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**State of Oklahoma
Police Pension and
Retirement System**

**Experience Study
for the Five-Year Period
Ending June 30, 2017**

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March 21, 2018

Board of Trustees
Oklahoma Police Pension and Retirement System
1001 N.W. 63rd Street, Suite 305
Oklahoma City, OK 73116-7335

Members of the Board:

We are pleased to submit the results of a study of the economic and demographic experience for the Oklahoma Police Pension and Retirement System (OPPRS). The purpose of this investigation is to assess the reasonability of the current actuarial assumptions for the System and provide a basis for revising assumptions, if appropriate. This investigation covers the five-year period from July 1, 2012 to June 30, 2017. As a result of the investigation, we recommend that revised assumptions be adopted by the Board for use in the July 1, 2018 actuarial valuation.

The set of recommended assumptions is shown in Appendix E of this report. In the actuary's judgment, these recommendations are suitable for use to measure the actuarial liability and budget future costs. Changing assumptions will not change the actual cost of future benefits. Once the assumptions have been adopted, the actuarial valuation measures the adequacy of the expected contributions to fund the benefits.

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

Respectfully submitted,

Brent A. Banister, PhD, FSA, EA, FCA, MAAA
Chief Actuary

Summary of Results

The following summarizes the findings and recommendations with regard to the assumptions utilized by the Oklahoma Police Pension and Retirement System. Explanations for the recommendations are found in the sections that follow.

Recommended Economic Assumption Changes

As the table indicates, although we are recommending a decrease in the price inflation assumption from 3.00% to 2.75%, our recommendation is to leave the assumed investment return assumption unchanged at 7.50%. We are also introducing a specific assumption for real wage growth of 0.75%. This assumption is used to build the total salary scale assumption as well as to estimate the COLA for the Baker group. The members of this closed group of retirees receive increases of one-third or one-half of the pay raise rates for the entity from which they retired.

Item	Current	Proposed
Price Inflation	3.00%	2.75%
Investment Return	7.50%	7.50%
Interest Credit on DOP Balances	7.75%	11.00%
Real Wage Growth	N/A	0.75%
COLA basis (Baker group)	3.00%	3.50%

Recommended Demographic Assumption Changes

We recommend minor changes to the demographic assumptions based on the experience of the last five years. Mortality rates and the probability of disability did not change, but the rates of retirement and termination, along with the expected severity of disability, were revised. There were also revisions to the total salary scale.

Recommended Actuarial Method Changes

Currently, the unfunded actuarial accrued liability (UAAL) is amortized as a level dollar amount over an open five-year period, whether it is a positive (UAAL) or negative number (actuarial assets exceed actuarial accrued liability, i.e., surplus). When a surplus exists, we recommend it be amortized over an open 30-year period. As a result, only a small portion of the excess assets in any one year is used to reduce contributions and most of the surplus is reserved to protect against unexpected investment losses in the future.

Financial Impact

The table below highlights the financial impact of the proposed assumptions, including the change in the unfunded actuarial accrued liability (UAAL), funded ratio and components of the actuarial contribution rate, based on the June 30, 2017 actuarial valuation. If adopted, the new set of assumptions will first be used in the July 1, 2018 actuarial valuation. While the impact of the new assumptions is expected to be similar, as a percentage of the Actuarial Accrued Liability, the dollar amounts will be different.

	Before Changes	Assumption Changes Only	All Changes
Actuarial Accrued Liability	$2,403,073,000	$2,425,756,000	$2,425,756,000
Actuarial Value of Assets	2,447,351,000	2,447,351,000	2,447,351,000
Unfunded Actuarial Accrued Liability	$(44,278,000)	$(21,595,000)	$(21,595,000)
Funded Ratio	101.8%	100.9%	100.9%
Normal Cost Rate	21.1%	20.4%	20.4%
Amortization Rate	(3.4%)	(1.7%)	(0.6%)
Budgeted Expense Rate	0.7%	0.7%	0.7%
Total Actuarial Contribution Rate	18.4%	19.4%	20.5%

Economic Assumptions

There are three core economic assumptions used in performing the actuarial valuation for the Oklahoma Police Pension and Retirement System (OPPRS) from which other economic assumptions are derived. The assumptions are:

- Price Inflation
- Investment Return
- Wage Inflation

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

Sources of data considered in the analysis and selection of the economic assumptions included:
- The 2017 Social Security Trustees Report
- Future expectations of OPPRS' investment consultant, Asset Consulting Group (ACG)
- U.S. Department of the Treasury bond rates
- Assumptions used by other large public retirement systems, based on the Public Fund Survey, published by the National Association of State Retirement Administrators (NASRA)
- Historical observations of price and wage growth statistics and investment returns

Actuarial Standard of Practice Number 27

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

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

a. it is appropriate for the purpose of the measurement;

b. it reflects the actuary's professional judgment;

c. it takes into account historical and current economic data that is relevant as of the measurement date;

  d. it reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data, or a combination thereof; and

  e. it has no significant bias (i.e., it is neither significantly optimistic nor pessimistic) except when provisions for adverse deviation or plan provisions that are difficult to measure are included.

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

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

The standard also acknowledges that there is not a single right assumption, noting "the actuary should also recognize that different actuaries will apply professional judgment and may choose different reasonable assumptions." As a result, a range of reasonable assumptions may develop both for an individual actuary and across actuarial practice.

This section of the report will address the relevant types of economic assumptions used in the actuarial valuation to determine the obligations of the System. In our opinion, the economic assumptions proposed in this report have been developed in accordance with ASOP No. 27.

The following table summarizes the current and proposed major economic assumptions:

	Current Assumptions	Proposed Assumptions
Price Inflation	3.00%	2.75%
Investment Return	7.50%	7.50%
Wage Inflation	Not explicit	0.75%

Price Inflation

Use in the Valuation: Future price inflation has an indirect impact on the results of the actuarial valuation through the development of the assumptions for investment return, and wage inflation (which then impacts individual salary increases).

The long-term relationship between price inflation and investment return has long been recognized by economists. The basic principle is that the investor demands a more or less level "real return" – the excess of actual investment return over price inflation. If inflation rates are expected to be high, investment return rates are also expected to be high, while low inflation rates are expected to result in lower expected investment returns, at least in the long run. Likewise, wages are expected, over the long haul, to increase with the prices of goods and services (price inflation) along with some increase to reflect general increases in productivity in the workplace.

Past Experience: Although economic activities, in general, and inflation in particular, do not lend themselves to prediction solely on the basis of historical analysis, historical patterns and long-term trends are factors to be considered in developing the inflation assumption. The Consumer Price Index, US City Average, All Urban Consumers, CPI (U), has been used as the basis for reviewing historical levels of price inflation. The following table provides historical annualized rates and annual standard deviations of the CPI-U over periods ending December 31st. More complete data is shown in Appendix A.

Period	Number of Years	Annualized Rate of Inflation	Annual Standard Deviation
1927 – 2017	90	2.98%	3.82%
1957 – 2017	60	3.68	2.74
1967 – 2017	50	4.07	2.84
1977 – 2017	40	3.56	2.76
1987 – 2017	30	2.60	1.21
1997 – 2017	20	2.14	1.03
2007 - 2017	10	1.69	1.28

The following graph illustrates the historical annual change in price inflation, measured as of December 31 for each year for more than 70 years, as well as the thirty year rolling average.

Price Inflation
CPI-U
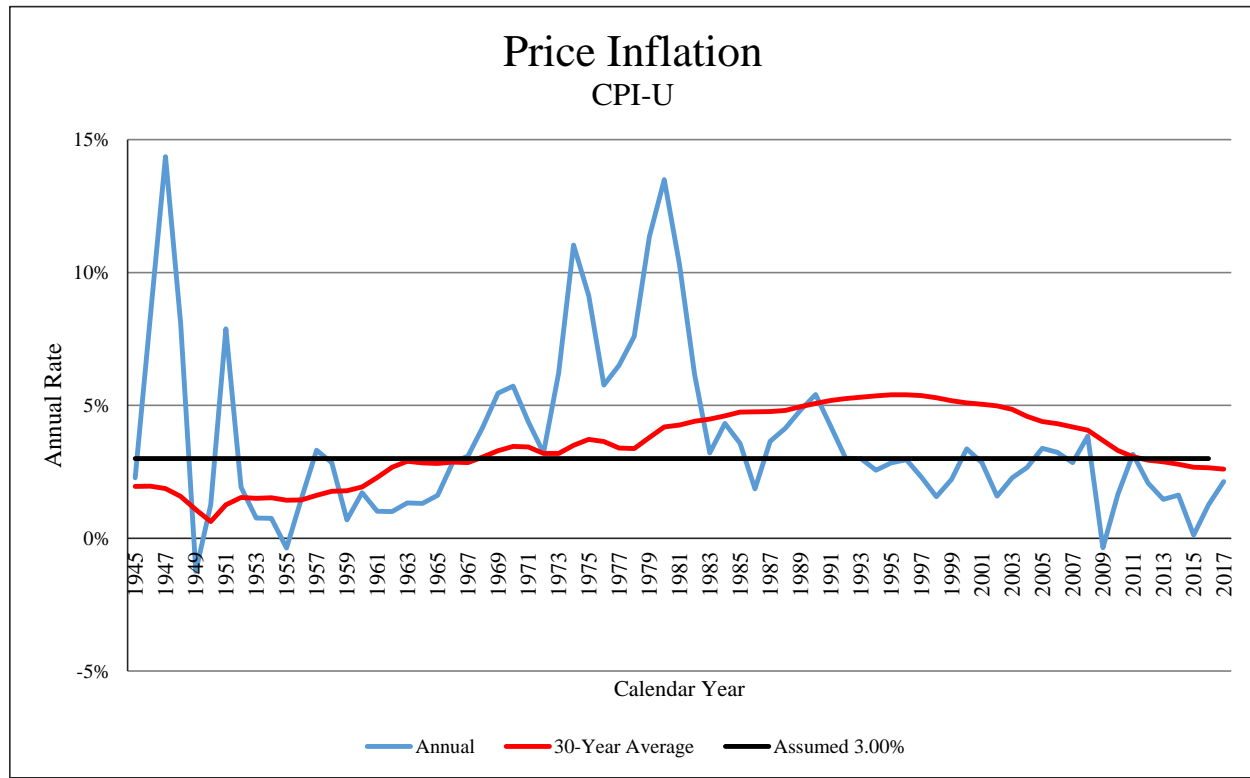
Over more recent periods, measured from December 31, 2017, the average annual rate of increase in the CPI-U has been below the current assumption of 3.00%. The period of high inflation from 1973 to 1982 has a significant impact on the averages over periods which include these rates. It is difficult to ignore the steady decline in inflation shown in the data above.

Forecasts of Inflation

Additional information to consider in formulating this assumption is obtained from measuring the spread on Treasury Inflation Protected Securities (TIPS) and from the prevailing economic forecasts. The spread between the nominal yield on treasury securities (bonds) and the inflation indexed yield on TIPS of the same maturity is referred to as the "breakeven rate of inflation" and represents the bond market's expectation of inflation over the period to maturity. Current market prices as of February 2018 suggest that investors expect inflation to be around 2.1% over the next 30 years, although there has been some recent volatility. The bond market expectations may be heavily influenced by the low interest rate environment created by the Federal Reserve Bank's manipulation of the bond market. Whether inflation returns to the higher rates observed historically remains to be seen.

We also note that ACG estimates that inflation will be 2.20% in the near term, increasing to 3.48% over time. A survey of 35 financial advisors conducted by Horizon Actuarial indicated a near-term assumption of 2.23%, with a longer range forecast of 2.445.

