terminations with less than five years of service, 30% of those with five to 14 years of service, and 10% of those with more than 15 years of service, are assumed to take a refund of contributions.

60% of all Safety Member terminations with less than five years of service, 30% of those with five to nine years of service, and 15% of those with more than 10 years of service, are assumed to take a refund of contributions.

9. Vested Termination and Reciprocal Transfers

Rates of vested termination apply to active Members who terminate their employment and leave their member contributions on deposit with the Plan.

40% of all General Member terminations with less than five years of service, 70% of those with five to 14 years of service, and 90% of those with more than 15 years of service, are assumed to leave their contributions on deposit.

40% of all Safety Member terminations with less than five years of service, 70% of those with five to nine years of service, and 85% of those with more than 10 years of service, are assumed to leave their contributions on deposit.

Vested terminated General Members are assumed to begin receiving benefits at age 58; vested terminated Safety Members are assumed to begin receiving benefits at age 53.

75% of vested terminated General Members with less than five years of service, 25% of those with five to 14 years of service, and 30% of those with more than 15 years of service, are assumed to be reciprocal.

67% of vested terminated Safety Members with less than five years of service, and 50% of those with more than five years of service, are assumed to be reciprocal.

Final average pay for General Members who terminate with reciprocity is assumed to increase by 3.67% per year until their assumed retirement date.

Final average pay for Safety Members who terminate with reciprocity is assumed to increase by 4.44% per year until their assumed retirement date.

APPENDIX A – SUMMARY OF PROPOSED ASSUMPTIONS

10. Rates of Service-Connected Disability

Sample service-connected disability rates of active participants are provided in the table below.

Rates of Svc Disability				
Age	General Male	General Female	Safety Male	Safety Female
22	0.094%	0.019%	0.048%	0.048%
27	0.107%	0.024%	0.086%	0.089%
32	0.122%	0.033%	0.161%	0.166%
37	0.139%	0.044%	0.296%	0.305%
42	0.414%	0.058%	0.565%	0.592%
47	0.446%	0.080%	1.023%	1.101%
52	0.361%	0.106%	1.425%	1.425%
57	0.410%	0.135%	1.425%	1.425%
62	0.470%	0.164%	1.425%	1.425%

11. Rates of Nonservice-Connected Disability

Sample nonservice-connected disability rates of active participants are provided in the table below.

Rates of Non-Svc Disability				
Age	General Male	General Female	Safety Male	Safety Female
22	0.023%	0.057%	0.003%	0.003%
27	0.027%	0.072%	0.005%	0.005%
32	0.030%	0.099%	0.008%	0.009%
37	0.035%	0.131%	0.016%	0.016%
42	0.104%	0.174%	0.030%	0.031%
47	0.112%	0.239%	0.054%	0.058%
52	0.090%	0.319%	0.075%	0.075%
57	0.102%	0.406%	0.075%	0.075%
62	0.118%	0.493%	0.075%	0.075%

12. Rates of Mortality for Healthy Lives

Mortality rates for General active members are based on the sex distinct Public General 2010 Above-Median Income Mortality Table, with generational mortality improvements projected from 2010 using Projection Scale MP-2018, and a partial credibility adjustment of 1.05 for females and no adjustment for males.

APPENDIX A – SUMMARY OF PROPOSED ASSUMPTIONS

Mortality rates for Safety active members are based on the sex distinct Public Safety 2010 Mortality Table, with generational mortality improvements projected from 2010 using Projection Scale MP-2018, and a partial credibility adjustment of 0.98 for males and 1.06 for females. 10% of Safety member active deaths are assumed to occur in the line of duty.

Mortality rates for healthy General annuitants are based on the sex distinct Public General 2010 Above-Median Income Mortality Table, with generational mortality improvements projected from 2010 using Projection Scale MP-2018, and a partial credibility adjustment of 1.04 for females and no adjustment for males.

Mortality rates for Safety annuitants are based on the sex distinct Public Safety 2010 Mortality Table, with generational mortality improvements projected from 2010 using Projection Scale MP-2018, and a partial credibility adjustment of 1.02 for males and 1.05 for females.

13. Rates of Mortality for Disabled Retirees

Mortality rates for General disabled annuitants are based on the sex distinct Public General Disabled Annuitant 2010 Mortality Table, with generational mortality improvements projected from 2010 using Projection Scale MP-2018, with a partial credibility adjustment of 1.04 for males and 1.07 for females.