Social Security Projections

Although many economists forecast lower inflation than the assumptions used by retirement systems, they are generally looking at a shorter time horizon (10 years) than is appropriate for a pension valuation. To consider a longer, similar time frame, we looked at the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. In the most recent report (July 2017), the projected average annual increase in the CPI over the next 75 years was estimated to be 2.6%, under the intermediate (best estimate) cost assumption. The range of price inflation used in the Social Security 75-year modeling, which includes low and high cost scenarios in addition to the intermediate cost projection, was 2.0% to 3.2%.

Peer System Comparison

While we do not recommend the selection of any assumption based on what other systems use, it does provide another set of relevant information to consider. According to the Public Plan Database (a survey of over 150 state and local retirement systems maintained by a collaboration between the Center for Retirement Research at Boston College, the Center for State and Local Government Excellence, and the National Association of State Retirement Administrators) the average inflation assumption for statewide systems has been steadily declining. As of the most recent study, the most common assumption is 3.00%, which is consistent with OPPRS' current assumption. However, there has been a consistent downward shift over the past several years as systems have been lowering this assumption.

Conclusion: The current inflation assumption is 3.0%. While actuarial standards caution against assigning too much weight to recent experience, multiple factors lead us to believe the current inflation assumption should be reduced. Actual inflation for the last 30 years has been 2.6%. The bond markets reflect an expectation of inflation well below 3.0% and the inflation assumption used by the Chief Actuary of the Social Security Administration in their 75-year projections is 2.6%. Some of the lower expectations are considering shorter periods of time that the timeframe we need to consider as actuaries, so we are careful not to give those estimates as much weight. We also want to be measured in our changes so that we don't have to reverse a change in the next experience study. Based on this information, **we recommend a reduction in the inflation assumption from 3.00% to 2.75%.**

Consumer Price Inflation	
Current Assumption	3.00%
Recommended Assumption	2.75%

INVESTMENT RETURN

Use in the Valuation: The investment return assumption reflects anticipated returns on the current and future assets. It is one of the primary determinants in the calculation of the expected cost of the System's benefits, providing a discount of the estimated future benefit payments to reflect the time value of money. This assumption has a direct impact on the calculation of liabilities, normal costs, and contribution rates. Generally, the investment return assumption should be set with consideration of the asset allocation policy, expected long term real rates of return on the specific asset classes, the underlying inflation rate, and any investment expenses, but is also impacted by the dynamics of the system along with the risk tolerance and preferences of the Board.

The current investment return assumption is 7.50% per year, net of all investment-related expenses. The 7.50% rate of return is referred to as the nominal rate of return and is composed of two components. The first component is price inflation (previously discussed). Any excess return over price inflation is referred to as the real rate of return. The real rate of return, based on the current set of assumptions, is 4.50% (7.50% nominal return less 3.00% inflation).

ASOP 27 provides guidance to actuaries on the selection of economic assumptions used for measuring pension obligations. Our findings and analysis, following that ASOP, are discussed below.

Long Term Perspective

Because the economy is constantly changing, assumptions about what may occur in the near term are volatile. Asset managers and investment consultants usually focus on this near-term horizon so as to make prudent choices regarding how to invest the trust funds, i.e., asset allocation. For actuarial calculations, we typically consider very long periods of time as some current employees will still be receiving benefit payments more than 80 years from now. For example, a newly-hired employee who is 25 years old may work for 30 years, to age 55, and live another 35 years, to age 90. The retirement system would receive contributions for the first 30 years and then pay out benefits for the next 35 years. During the entire 65-year period, the system is investing assets on behalf of the member. For such a typical career employee, more than one-half of the investment income earned on assets accumulated to pay benefits is received <u>after</u> the employee retires. This difference in time horizon is frequently a source of debate and confusion when setting economic assumptions.

Forward Looking Analysis

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

In performing our analysis, we use the building block approach so the real rate of return of the portfolio is modeled, based on the target asset allocation, and then the expected return is added to the price inflation assumption. Therefore, our analysis focuses on the real rate of return while the analysis of the investment consultants more typically focuses on the nominal return in their asset allocation consulting. OPPRS' current target asset allocation, along with their investment consultant's (ACG) long-term capital market assumptions, are shown in the following table (more detail is shown in Appendix B):

OPPRS Target Asset Allocation and ACG Assumptions

Asset Class	Target Allocation	Arithmetic Nominal Return	Standard Deviation
Core Bonds	10.0%	6.22%	6.21%
Multi-Sector Bonds	7.5%	7.08%	7.10%
Absolute Return	7.5%	7.30%	6.67%
U.S. Large Cap Equity	15.0%	11.01%	17.34%
U.S. Small Cap Equity	5.0%	12.27%	21.33%
International Developed Equity	10.0%	11.99%	22.66%
Emerging Market Equity	5.0%	13.28%	30.71%
Long/Short Equity	10.0%	9.75%	13.19%
Private Equity	15.0%	13.64%	27.73%
Core Real Estate	5.0%	9.39%	9.49%
Opportunistic Real Estate	5.0%	12.48%	16.23%
Commodities	5.0%	5.66%	17.86%
Total	100.0%		

While arithmetic means are straightforward to calculate, because of the nature of compounding returns, the arithmetic mean is of limited value. A more relevant measure is the geometric mean, which is the expected long-term compound rate of return. Mathematically, the geometric return will always be less than the arithmetic return due to the impact of the volatility of returns. Under the ACG long-term capital market assumptions, the geometric mean is 9.49%. It is important to note that this rate of return is their expectation for what returns will be 10 or 15 years from now,

and not what the returns will be in between. Their intermediate (the next ten years) assumptions lead to an expected return of 6.06%.

When considering the expected return of the OPPRS portfolio, it is important to consider both the short-term and the long-term. If we use a blend of ACG's intermediate assumptions for the next ten years, and then their long-term assumptions for the next 20 years, we get an estimate of the expected return for the next 30 years. Adjusting for our proposed inflation assumption of 2.75%, the geometric mean for the portfolio over the next 30 years would be 8.04%.

It should be noted that there is currently a fair amount of variation in expectations among investment professionals. We have examined the ACG assumptions compared to a survey of 35 investment advisors conducted by Horizon Actuarial Services. Generally, ACG's intermediate-term assumptions are in line with those of other firms. For the long-term assumptions, comparisons are complicated by methodology and inflation differences, but after accounting for those, we do not believe that ACG's assumptions for the future are unreasonable.

Peer System Comparison

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

The following graph shows the change in the distribution of the investment return assumption from fiscal year 2001 through August, 2016 for more than 120 large public retirement systems included in the NASRA Public Fund Survey. As it indicates, the investment return assumptions used by public plans have decreased over the last fifteen years, likely heavily impacted by a corresponding decrease in the underlying inflation assumption from 4.0% to 3.0% over the same period. It is worth noting that the median investment return assumption in fiscal year 2012 dropped from 8.00% to 7.75% and has declined further to 7.50%.

Distribution of Public Pension Investment Return Assumptions, FY 01 to FY 18

Public Fund Survey, NASRA Feb-18 — Fiscal Year
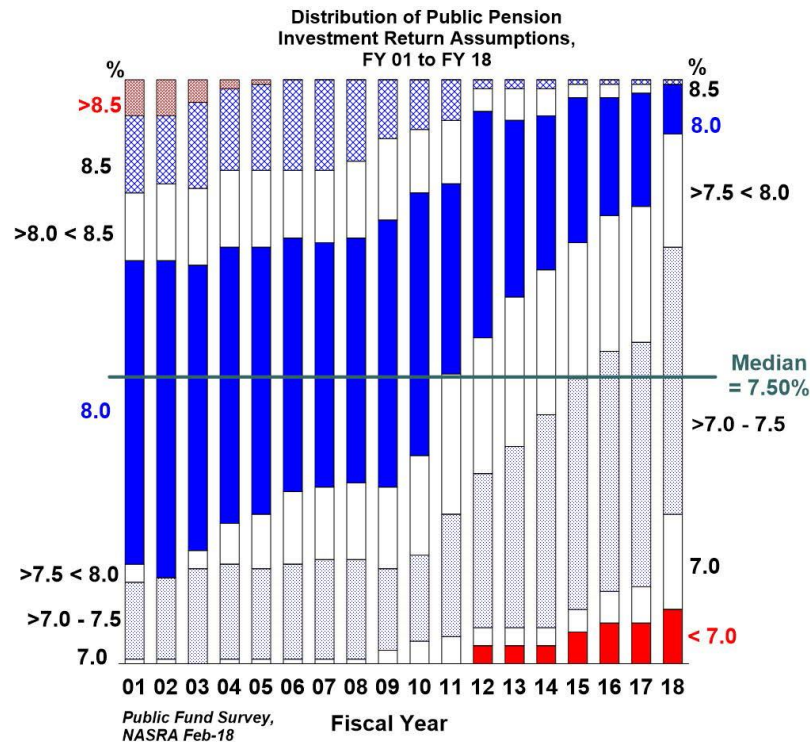
Administrative and Investment Expenses: Budgeted administrative expenses are directly accounted for as a separate component of the actuarial contribution rate so no adjustment to the investment return assumption is necessary. Generally, capital market assumptions are reflective of passive investment strategies where there are minimal investment expenses. Where active management is utilized, it is assumed that the additional return from active management is at least as great as the additional expense, and so no investment expense adjustment is required.

Recommendation: Investment advisors typically focus on the shorter term in order to appropriately make asset allocation decisions. There seems to be a general consensus among investment consultants that returns in the short-term will be lower because, among other factors, the current low interest rate environment means that returns on bond investments will not reach the anticipated long-term levels for some time. Pensions, however, must focus on a much longer time frame, and so we are inclined to give more consideration to those advisors who are making longer term projections. Considering the capital market assumptions produced by ACG, the trends among similar funds, the historical returns since 1990 of 7.8%, and the desire for stability in the absence of a significant reason to change, we believe that 7.50% remains a reasonable assumption. It should be noted that because the inflation assumption is being lowered, retaining the same investment return assumption is effectively increasing the expected real rate of return by 0.25%.

Investment Return Assumption	
Current	7.50%
Recommended	7.50%

Interest Credited to DOP Accounts

Members who participate in the Deferred Option Program (DOP) receive an annual interest credit to their account balance. The benefit provisions call for a credit of the greater of the investment return assumption or the actual investment return less 2%. Based on a median return of 7.50% (the assumed investment return assumption) and the portfolio's standard deviation of 10.91%, we estimate the effective DOP interest crediting rate to be 11.0%. The effective rate is well above the investment return assumption, because when the return on the portfolio is less than 9.50%, the DOP account is credited with 7.50% interest. Given the portfolio's standard deviation, this means a higher rate than 7.50% is credited about 42% of the time, and the credited rate exceeds 11% (so a portfolio return over 13%) more than 30% of the time. Based on our analysis, **we recommend that the assumed interest crediting rate for DOP accounts be increased from 7.75% to 11.0%.** We intend to reflect this assumption only for active members who are assumed to elect a retroactive DOP at some point in the future. Applying this assumption to current DOP members would be a complex process and have only an minor, immaterial impact on liabilities.

GENERAL WAGE GROWTH

Background: General wage growth, thought of as the "across the board" rate of salary increases, is composed of the price inflation assumption and an assumption for the real rate of wage increases real wage growth in excess of inflation. The excess of general wage growth over price inflation represents the increase in the standard of living, also called productivity growth.

In constructing the salary increase assumption used to project future salary increases for individual members, the general wage growth assumption is combined with an assumption for service-based salary increases (called a merit scale). The service-based salary increase assumption will be addressed with the demographic assumptions. Currently, there is no explicit assumption for general wage growth, but such as assumption is needed to accurately model the benefit increases to be received by the Baker group.

Historical Perspective: Wage statistics are found in the Social Security System database on the National Average Wage data. This information goes back to 1955 and is the most comprehensive database available. Because the National Average Wage is based on all wage earners in the country who are covered by Social Security, it can be influenced by the mix of jobs (full-time vs. part-time, manufacturing vs. service, etc.) as well as by changes in some segments of the workforce that are not seen in all segments (e.g. regional changes or growth in computer technology). Furthermore, if compensation is shifted between wages and benefits, the wage index would not accurately reflect increases in total compensation. OPPRS membership is composed exclusively of governmental employees working in Oklahoma, whose wages and benefits are somewhat linked as a result of state and local tax revenues, funding allocations, and governing policies. Because the competition for workers can, in the long term, extend across industries and geography, the broad national earnings growth will have some impact on OPPRS members. In the shorter term, however, the wage growth of OPPRS and the nation may be less directly correlated.

The excess of wage growth over price inflation represents the real wage growth rate. The following table shows the compounded wage growth over various periods, along with the comparable price inflation rate for the same period. The differences represent the real wage growth rate. The data for each year is documented in Appendix C.

Years	Period	General Wage Growth	CPI Increase	Real Wage Growth
2006-2016	10	2.3%	1.7%	0.6%
1996-2016	20	3.2%	2.1%	1.1%
1986-2016	30	3.5%	2.6%	0.9%
1976-2016	40	4.2%	3.6%	0.6%
1966-2016	50	4.7%	4.1%	0.6%
1956-2016	60	4.5%	3.7%	0.8%

Similar information over rolling thirty year periods is shown in the following graph:
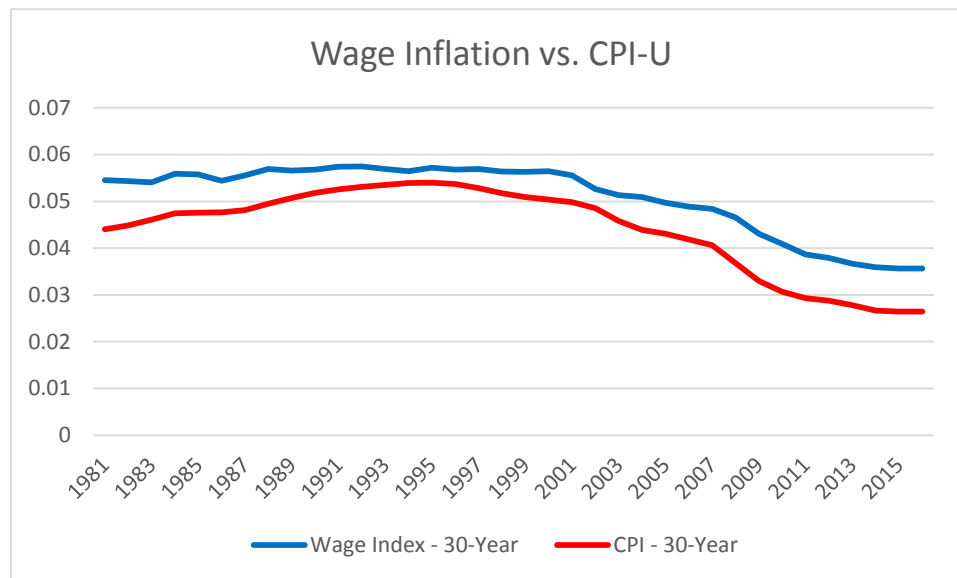
Over the last 30 years, the real wage increase, as measured by the increase in the National Average Wage Index, has been 0.88% per year on average. A somewhat similar, but slight different set of data is available from the Bureau of Labor Statistics, which reports the median weekly wage for full-time employees. Over the last 30 years, this amount (adjusted for inflation) has had an average increase of less than 0.20% per year. Part of the difference in these results arises from the

difference between using an average and a median. There are also technical differences arising from who is included in each measure.

Forecasts of Future Wages: The wage index used for the historical analysis is projected forward by the Office of the Chief Actuary of the Social Security Administration in their 75-year projections. In the July, 2017 Trustees Report, the annual increase in the National Average Wage Index under the intermediate cost assumption (best estimate) was 3.8%, 1.2% higher than the Social Security Administration's intermediate inflation assumption of 2.6% per year. The range of the assumed real wage growth in the 2017 Trustees report was 0.6% to 1.8% per year.

Analysis and Conclusion: The various measures analyzed support a real wage growth assumption between 0.5% and 1.0%. **We recommend setting the real wage assumption at 0.75%, so the total general salary growth assumption (price inflation plus real wage growth) will be 3.50%.**

SUMMARY

The following table summarizes the current set of economic assumptions along with the recommended set of economic assumptions:

	Current Assumptions	Recommended Assumptions
Price Inflation	3.00%	2.75%
Investment Return	7.50%	7.50%
Interest Credited on DOP Balances	7.75%	11.00%
Real Wage Growth	N/A	0.75%
General Wage Growth	N/A	3.50%
COLA basis (Baker group)	3.00%	3.75%

Demographic Assumptions

There are several demographic assumptions used in the actuarial valuations performed for the Oklahoma Police Pension and Retirement System (OPPRS), including:

- Mortality
- Service Retirement
- Disability Retirement
- Termination of Employment
- Salary Increase for Merit and Promotions

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

The purpose of a study of demographic experience is to compare what actually happened to the membership during the study period (June 30, 2012 through June 30, 2017) with what was expected to happen, based on the assumptions used in the most recent actuarial valuation.

Detailed tabulations by age, service and/or gender are performed over the entire study period. These tabulations look at all active and retired members during the period as well as separately identifying those who experience a demographic event, also referred to as a decrement. In addition, the tabulation of all members together with the current assumptions permits the calculation of the number of expected decrements during the study period. We then compare the ratio of Actual to Expected decrements, called the A/E ratio as a measure of the adequacy of the assumption.

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

Because a major purpose of an actuarial valuation is to determine the liability for future benefit payments, it is often preferable to measure the events that occurred by the proportion of liability changing rather than simply the proportion of individuals change. This approach, called "liability weighting", helps reflect that if certain events are connected with the salary or service of

individuals, then we should reflect that by giving more weight to those with greater liability. In some cases, there may be a noticeable difference in the results based upon whether we look at the analysis on a count or weighted basis. In these cases, we may select an assumption somewhere in between the two and move over time as the credibility of the liability-weighted results increases. For the most part, the relatively homogenous nature of OPPRS membership means that this analysis adds little value to our analysis. However, we did perform and consider this analysis, anticipating that it might better reflect the mix of larger and smaller employers participating in OPPRS.

The remainder of this section presents the results of the demographic study. We have prepared graphs and tables that show a comparison of the actual and expected decrements and the overall ratio of actual to expected results under the current assumptions. If a change is being proposed, the revised actual to expected ratios are shown as well. These tables are presented in Appendices E and F.

Mortality Tables

Mortality tables are a fundamental demographic assumption in actuarial valuations. Because pension benefits are typically paid over a retiree's lifetime, it is important to appropriately reflect the timeframe for a typical life. In addition, deaths before retirement may also result in the payout of benefits to a spouse or survivor. For valuation purposes, we must consider mortality tables for retirees, beneficiaries of retirees, disabled retirees, and active members. However, the post-retirement mortality assumption has a far greater impact on the system's funding than the pre-retirement mortality assumption.

Retiree Mortality:

The post-retirement mortality rates used in the actuarial valuation project the percentage of retirees who are expected to die in a given future year. Of all of the demographic assumptions, the mortality assumption typically has the most significant impact on liability projections.

Based upon the long-term trend of mortality improvement, actuaries seek to account for future improvements in longevity, either by directly projecting future improvements or by maintaining a sufficient margin in expected rates of mortality to allow for future improvement. The most direct approach is a projection of mortality improvements – also called generational mortality – starting with a base table and then estimating mortality rates for each year in the future based on expected improvements in mortality over time. The current assumption is the RP-2000 Blue Collar Mortality Table, projected with Scale AA. This mortality table and projection scale, developed by the Society of Actuaries, were the most current tables published at the time of the last experience study.

In 2014, the Society of Actuaries published a new family of mortality tables based on the most current data available. This RP-2014 family of mortality tables has a more sophisticated mortality improvement mechanism to allow for reflecting certain generational trends observed in the United States. While the data used for this table was from the private sector rather than the public sector, we believe that it can be considered as a basis for public plans, including OPPRS.

Graphs showing actual versus expected post-retirement mortality rates for OPPRS male retirees are shown in Appendix F-1, while Appendix G-1 has the corresponding numerical data. Female retirees are shown in Appendix F-2 and G-2. The analysis of the actual post-retirement mortality experience over the five-year experience study period yields an actual/expected ratio of 107% for males and 122% for females. (Under the liability weighting discussed earlier, the A/E ratios are 99% and 129%, respectively). It should be noted that the overall number of retirees in OPPRS is relatively small for purposes of analyzing mortality experience, but the number of female retirees is especially limited, and we are therefore cautious regarding drawing strong conclusions from it.

While the actual/expected ratio is a measure of how well an assumption predicted the actual events, this ratio does not necessarily supply a complete picture. For example, if a set of mortality rates predicted too many deaths at younger ages and not enough at older ages, the actual/expected ratio could be near 100%, even though the assumption might not be a good fit. We examined the RP-2014 Blue Collar table (with a one year age setback) and found that it had an actual/expected count ratio for males of 104% for ages 50 to 90, comparable to the current assumption. However, the alternative table was lower in the areas of the table where we are already on the lower end of matching experience, and higher in the parts of the table where we are already on the high end. So, while the A/E ratio – an average of the whole range of ages – was close, the quality of the fit was not as good as the current table. Therefore, we believe that the retiree table for males should be retained.

For the female retirees, we note that in the last experience study, mortality rates were reduced to better fit the data observed, not only in that study, but in the study before it. (We believe this included female surviving spouses as well as female retirees.) While the observations for the current study period would suggest that rates could be increased, when we consider the small amount of data and the historical studies, we believe it is reasonable to retain the current retiree table for females as well.

Beneficiary Mortality:
For benefits payable with a joint and survivor option (which is the automatic form for OPPRS benefits), an assumption is needed regarding the beneficiary's lifetime. Beneficiary data is often less precise because it is not needed prior to a retiree's death. Further, data tracking of beneficiaries is less precise during the years when the member is alive. Consequently, we do not find

sufficiently credible data to analyze this group separately. We recommend that the same table used for retirees also be used for beneficiaries.

Disabled Retiree Mortality:
Members who retire under the disability retirement provisions are generally expected to be less healthy than the overall working population. Currently, the assumption for this group is the same as the regular members, but with a four-year age set forward. The number of disabled retirees is small, and so the number of deaths in this group can be very volatile. Consequently, it is difficult to perform any meaningful analysis. We do note that the actual/expected ratio on a count basis was 78% for this study period. If it continues to be well below 100%, we are likely to adjust this table in the next study.

Active Member Mortality:
For active members, the mortality assumption is less significant since it represents only a small portion of cases where employment ends and benefits begin. Further, there is less of a concern with margin for future improvements compared to retirees. During this study period, there were 10 active member deaths compared with 14 for the 2007 to 2012 study and 8 for the 2002 to 2007 study. Limited data such as this makes studying the assumption in detail impossible.

Because we are recommending no changes to the mortality tables for retirees and beneficiaries, we believe it is reasonable to retain the active mortality table assumption as well. All active member deaths will be assumed to be duty-related for conservatism and simplicity.

Rates of Retirement

The service retirement rates used in the actuarial valuations project the percentage of employees who are expected to retire during a given year. This assumption does not include the retirement patterns of the individuals who terminated from active membership prior to their retirement.