Mortality rates for Safety disabled annuitants are based on the sex distinct Public Safety Disabled Annuitant 2010 Mortality Table, with generational mortality improvements projected from 2010 using Projection Scale MP-2018, with a partial credibility adjustment of 1.04 for males and 0.98 for females.

14. Mortality Improvement

The mortality assumptions employ a fully generational mortality improvement projection from the base year of the Pub2010 mortality tables (2010) using Scale MP-2018.

15. Adjustment for Service Purchases

SJCERA provides Cheiron with the amount of service that active employees are eligible to purchase. We include this service when calculating the employees' benefit eligibility. Half of eligible service purchases, which have not been purchased by the members, are included in the employees' Credited Service, as employees will pay approximately half of the normal cost for these benefits when purchasing this service.

APPENDIX A – SUMMARY OF PROPOSED ASSUMPTIONS

16. Assumptions for Employee Contribution Rates

Mortality rates are the base mortality tables described above, projected using Scale MP-2018 from 2010 to 2040 for General Members and to 2041 for Safety Members. The projection periods are based on the duration of active liabilities for the respective groups, and the period during which the associated employee contribution rates will be in use. The employee contribution rates are also blended using a male/female weighting of 29%/71% for General Members and 75%/25% for Safety members.

17. Rates of Retirement

Rates of retirement are based on age and service according to the following table.

Rates of Retirement								
	General Male Years of Service			General Female Years of Service			Safety Years of Service	
Age	5-9	10-29	30+	5-9	10-29	30+	5-19	20+
45	0.00%	0.00%	5.00%	0.00%	0.00%	4.50%	0.00%	5.00%
46	0.00%	0.00%	5.00%	0.00%	0.00%	4.50%	0.00%	5.00%
47	0.00%	0.00%	5.00%	0.00%	0.00%	4.50%	0.00%	5.00%
48	0.00%	0.00%	5.00%	0.00%	0.00%	4.50%	0.00%	5.00%
49	0.00%	0.00%	5.00%	0.00%	0.00%	4.50%	0.00%	5.00%
50	3.00%	3.00%	5.00%	1.00%	3.50%	4.50%	5.00%	15.00%
51	3.00%	3.00%	5.00%	1.00%	3.50%	4.50%	5.00%	10.00%
52	3.00%	3.00%	5.00%	1.00%	3.50%	4.50%	5.00%	10.00%
53	3.00%	3.00%	5.00%	1.00%	3.50%	4.50%	5.00%	20.00%
54	3.00%	3.00%	10.00%	5.75%	3.50%	4.50%	5.00%	20.00%
55	3.00%	6.50%	10.00%	2.50%	3.50%	4.50%	5.00%	20.00%
56	3.00%	4.00%	10.00%	1.50%	7.00%	15.00%	10.00%	20.00%
57	3.00%	4.00%	10.00%	1.50%	7.00%	15.00%	10.00%	20.00%
58	3.00%	4.00%	10.00%	1.50%	7.00%	15.00%	10.00%	20.00%
59	7.00%	9.00%	27.50%	2.00%	7.00%	15.00%	10.00%	15.00%
60	7.00%	9.00%	27.50%	6.25%	12.50%	25.00%	10.00%	30.00%
61	7.00%	15.00%	27.50%	6.25%	12.50%	25.00%	10.00%	30.00%
62	7.00%	30.00%	40.00%	18.50%	25.00%	35.00%	20.00%	30.00%
63	7.00%	25.00%	40.00%	5.00%	25.00%	35.00%	20.00%	30.00%
64	15.00%	25.00%	40.00%	9.00%	25.00%	35.00%	20.00%	50.00%
65	25.00%	25.00%	40.00%	12.50%	25.00%	35.00%	100.00%	100.00%
66	10.00%	35.00%	50.00%	25.00%	25.00%	30.00%	100.00%	100.00%
67	15.00%	30.00%	40.00%	25.00%	25.00%	30.00%	100.00%	100.00%
68	15.00%	30.00%	30.00%	25.00%	25.00%	30.00%	100.00%	100.00%
69	30.00%	40.00%	30.00%	25.00%	25.00%	30.00%	100.00%	100.00%
70	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

APPENDIX B – SUMMARY OF PRIOR ASSUMPTIONS

The recommended assumptions were adopted by the Board at their August 17, 2016 meeting. The demographic assumptions are based on an experience study covering the period from January 1, 2013 through December 31, 2015.

1. Rate of Return

Assets are assumed to earn 7.25% net of investment expenses.

2. Administrative Expenses

Administrative expenses are assumed to be $4,628,096 for the next year, to be split between employees and employers based on their share of the overall contributions. Expenses are expected to grow with the cost of living (by 2.90% per year.)