OPPRS provides a normal (unreduced) retirement benefit at any age upon the completion of 20 years of service. After 30 years of service, the maximum benefit multiplier of 75% applies so the amount of the retirement benefit grows only with salary increases. Significantly affecting retirement decisions are two other retirement options provided by OPPRS.

The Deferred Option Plan (DOP) allows a member to be treated by the System as though he or she had retired, but continue in active employment for up to five years. Monthly benefits that would normally be paid during this deferral period are accumulated with interest, along with half of the employer contributions made on the member's behalf (the member no longer contributes). Upon final termination of employment, the member receives the monthly payments prospectively along

with payment of the DOP account balance in a lump sum. A second alternative upon retiring is to have benefits calculated as though the member elected the DOP option at a specified time in the past. For purposes of preparing the funding valuation and compliance with accounting standards, a member is treated as retiring upon entering DOP, electing a retroactive DOP, or simply retiring and commencing benefits.

Graphs and detailed tables showing actual versus expected retirement rates are shown in Appendices F-3 and G-3. The analysis of the actual retirement experience over the five-year period yields an actual/expected ratio of 39%, indicating utilization is substantially lower than expected. In the prior two experience studies performed by the prior actuary, the most notable result, consistent with this study, was that retirement rates at 30 years and beyond were well below 100%, the assumed rate for members with 30 or more years of service. Retirement rates increase at 35 years when a member may elect a retroactive DOP for the five-year maximum and still receive the maximum benefit multiplier.

Currently, the assumption is that all retirees elect a DOP retroactive for five years (or the date of retirement eligibility if more recent). During this study period, we identified 526 members as retiring, but there are only 14 members in DOP as of the most recent valuation. This would suggest that a forward-looking DOP election is rare. Because the retroactive election (back to the earliest unreduced retirement age that may be elected) is generally going to be more valuable than not electing it, we believe that it is reasonable to assume that all retirees elect the retroactive DOP. OPPRS staff also confirmed that almost all members elect the retroactive DOP.

Based on the observed data, we are proposing some revisions to the retirement rates. There are some minor changes for those with 20 to 25 years of service to better match observed data. More significantly, we are suggesting that between 30 and 35 years of service, the rates be lowered substantially from the current 100% assumption. In keeping with our usual approach of moving part way, we are recommending retirement rates that are still higher than have been recently been observed, but lower than had been assumed. If the results of the next experience study continue to show the current patterns, we anticipate further reduction in the rates. Specific rates are included in Appendix G-3.

Rates of Disability Retirement

The rates of disability used in the actuarial valuation project the percentage of employees who are expected to become disabled each year and begin to receive a disability retirement benefit. For the study period, there were 12 disability retirements in the core ages of 20 to 54, compared with 10 expected. A graphs and detailed table showing actual versus expected disability rates are shown in Appendices F-4 and G-4.

In the prior experience study, disability rates were adjusted to vary more by age; i.e., as members age, the rate of disability increases. The change lowered the expected number of disabilities. In this study period, actual disabilities were somewhat higher than expected, but with only a limited number of disability retirements observed, it is difficult to credibly assess whether or not a change is needed. We prefer to leave the disability rates alone at this time, and reevaluate the assumption in the next study.

We reviewed the 21 disability retirements granted between 2011 and 2017, some of which were outside the formal five-year study period. A summary of the award percentage is shown in the following table:

Award Level	Number of Awards
25%	1
50%	8
75%	5
100%	7
	21

Based on these observations, we recommend that the award percentage assumption be changed from 50% to 75%, slightly higher than the average award of 71%.

Rates of Termination of Employment

The termination of employment rates are used to determine the expected number of separations from active service that will occur prior to members attaining the eligibility requirement for a retirement benefit as a result of resignation or dismissal.

The experience during the five-year study period was close to expected with an A/E ratio of 99%. The current assumptions are service-based, a common approach, and one well supported by the data. After also considering the results from the prior study, we recommend some adjustments to smooth out the assumed rates and more closely fit the recent observations. The complete tables of recommended termination of employment rates are shown in Appendices F-5 and G-5.

We also recommend that the current assumption that all vested members who terminate will elect to receive a future benefit, commencing at age 50, be retained.

Rates of Total Salary Increase

Under the "building block" approach recommended in ASOP 27, this assumption is composed of three components; inflation, productivity (real wage increases), and merit/promotion. The first two of these were developed in the economic assumptions section.. The merit component includes the additional increases in salary due to performance, seniority, promotions, etc.

We frequently find that salary increases are correlated to a member's length of service. Typically, new employees receive larger increases as certain milestones are met, while mid-career employees tend to have smaller increases, some of which reflect promotion to supervisory or management positions. Longer term employees generally receive only general wage increases. In light of the recommended assumption for general wage growth of 3.50%, the total salary increase assumption (general wage increase plus merit) is expected to be 3.50% at longer service durations.

In developing this assumption, we are cognizant that actual price inflation was lower than expected during this study period. Consequently, we seek to develop an assumption that has a similar "shape" to the observed increases, but also assumes greater increases than were recently observed. Detailed salary increase rates at all ages are shown in Appendices F-6 and G-6. We recommend some changes be made to better fit the observed data, along with the reflection of our proposed general wage increase of 3.50% (down from 4.50%).

Miscellaneous Assumptions

Marriage Assumptions: Currently 85% of members are assumed to be married with the husband three years older than the wife. This is a common and reasonable assumption and we recommend maintaining this assumption.

Administrative Expenses: Currently, the System provides a budgeted estimate of administrative expenses for the upcoming year that is included as a separate component of the actuarial contribution rate. We recommend this approach be continued. Note that the impact of any investment expenses is reflected in the net investment return assumption.

Missing Data: In preparing the valuation data, certain data items are missing, unavailable, or unreasonable. In such cases, assumptions have been developed for those data elements. These assumptions are described in Appendix D. We recommend retaining these assumptions.

Actuarial Methods

Actuarial valuations utilize methods to determine the liabilities, assets, and costs. The selection of these methods constitute the system's funding policy. While these are not like assumptions that may change over time, an experience study is still a good opportunity to review these methods to see if they are still appropriate for systematically funding the promised benefits. Significant methods are described below.

Actuarial Cost Method: The cost method is used to allocate the present value of benefits between past service (actuarial accrued liability) and future service (normal cost). Currently the valuation uses the entry age normal cost method. This is the most widely used cost method of large public sector plans and has demonstrated the highest degree of stability as compared to alternative methods. We recommend no change in the use of this method.

Actuarial Value of Assets: The purpose of the asset smoothing is to dampen the impact that market volatility has on valuation results by spreading the unexpected market gains and losses over several years. Currently the System uses a smoothing method that recognizes 20% of each year's difference between the market value of assets and the expected actuarial value of assets (based on the assumed rate of return) for five years. The actuarial value of assets cannot be less than 80% or more than 120% of market value. We recommend no change in the use of this method.

Amortization Method: The unfunded actuarial accrued liability is amortized using a level dollar method over an open five-year period. Essentially, this has the effect of attempting to move about a quarter of the way from the current funded position towards 100% funding. (Because the actual contributions are not based on the UAAL amortization contribution rate, actual results are not directly affected.) Compared to other retirement systems, this would be considered to be an aggressive attempt to reach 100% funding. We do note, however, that should the plan have a funded ratio of over 100% (actuarial assets exceed actuarial accrued liability), the amortization method serves to use any excess at the same rate as would be used to fund a shortfall. We would suggest that rather than try to use surplus rapidly only a small portion of the excess be used in any one year to reduce contributions, and the rest be maintained for protection against unexpected losses. Therefore, we recommend that any surplus be amortized as a level dollar amount over an open 30-year period, while unfunded actuarial accrued liabilities continue to be amortized as a level dollar amount over an open five-year period.

Historical CPI-U Index

December of:	Index	Increase	December of:	Index	Increase
1928	17.1				
1929	17.2	0.6 %	**1974**	51.9	12.3%
1930	16.1	-6.4	**1975**	55.5	6.9
1931	14.6	-9.3	**1976**	58.2	4.9
1932	13.1	-10.3	**1977**	62.1	6.7
1933	13.2	0.8	**1978**	67.7	9.0
1934	13.4	1.5	**1979**	76.7	13.3
1935	13.8	3.0	**1980**	86.3	12.5
1936	14.0	1.4	**1981**	94.0	8.9
1937	14.4	2.9	**1982**	97.6	3.8
1938	14.0	-2.8	**1983**	101.3	3.8
1939	14.0	0.0	**1984**	105.3	3.9
1940	14.1	0.7	**1985**	109.3	3.8
1941	15.5	9.9	**1986**	110.5	1.1
1942	16.9	9.0	**1987**	115.4	4.4
1943	17.4	3.0	**1988**	120.5	4.4
1944	17.8	2.3	**1989**	126.1	4.6
1945	18.2	2.2	**1990**	133.8	6.1
1946	21.5	18.1	**1991**	137.9	3.1
1947	23.4	8.8	**1992**	141.9	2.9
1948	24.1	3.0	**1993**	145.8	2.7
1949	23.6	-2.1	**1994**	149.7	2.7
1950	25.0	5.9	**1995**	153.5	2.5
1951	26.5	6.0	**1996**	158.6	3.3
1952	26.7	0.8	**1997**	161.3	1.7
1953	26.9	0.7	**1998**	163.9	1.6
1954	26.7	-0.7	**1999**	168.3	2.7
1955	26.8	0.4	**2000**	174.0	3.4
1956	27.6	3.0	**2001**	176.7	1.6
1957	28.4	2.9	**2002**	180.9	2.4
1958	28.9	1.8	**2003**	184.3	1.9
1959	29.4	1.7	**2004**	190.3	3.3
1960	29.8	1.4	**2005**	196.8	3.4
1961	30.0	0.7	**2006**	201.8	2.5
1962	30.4	1.3	**2007**	210.0	4.1
1963	30.9	1.6	**2008**	210.2	0.1
1964	31.2	1.0	**2009**	215.9	2.7
1965	31.8	1.9	**2010**	219.2	1.5
1966	32.9	3.5	**2011**	225.7	3.0
1967	33.9	3.0	**2012**	229.6	1.7
1968	35.5	4.7	**2013**	233.0	1.5
1969	37.7	6.2	**2014**	234.8	0.8
1970	39.8	5.6	**2015**	236.5	0.8
1971	41.1	3.3	**2016**	241.4	2.1
1972	42.5	3.4	**2017**	246.5	2.1
1973	46.2	8.7			

Capital Market Assumptions and Asset Allocation

Rates of Return and Standard Deviation by Asset Class

Asset Class	Target Allocation	Arithmetic Nominal Return	Standard Deviation
Core Bonds	10.0%	6.22%	6.21%
Multi-Sector Bonds	7.5%	7.08%	7.10%
Absolute Return	7.5%	7.30%	6.67%
U.S. Large Cap Equity	15.0%	11.01%	17.34%
U.S. Small Cap Equity	5.0%	12.27%	21.33%
International Developed Equity	10.0%	11.99%	22.66%
Emerging Market Equity	5.0%	13.28%	30.71%
Long/Short Equity	10.0%	9.75%	13.19%
Private Equity	15.0%	13.64%	27.73%
Core Real Estate	5.0%	9.39%	9.49%
Opportunistic Real Estate	5.0%	12.48%	16.23%
Commodities	5.0%	5.66%	17.86%
Total	100.0%		

Asset Class Correlation Coefficients

Asset Class	Core Bonds	Multi Sector	Absolute Return	US Large	US Small	Int'l Develop	Emerg. Market	Long/Short	Private Equity	Real Estate	Opportune Real Estate	Commod-ities
Core Bonds	1.00	0.75	0.14	0.19	0.12	0.04	-0.11	0.10	-0.24	-0.19	-0.21	0.00
Multi-Sector		1.00	0.35	0.39	0.38	0.36	0.28	0.31	-0.12	-0.23	-0.11	0.25
Absolute Return			1.00	0.54	0.58	0.52	0.48	0.80	0.55	0.20	0.29	0.51
U.S. Large Cap				1.00	0.77	0.66	0.42	0.50	0.50	0.14	0.31	0.20
U.S. Small Cap					1.00	0.61	0.56	0.59	0.45	0.10	0.20	0.34
Int'l Developed						1.00	0.64	0.50	0.33	0.14	0.32	0.36
Emerging Market							1.00	0.55	0.33	-0.08	0.11	0.46
Long/Short Equity								1.00	0.51	-0.01	0.08	0.39
Private Equity									1.00	0.24	0.39	0.42
Core Real Estate										1.00	0.76	0.23
Opportunistic RE											1.00	0.36
Commodities												1.00

National Average Wage Index

	Index	Increase		Index	Increase
1927	$1,159.14				
1928	1,162.53	0.3%	**1973**	7,580.16	6.3
1929	1,196.88	3.0	**1974**	8,030.76	5.9
1930	1,164.95	-2.7	**1975**	8,630.92	7.5
1931	1,086.09	-6.8	**1976**	9,226.48	6.9
1932	954.02	-12.2	**1977**	9,779.44	6.0
1933	892.58	-6.4	**1978**	10,556.03	7.9
1934	929.34	4.1	**1979**	11,479.46	8.7
1935	968.53	4.2	**1980**	12,513.46	9.0
1936	1,008.20	4.1	**1981**	13,773.10	10.1
1937	1,071.58	6.3	**1982**	14,531.34	5.5
1938	1,047.39	-2.3	**1983**	15,239.24	4.9
1939	1,076.41	2.8	**1984**	16,135.07	5.9
1940	1,106.41	2.8	**1985**	16,822.51	4.3
1941	1,228.81	11.1	**1986**	17,321.82	3.0
1942	1,455.70	18.5	**1987**	18,426.51	6.4
1943	1,661.79	14.2	**1988**	19,334.04	4.9
1944	1,796.28	8.1	**1989**	20,099.55	4.0
1945	1,865.46	3.9	**1990**	21,027.98	4.6
1946	2,009.14	7.7	**1991**	21,811.60	3.7
1947	2,205.08	9.8	**1992**	22,935.42	5.2
1948	2,370.53	7.5	**1993**	23,132.67	0.9
1949	2,430.52	2.5	**1994**	23,753.53	2.7
1950	2,570.33	5.8	**1995**	24,705.66	4.0
1951	2,799.16	8.9	**1996**	25,913.90	4.9
1952	2,973.32	6.2	**1997**	27,426.00	5.8
1953	3,139.44	5.6	**1998**	28,861.44	5.2
1954	3,155.64	0.5	**1999**	30,469.84	5.6
1955	3,301.44	4.6	**2000**	32,154.82	5.5
1956	3,532.36	7.0	**2001**	32,921.92	2.4
1957	3,641.72	3.1	**2002**	33,252.09	1.0
1958	3,673.80	0.9	**2003**	34,064.95	2.4
1959	3,855.80	5.0	**2004**	35,648.55	4.6
1960	4,007.12	3.9	**2005**	36,952.94	3.7
1961	4,086.76	2.0	**2006**	38,651.41	4.6
1962	4,291.40	5.0	**2007**	40,405.48	4.5
1963	4,396.64	2.5	**2008**	41,334.97	2.3
1964	4,576.32	4.1	**2009**	40,711.61	-1.5
1965	4,658.72	1.8	**2010**	41,673.83	2.4
1966	4,938.36	6.0	**2011**	42,979.61	3.1
1967	5,213.44	5.6	**2012**	44,321.67	3.1
1968	5,571.76	6.9	**2013**	44,888.16	1.3
1969	5,893.76	5.8	**2014**	46,481.52	3.5
1970	6,186.24	5.0	**2015**	48,098.63	3.5
1971	6,497.08	5.0	**2016**	48,642.26	1.1
1972	7,133.80	9.8			

Current Assumptions and Methods

Actuarial Cost Method

Liabilities and contributions shown in this report are computed using the Individual Entry Age method of funding. Sometimes called the "funding method," this is a particular technique used by actuaries for establishing the amount of the annual actuarial cost of pension benefits, or normal cost, and the related unfunded actuarial accrued liability. Ordinarily the annual contribution to the System is comprised of (1) the normal cost; and (2) an amortization payment on the unfunded actuarial accrued liability.

Under the Entry Age Actuarial Cost Method, the **Normal Cost** is computed as the level percentage of pay which, if paid from the earliest time each member would have been eligible to join the System had it existed (thus entry age) until his retirement or termination, would accumulate with interest at the rate assumed in the valuation to a fund sufficient to pay all benefits under the System.

The **Actuarial Accrued Liability** under this method, at any point in time, is the theoretical amount of the fund that would have accumulated had annual contributions equal to the normal cost been made in prior years (it does not represent the liability for benefits accrued to the valuation date). The **Unfunded Actuarial Accrued Liability** is the excess of the actuarial accrued liability over the actuarial value of System assets on the valuation date.

Under this method, experience gains or losses, i.e. decreases or increases in actuarial accrued liabilities attributable to deviations in experience from the actuarial assumptions, adjust the unfunded actuarial accrued liability.

Asset Valuation Method

The actuarial value of assets is based on a five-year moving average of expected and actual market values determined as follows:

- at the beginning of each fiscal year, a preliminary expected actuarial asset value is calculated as the sum of the previous year's actuarial value increased with a year's interest at the System valuation rate plus net cash flow adjusted for interest (at the same rate) to the end of the previous fiscal year;

- the expected actuarial asset value is set equal to the preliminary expected actuarial value plus the unrecognized investment gains and losses as of the beginning of the previous fiscal year;

- the difference between the expected actuarial asset value and the market value is the investment gain or loss for the previous year;

- the (final) actuarial asset value is the preliminary value plus 20% of the investment gains and losses for each of the five previous fiscal years, but in no case more than 120% of the market value or less than 80% of the market value.

Amortization Method

The unfunded actuarial accrued liability is amortized as a level dollar amount over a 5-year open period.

Valuation Procedures

The wages used in the projection of benefits and liabilities are pay for the year ending June 30, 2017 (including longevity bonuses). These amounts were projected into the valuation year using the valuation salary scale.

In computing accrued benefits, average earnings were determined using the valuation salary scale. Historical earnings for the past five years have been retained.

Retired Members were assumed to be married with a beneficiary if a spouse date of birth was provided on the data. Members whose data did not have a spouse's date of birth were assumed to be single.

The impact from compensation limit under IRC Section 401(a)(17) and from the dollar limitation required by the Internal Revenue Code Section 415 for governmental plans were considered in this valuation and was determined to be *de minimis*.

No additional liability is being carried for the guaranteed minimum interest rate for the Deferred Option Plan account balances.

The calculations for the required state contribution are determined as of mid-year. Since the agency contributions, member contributions and State insurance premium tax allocations are made on a monthly basis throughout the year, a mid-year determination date represents an average weighting of the contributions.

Actuarial Assumptions

Economic Assumptions

1. Investment Return   7.50%, net of investment expenses, per annum, compound annually.

2. Salary Scale   Sample rates are shown below:

Attained Service	Inflation %	Merit %	Increase %
0	3.00	14.00	17.00
1	3.00	10.00	13.00
2	3.00	6.30	9.30
3	3.00	5.90	8.90
4	3.00	5.50	8.50
5	3.00	5.10	8.10
6	3.00	4.70	7.70
7	3.00	4.30	7.30
8	3.00	3.90	6.90
9	3.00	3.50	6.50
10	3.00	3.15	6.15
15	3.00	1.70	4.70
20	3.00	1.50	4.50

Demographic Assumptions

1. Retirement Rates   Sample rates are shown below:

Attained Service	Annual Rates of Retirement
20	20%
21	6
22	6
23	6
24	10
25	20
26	10
27	10
28	10
29	15
30	100

2. Mortality Rates

(a) Active participants | RP-2000 Combined Blue Collar Healthy Employees (Fully generational using Scale AA) with age set back four years

(b) Active participants (post-retirement) and nondisabled pensioners | RP-2000 Combined Blue Collar Healthy Employees with Generational Projection

(c) Disabled pensioners | RP-2000 Combined Blue Collar Healthy Combined with age set back four years

3. Disability Rates | Sample rates are shown below:

Age	Rate
20-24	.0002
25-29	.0002
30-34	.0004
35-39	.0006
40-44	.0008
45-49	.0010
50-54	.0012
55-59	.0014

4. Withdrawal Rates | Sample rates are shown below:

Service Range	Rate
0	.200
1	.130
2	.080
3	.060
4	.060
5-10	.040
11-15	.015
16-20	.010
Over 20	.000

5. Marital Status

(a) Percentage married: | Males: 85%; Females: 85%

(b) Age difference: | Males are assumed to be three (3) years older than females.

Other Assumptions:

1. Deferred Benefits Begin at:	Age 50, or the date at which the participant would have achieved 20 years of service, if later.
2. Provision for Expenses:	Administrative Expenses, as budgeted by the Oklahoma Police Pension and Retirement System.
3. Percentage of Disability:	Members becoming disabled have a 25%-49% impairment.
4. Duty-Related Death:	All pre-retirement deaths are duty-related.
5. Cost-of-Living Allowance:	Police officers eligible to receive increased benefits according to repealed Section 50-120 of Title 11 of the Oklahoma Statutes pursuant to a court order receive an adjustment of 1/3 to ½ of the increase or decrease of any adjustment to the base salary of a regular police officer, based on an increase in base salary of 3%.
6. Deferred Option Plan:	Members currently participating in the Deferred Option plan (DOP) are assumed to remain in the DOP for the maximum of five years. Active members leaving active service are assumed to retroactively elect to join the DOP for the maximum allowable period. DOP account balances are assumed to accumulate at 7.75% (to reflect the interest rate guarantee prior to retirement) and members are assumed to elect a lump sum at retirement. All balances held in Deferred Option payout Accounts are assumed to be paid immediately.

Proposed Assumptions and Methods

Actuarial Cost Method

Liabilities and contributions shown in this report are computed using the Individual Entry Age method of funding. Sometimes called the "funding method," this is a particular technique used by actuaries for establishing the amount of the annual actuarial cost of pension benefits, or normal cost, and the related unfunded actuarial accrued liability. Ordinarily the annual contribution to the System is comprised of (1) the normal cost; and (2) an amortization payment on the unfunded actuarial accrued liability.

Under the Entry Age Actuarial Cost Method, the **Normal Cost** is computed as the level percentage of pay which, if paid from the earliest time each member would have been eligible to join the System had it existed (thus entry age) until his retirement or termination, would accumulate with interest at the rate assumed in the valuation to a fund sufficient to pay all benefits under the System.

The **Actuarial Accrued Liability** under this method, at any point in time, is the theoretical amount of the fund that would have accumulated had annual contributions equal to the normal cost been made in prior years (it does not represent the liability for benefits accrued to the valuation date). The **Unfunded Actuarial Accrued Liability** is the excess of the actuarial accrued liability over the actuarial value of System assets on the valuation date.

Under this method, experience gains or losses, i.e. decreases or increases in actuarial accrued liabilities attributable to deviations in experience from the actuarial assumptions, adjust the unfunded actuarial accrued liability.