3. Cost of Living

The cost of living as measured by the Consumer Price Index (CPI) will increase at the rate of 2.90% per year.

4. Post Retirement COLA

Benefits are assumed to increase after retirement at the rate of 2.6% per year.

5. Increases in Pay

Assumed pay increases for active Members consist of increases due to base salary adjustments plus service-based increase due to longevity and promotion, as shown below:

Pay Increases	Years of Service									
	0	1	2	3	4	5	6	7	8-29	30+
Base Increase	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%
Longevity & Promotion										
General	6.00%	5.00%	4.00%	3.00%	2.00%	1.50%	1.00%	0.75%	0.50%	0.00%
Safety	7.00%	6.00%	5.00%	4.00%	3.00%	2.25%	1.25%	1.25%	1.25%	1.25%
Total (Compound)										
General	9.34%	8.31%	7.28%	6.24%	5.21%	4.70%	4.18%	3.92%	3.67%	3.15%
Safety	10.37%	9.34%	8.31%	7.28%	6.24%	5.47%	4.44%	4.44%	4.44%	4.44%

APPENDIX B – SUMMARY OF PRIOR ASSUMPTIONS

6. Family Composition

Percentage married for all active members who retire, become disabled, or die during active service is shown in the following table. Male members are assumed to be four years older than their spouses, and female members are assumed to be two years younger than their spouses.

Percentage Married	
Gender	Percentage
Males	75%
Females	55%

7. Rates of Termination

Sample rates of termination are show in the following table.

Rates of Termination*		
Years of Service	General	Safety
0	17.50%	10.00%
1	11.00%	7.75%
2	10.00%	5.75%
3	7.75%	5.00%
4	6.75%	4.50%
5	6.25%	2.00%
6	6.00%	1.75%
7	4.50%	1.50%
8	4.50%	1.50%
9	3.75%	1.50%
10	3.75%	0.75%
11-12	2.75%	0.75%
13-19	2.50%	0.75%
20-29	1.00%	0.00%
30+	0.00%	0.00%

* Termination rates do not apply once a member is eligible for retirement.

APPENDIX B – SUMMARY OF PRIOR ASSUMPTIONS

8. Withdrawal

Rates of withdrawal apply to active Members who terminate their employment and withdraw their member contributions, forfeiting entitlement to future Plan benefits.

60% of all General Member terminations with less than five years of service, 30% of those with five to 14 years of service, and 10% of those with more than 15 years of service, are assumed to take a refund of contributions.

60% of all Safety Member terminations with less than five years of service, 10% of those with five to 14 years of service, and none of those with more than 15 years of service, are assumed to take a refund of contributions.

9. Vested Termination and Reciprocal Transfers

Rates of vested termination apply to active Members who terminate their employment and leave their member contributions on deposit with the Plan.

40% of all General Member terminations with less than five years of service, 70% of those with five to 14 years of service, and 90% of those with more than 15 years of service, are assumed to leave their contributions on deposit.

40% of all Safety Member terminations with less than five years of service, 90% of those with five to 14 years of service, and 100% of those with more than 15 years of service, are assumed to leave their contributions on deposit.

Vested terminated General Members are assumed to begin receiving benefits at age 58; vested terminated Safety Members are assumed to begin receiving benefits at age 50.
25% of vested terminated General Members and 50% of vested terminated Safety Members are assumed to be reciprocal.

Final average pay for General Members who terminate with reciprocity is assumed to increase by 3.67% per year until their assumed retirement date.

Final average pay for Safety Members who terminate with reciprocity is assumed to increase by 4.44% per year until their assumed retirement date.

APPENDIX B – SUMMARY OF PRIOR ASSUMPTIONS

10. Rates of Service-Connected Disability

Sample service-connected disability rates of active participants are provided in the table below.

Rates of Svc Disability				
Age	General Male	General Female	Safety Male	Safety Female
22	0.066%	0.022%	0.048%	0.048%
27	0.066%	0.030%	0.086%	0.089%
32	0.066%	0.051%	0.161%	0.166%
37	0.066%	0.073%	0.296%	0.305%
42	0.380%	0.094%	0.565%	0.592%
47	0.380%	0.123%	1.023%	1.101%
52	0.226%	0.159%	1.425%	1.425%
57	0.226%	0.204%	1.425%	1.425%
62	0.226%	0.249%	1.425%	1.425%

11. Rates of Nonservice-Connected Disability

Sample nonservice-connected disability rates of active participants are provided in the table below.

Rates of Non-Svc Disability				
Age	General Male	General Female	Safety Male	Safety Female
22	0.051%	0.053%	0.003%	0.003%
27	0.068%	0.067%	0.005%	0.005%
32	0.086%	0.081%	0.008%	0.009%
37	0.108%	0.102%	0.016%	0.016%
42	0.138%	0.138%	0.030%	0.031%
47	0.178%	0.197%	0.054%	0.058%
52	0.225%	0.267%	0.075%	0.075%
57	0.286%	0.337%	0.075%	0.075%
62	0.362%	0.408%	0.075%	0.075%

12. Rates of Mortality for Healthy Lives

Mortality rates for active members are based on the sex distinct CALPERS Preretirement Non-Industrial Mortality Table, with generational mortality improvements projected from 2009 using Projection Scale MP-2015, published by the Society of Actuaries.

APPENDIX B – SUMMARY OF PRIOR ASSUMPTIONS

Mortality rates for healthy annuitants are based on the sex distinct CALPERS Healthy Annuitant Mortality Table, with no adjustment for General members and a partial credibility adjustment of 1.10 for Safety members, with generational mortality improvements projected from 2009 using Projection Scale MP-2015, published by the Society of Actuaries.

Mortality rates for active members who die in the line-of-duty are based on the sex distinct CALPERS Preretirement Industrial Mortality Table, with generational mortality improvements projected from 2009 using Projection Scale MP-2015, published by the Society of Actuaries.

13. Rates of Mortality for Disabled Retirees

Mortality rates for Safety disabled annuitants are based on the sex distinct CALPERS Industrially Disabled Annuitant Mortality Table, with no adjustment, with generational mortality improvements projected from 2009 using Projection Scale MP-2015, published by the Society of Actuaries.

Mortality rates for General disabled annuitants are based on the sex distinct CALPERS Non-Industrially Disabled Annuitant Mortality Table, with a partial credibility adjustment of 1.05, with generational mortality improvements projected from 2009 using Projection Scale MP-2015, published by the Society of Actuaries.

APPENDIX B – SUMMARY OF PRIOR ASSUMPTIONS

14. Rates of Retirement

Rates of retirement are based on age and service according to the following table.

Rates of Retirement								
	General Male Years of Service			General Female Years of Service			Safety Years of Service	
Age	5-9	10-29	30+	5-9	10-29	30+	10-19	20+
45	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.00%
46	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.00%
47	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.00%
48	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.00%
49	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.00%
50	3.25%	4.00%	5.00%	3.50%	3.50%	4.50%	10.00%	15.00%
51	3.25%	4.00%	5.00%	3.50%	3.50%	4.50%	5.00%	10.00%
52	3.25%	4.00%	5.00%	3.50%	3.50%	4.50%	5.00%	10.00%
53	3.25%	4.00%	5.00%	3.50%	3.50%	4.50%	5.00%	20.00%
54	3.25%	4.00%	5.00%	3.50%	3.50%	4.50%	5.00%	20.00%
55	4.00%	8.50%	15.00%	3.50%	3.50%	4.50%	5.00%	30.00%
56	4.00%	4.00%	15.00%	3.50%	7.00%	15.00%	5.00%	20.00%
57	4.00%	4.00%	15.00%	3.50%	7.00%	15.00%	5.00%	20.00%
58	4.00%	4.00%	20.00%	3.50%	7.00%	15.00%	5.00%	20.00%
59	4.00%	15.00%	25.00%	3.50%	7.00%	15.00%	5.00%	20.00%
60	4.00%	15.00%	25.00%	7.50%	12.50%	15.00%	5.00%	20.00%
61	7.50%	17.50%	35.00%	7.50%	12.50%	25.00%	25.00%	25.00%
62	7.50%	30.00%	40.00%	7.50%	25.00%	30.00%	25.00%	50.00%
63	7.50%	25.00%	35.00%	7.50%	25.00%	35.00%	25.00%	50.00%
64	7.50%	25.00%	35.00%	7.50%	25.00%	40.00%	25.00%	50.00%
65	15.00%	25.00%	50.00%	15.00%	25.00%	40.00%	100.00%	100.00%
66	15.00%	35.00%	50.00%	15.00%	25.00%	40.00%	100.00%	100.00%
67	15.00%	30.00%	40.00%	15.00%	25.00%	40.00%	100.00%	100.00%
68	15.00%	30.00%	30.00%	15.00%	25.00%	40.00%	100.00%	100.00%
69	15.00%	30.00%	30.00%	15.00%	25.00%	40.00%	100.00%	100.00%
70	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Classic Values, Innovative Advice