Asset Valuation Method

The actuarial value of assets is based on a five-year moving average of expected and actual market values determined as follows:

- at the beginning of each fiscal year, a preliminary expected actuarial asset value is calculated as the sum of the previous year's actuarial value increased with a year's interest at the System valuation rate plus net cash flow adjusted for interest (at the same rate) to the end of the previous fiscal year;

- the expected actuarial asset value is set equal to the preliminary expected actuarial value plus the unrecognized investment gains and losses as of the beginning of the previous fiscal year;

- the difference between the expected actuarial asset value and the market value is the investment gain or loss for the previous year;

- the (final) actuarial asset value is the preliminary value plus 20% of the investment gains and losses for each of the five previous fiscal years, but in no case more than 120% of the market value or less than 80% of the market value.

Amortization Method

The unfunded actuarial accrued liability is amortized as a level dollar amount over a 5-year open period. Surplus, if any, is amortized as a level dollar amount over a 30-year open period.

Valuation Procedures

The wages used in the projection of benefits and liabilities are pay for the year ending June 30, 2017 (including longevity bonuses). These amounts were projected into the valuation year using the valuation salary scale.

In computing accrued benefits, average earnings were determined using the valuation salary scale. Historical earnings for the past five years have been retained.

Retired Members were assumed to be married with a beneficiary if a spouse date of birth was provided on the data. Members whose data did not have a spouse's date of birth were assumed to be single.

The impact from compensation limit under IRC Section 401(a)(17) and from the dollar limitation required by the Internal Revenue Code Section 415 for governmental plans were considered in this valuation and was determined to be *de minimis*.

No additional liability is being carried for the guaranteed minimum interest rate for current Deferred Option Plan account balances.

The calculations for the required state contribution are determined as of mid-year. Since the agency contributions, member contributions and State insurance premium tax allocations are made on a monthly basis throughout the year, a mid-year determination date represents an average weighting of the contributions.

Actuarial Assumptions

Economic Assumptions

1. Inflation   2.75%, per annum, compound annually

2. Investment Return   7.50%, net of investment expenses, per annum, compound annually.

3. Salary Scale   Sample rates are shown below:

Attained Service	Wage Inflation %	Merit %	Increase %
0	3.50	6.50	10.00
1	3.50	5.50	9.00
2	3.50	4.50	8.00
3	3.50	3.50	7.00
4-12	3.50	2.50	6.00
13	3.50	1.50	5.00
14	3.50	1.00	4.50
15	3.50	0.50	4.00
16+	3.50	0.00	3.50

Demographic Assumptions

1. Retirement Rates   Sample rates are shown below:

Attained Service	Annual Rates of Retirement
20	15%
21	8
22	8
23	8
24	8
25	20
26	10
27	10
28	10
29	15
30	20
31	30
32	40
33	50
34	75
35	100

2. Mortality Rates

(a) Active participants	RP-2000 Combined Blue Collar Healthy Employees (Fully generational using Scale AA) with age set back four years
(b) Active participants (post-retirement) and nondisabled pensioners	RP-2000 Combined Blue Collar Healthy Employees with Generational Projection
(c) Disabled pensioners	RP-2000 Combined Blue Collar Healthy Combined with age set back four years

3. Disability Rates

Sample rates are shown below:

Age	Rate
20-24	.0002
25-29	.0002
30-34	.0004
35-39	.0006
40-44	.0008
45-49	.0010
50-54	.0012
55-59	.0014

4. Withdrawal Rates

Sample rates are shown below:

Service Range	Rate
0	.150
1	.120
2	.100
3	.080
4	.070
5	.060
6	.050
7	.045
8	.040
9	.035
10	.030
11	.025
12	.020
13	.015
14-20	.010
Over 20	.000

5. Marital Status

(a) Percentage married:	Males: 85%; Females: 85%
(b) Age difference:	Males are assumed to be three (3) years older than females.

Other Assumptions:

1. Deferred Benefits Begin at:	Age 50, or the date at which the participant would have achieved 20 years of service, if later.
2. Provision for Expenses:	Administrative Expenses, as budgeted by the Oklahoma Police Pension and Retirement System.
3. Percentage of Disability:	Members becoming disabled have a 50%-74% impairment.
4. Duty-Related Death:	All pre-retirement deaths are duty-related.
5. Cost-of-Living Allowance:	Police officers eligible to receive increased benefits according to repealed Section 50-120 of Title 11 of the Oklahoma Statutes pursuant to a court order receive an adjustment of 1/3 to ½ of the increase or decrease of any adjustment to the base salary of a regular police officer, based on an increase in base salary of 3.5 (wage inflation)%.
6. Deferred Option Plan:	Members currently participating in the Deferred Option plan (DOP) are assumed to remain in the DOP for the maximum of five years. Active members leaving active service are assumed to retroactively elect to join the DOP for the maximum allowable period. DOP account balances are assumed to accumulate at 11% (to reflect the interest rate guarantee prior to retirement) for future BackDOP elections and members are assumed to elect a lump sum at retirement. All balances held in Deferred Option payout Accounts are assumed to be paid immediately.

Oklahoma Police Pension and Retirement System

Experience Study 2012-2017
Appendix F-1
Probability of Death - Healthy Retirees
Males
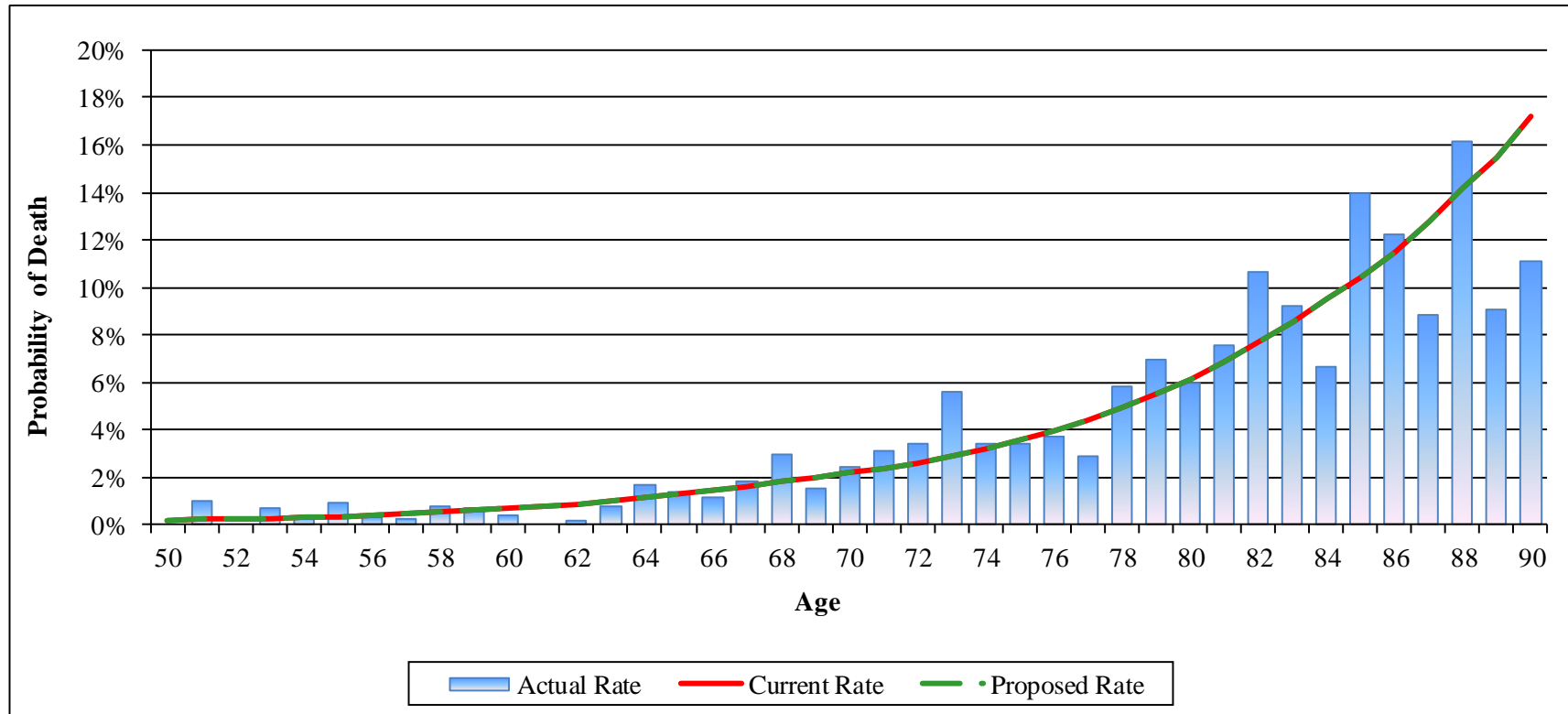
	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions
Count	219	205	205
Actual/Expected		107%	107%

Oklahoma Police Pension and Retirement System
Experience Study 2012-2017
Appendix F-2
Probability of Death - Healthy Retirees
Females
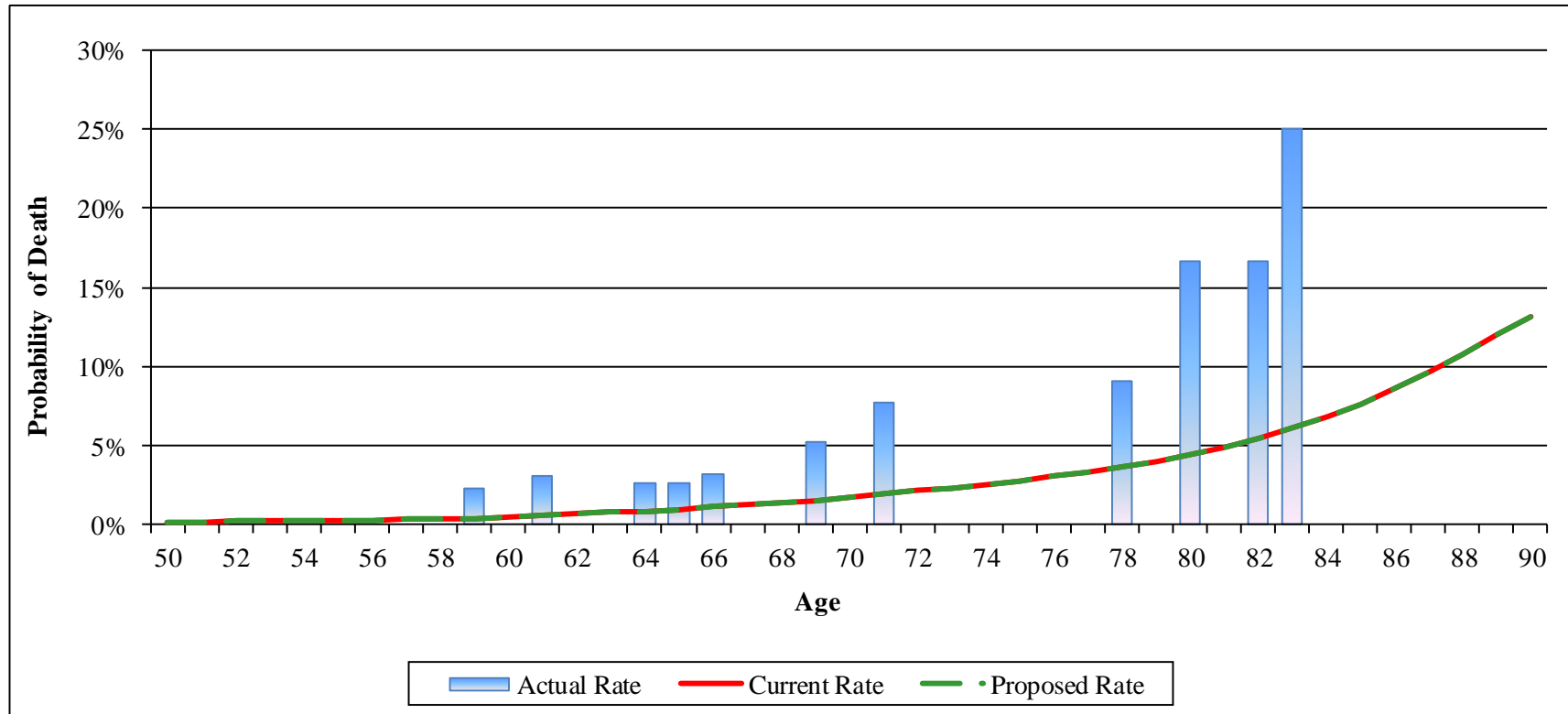
	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions
Count	11	9	9
Actual/Expected		122%	122%

Oklahoma Police Pension and Retirement System
Experience Study 2012-2017
Appendix F-3
Retirement Rates
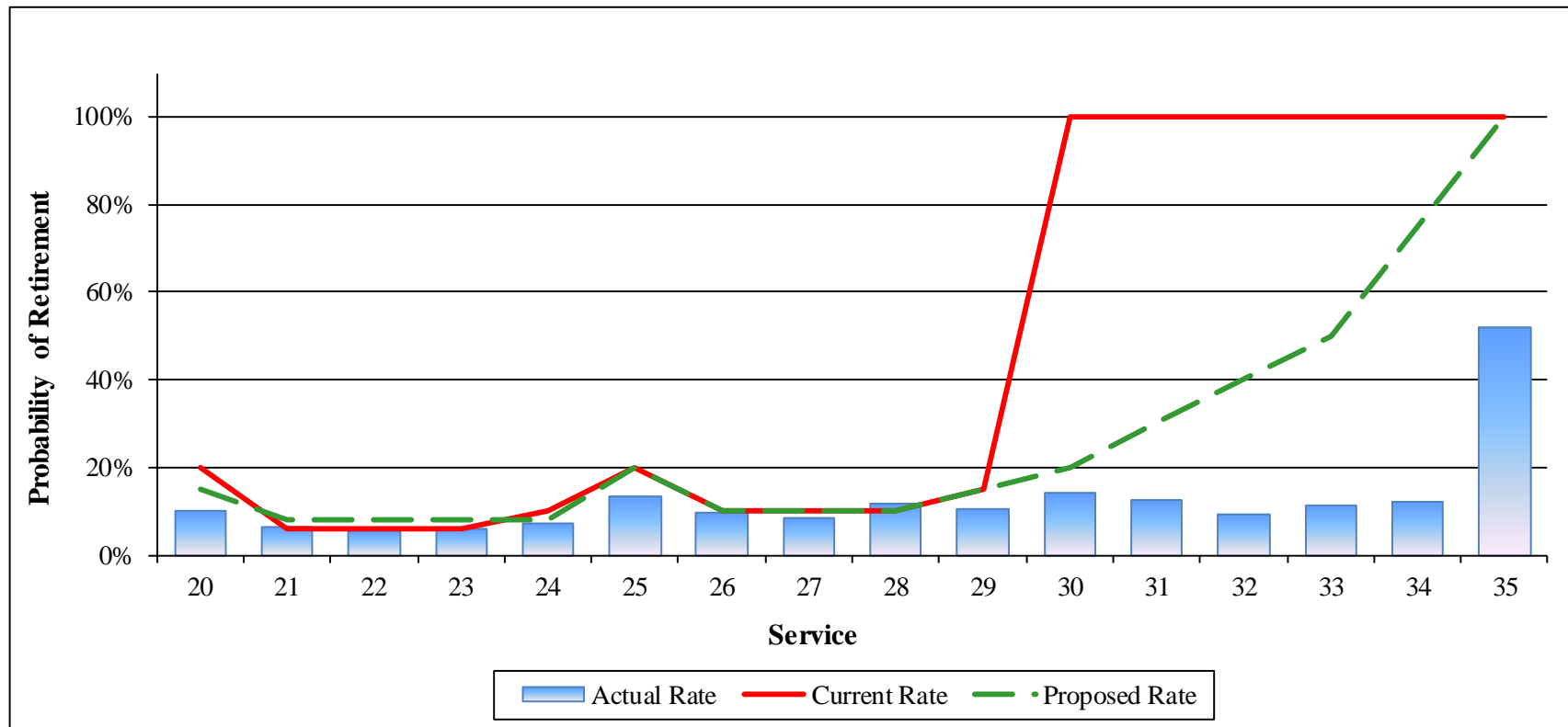
	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions
Total Count	513	1,328	869
Actual/Expected		39%	59%

Oklahoma Public Employees Retirement System

Experience Study 2012-2017
Appendix F-4
Rate of Disability - Active Lives
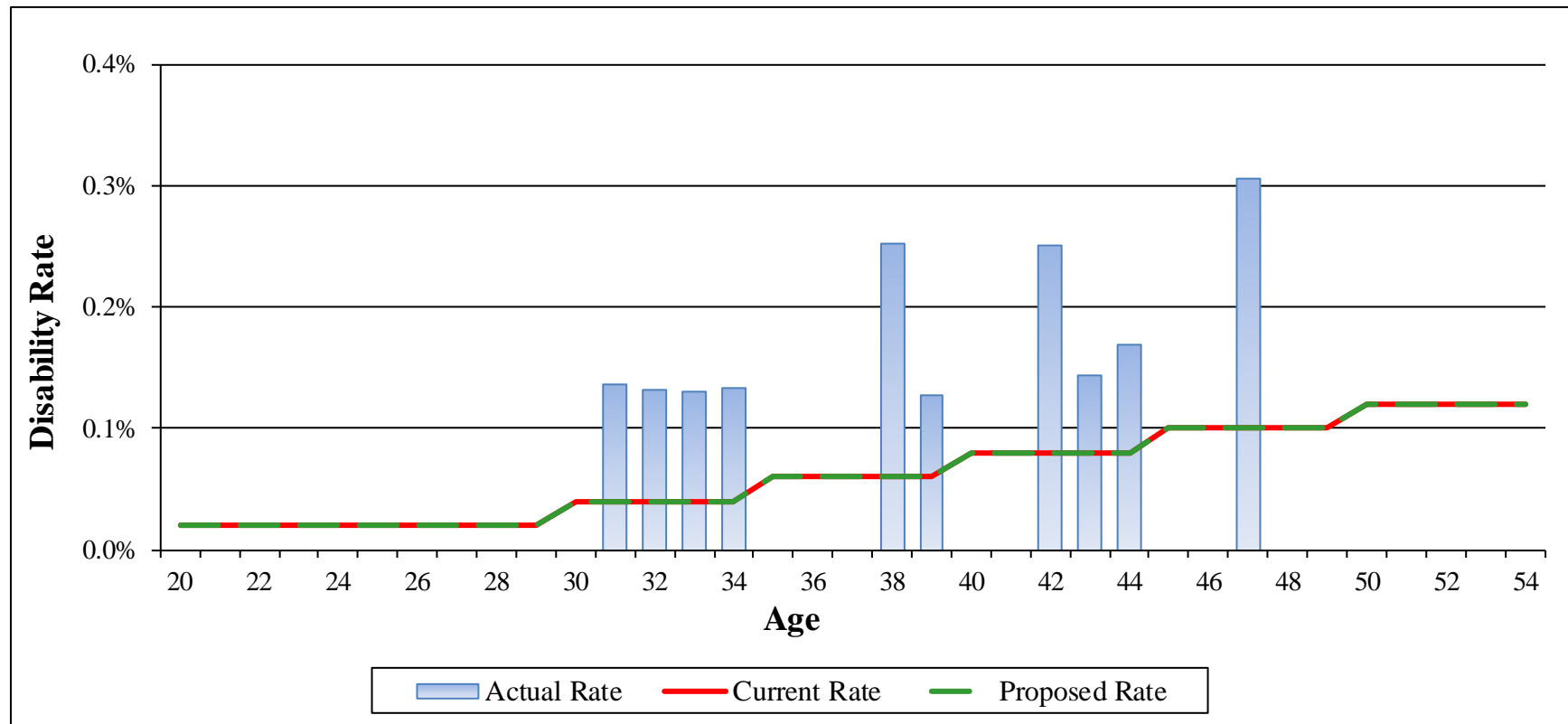
	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions
Total Count	12	10	10
Actual/Expected		120%	120%

Oklahoma Police Pension and Retirement System
Experience Study 2012-2017
Appendix F-5
Rate of Termination of Employment
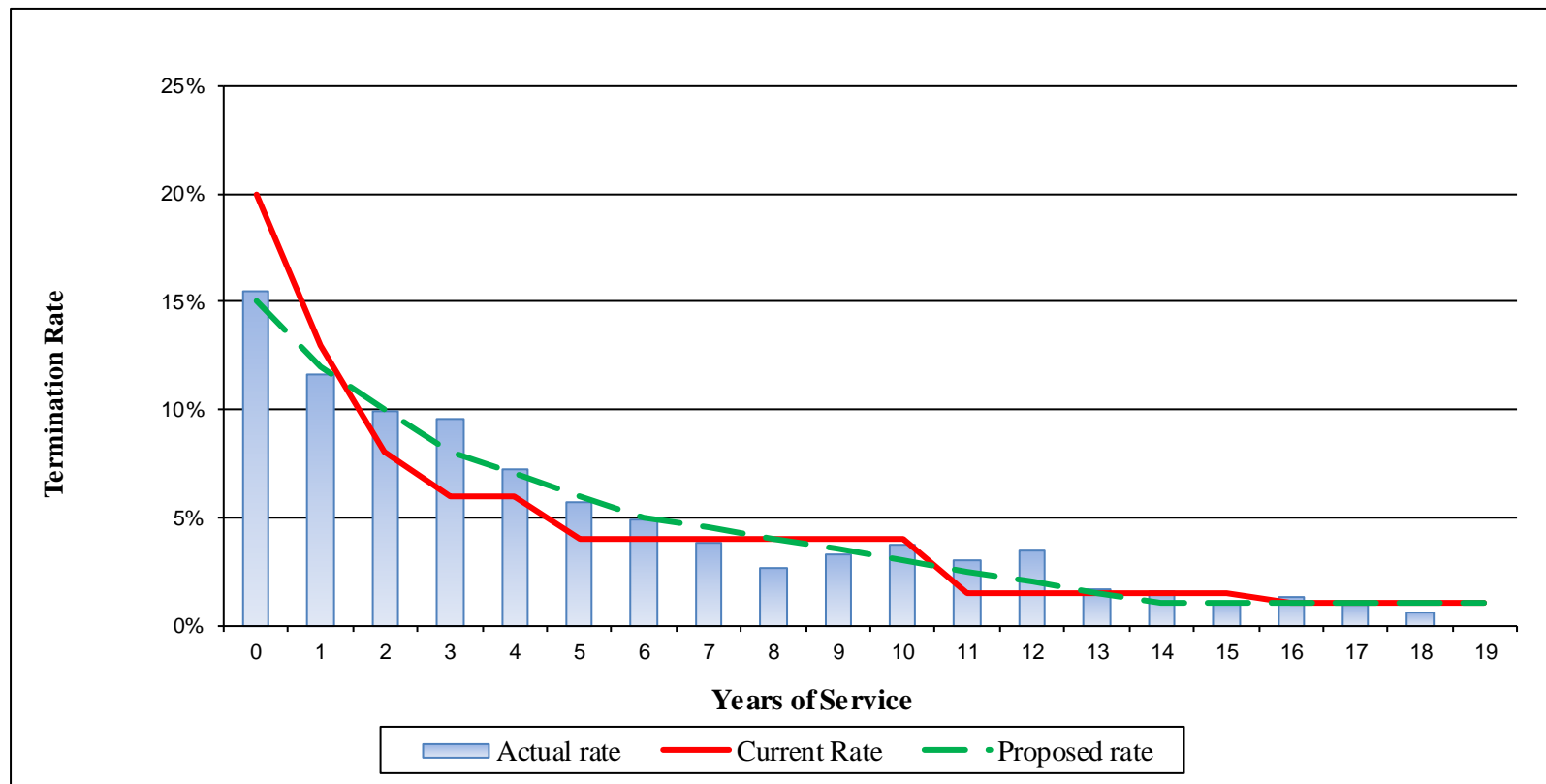
	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions
Total Count	1,039	1,049	1,019
Actual/Expected		99%	102%

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Oklahoma Police Pension and Retirement System
Experience Study 2012-2017
Appendix F-6
Total Salary Scale
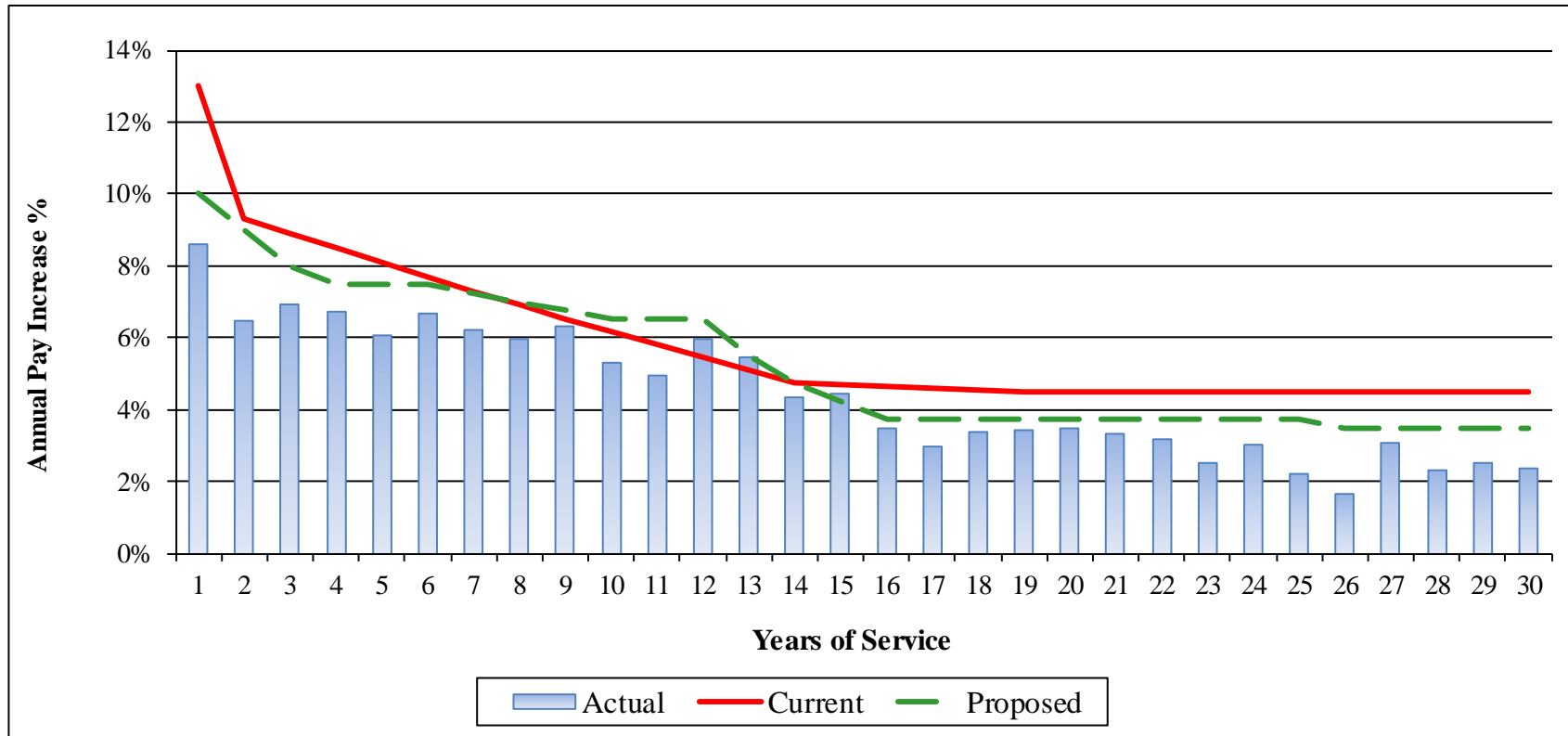
	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions
Average Increase	4.66%	6.03%	5.52%
Actual/Expected		77%	84%

Appendix G-1
Probability of Death - Healthy Retirees
Males

Age	Exposure	Actual Deaths	Actual Rate	Current Expected	Current Rate	Proposed Expected	Proposed Rate
50	189	-	0.0%	0.4	0.2%	0.4	0.2%
51	209	2	1.0%	0.4	0.2%	0.4	0.2%
52	256	-	0.0%	0.6	0.2%	0.6	0.2%
53	283	2	0.7%	0.7	0.2%	0.7	0.2%
54	305	1	0.3%	0.8	0.3%	0.8	0.3%
55	325	3	0.9%	1.0	0.3%	1.0	0.3%
56	369	1	0.3%	1.4	0.4%	1.4	0.4%
57	377	1	0.3%	1.7	0.4%	1.7	0.4%
58	411	3	0.7%	2.1	0.5%	2.1	0.5%
59	457	3	0.7%	2.6	0.6%	2.6	0.6%
60	493	2	0.4%	3.3	0.7%	3.3	0.7%
61	505	-	0.0%	3.9	0.8%	3.9	0.8%
62	521	1	0.2%	4.5	0.9%	4.5	0.9%
63	531	4	0.8%	5.4	1.0%	5.4	1.0%
64	537	9	1.7%	6.1	1.1%	6.1	1.1%
65	517	7	1.4%	6.6	1.3%	6.6	1.3%
66	523	6	1.1%	7.6	1.5%	7.6	1.5%
67	506	9	1.8%	8.2	1.6%	8.2	1.6%
68	477	14	2.9%	8.5	1.8%	8.5	1.8%
69	405	6	1.5%	8.0	2.0%	8.0	2.0%
70	374	9	2.4%	8.1	2.2%	8.1	2.2%
71	324	10	3.1%	7.7	2.4%	7.7	2.4%
72	297	10	3.4%	7.7	2.6%	7.7	2.6%
73	269	15	5.6%	7.7	2.9%	7.7	2.9%
74	237	8	3.4%	7.5	3.2%	7.5	3.2%
75	207	7	3.4%	7.3	3.5%	7.3	3.5%
76	191	7	3.7%	7.5	3.9%	7.5	3.9%
77	174	5	2.9%	7.6	4.4%	7.6	4.4%
78	154	9	5.8%	7.6	4.9%	7.6	4.9%
79	129	9	7.0%	7.1	5.5%	7.1	5.5%
80	118	7	5.9%	7.2	6.1%	7.2	6.1%
81	93	7	7.5%	6.4	6.9%	6.4	6.9%
82	75	8	10.7%	5.8	7.7%	5.8	7.7%
83	65	6	9.2%	5.5	8.5%	5.5	8.5%
84	60	4	6.7%	5.7	9.5%	5.7	9.5%
85	50	7	14.0%	5.2	10.4%	5.2	10.4%
86	41	5	12.2%	4.7	11.5%	4.7	11.5%
87	34	3	8.8%	4.3	12.7%	4.3	12.7%
88	31	5	16.1%	4.4	14.2%	4.4	14.2%
89	22	2	9.1%	3.4	15.5%	3.4	15.5%
90	18	2	11.1%	3.1	17.2%	3.1	17.2%
	11,159	219	2.0%	205.4	1.8%	205.4	1.8%

Appendix G-2
Probability of Death - Healthy Retirees
Females

Age	Exposure	Actual Deaths	Actual Rate	Current Expected	Current Rate	Proposed Expected	Proposed Rate
50	24	-	0.0%	0.0	0.2%	0.0	0.2%
51	30	-	0.0%	0.1	0.2%	0.1	0.2%
52	34	-	0.0%	0.1	0.2%	0.1	0.2%
53	32	-	0.0%	0.1	0.2%	0.1	0.2%
54	38	-	0.0%	0.1	0.2%	0.1	0.2%
55	46	-	0.0%	0.1	0.2%	0.1	0.2%
56	47	-	0.0%	0.1	0.3%	0.1	0.3%
57	41	-	0.0%	0.1	0.3%	0.1	0.3%
58	40	-	0.0%	0.1	0.4%	0.1	0.4%
59	43	1	2.3%	0.2	0.4%	0.2	0.4%
60	38	-	0.0%	0.2	0.5%	0.2	0.5%
61	33	1	3.0%	0.2	0.5%	0.2	0.5%
62	37	-	0.0%	0.2	0.6%	0.2	0.6%
63	41	-	0.0%	0.3	0.7%	0.3	0.7%
64	38	1	2.6%	0.3	0.9%	0.3	0.9%
65	38	1	2.6%	0.4	1.0%	0.4	1.0%
66	31	1	3.2%	0.3	1.1%	0.3	1.1%
67	28	-	0.0%	0.3	1.2%	0.3	1.2%
68	25	-	0.0%	0.3	1.4%	0.3	1.4%
69	19	1	5.3%	0.3	1.5%	0.3	1.5%
70	13	-	0.0%	0.2	1.7%	0.2	1.7%
71	13	1	7.7%	0.2	1.9%	0.2	1.9%
72	10	-	0.0%	0.2	2.1%	0.2	2.1%
73	8	-	0.0%	0.2	2.3%	0.2	2.3%
74	10	-	0.0%	0.3	2.6%	0.3	2.6%
75	9	-	0.0%	0.2	2.8%	0.2	2.8%
76	11	-	0.0%	0.3	3.0%	0.3	3.0%
77	10	-	0.0%	0.3	3.3%	0.3	3.3%
78	11	1	9.1%	0.4	3.7%	0.4	3.7%
79	8	-	0.0%	0.3	4.0%	0.3	4.0%
80	6	1	16.7%	0.3	4.4%	0.3	4.4%
81	5	-	0.0%	0.2	4.9%	0.2	4.9%
82	6	1	16.7%	0.3	5.5%	0.3	5.5%
83	4	1	25.0%	0.2	6.1%	0.2	6.1%
84	4	-	0.0%	0.3	6.8%	0.3	6.8%
85	4	-	0.0%	0.3	7.6%	0.3	7.6%
86	2	-	0.0%	0.2	8.6%	0.2	8.6%
87	1	-	0.0%	0.1	9.7%	0.1	9.7%
88	2	-	0.0%	0.2	10.7%	0.2	10.7%
89	1	-	0.0%	0.1	12.0%	0.1	12.0%
90	1	-	0.0%	0.1	13.1%	0.1	13.1%
Totals	842	11	1.3%	9.1	1.1%	9.1	1.1%

Appendix G-3
Retirement Rates

Duration	Exposure	Actual Retirements	Actual Rate	Current Expected	Current Rate	Proposed Expected	Proposed Rate
20	623	63	10.1%	124.6	20.0%	93.5	15.0%
21	492	32	6.5%	29.5	6.0%	39.4	8.0%
22	501	28	5.6%	30.1	6.0%	40.1	8.0%
23	515	31	6.0%	30.9	6.0%	41.2	8.0%
24	527	37	7.0%	52.7	10.0%	42.2	8.0%
25	482	65	13.5%	96.4	20.0%	96.4	20.0%
26	407	40	9.8%	40.7	10.0%	40.7	10.0%
27	330	28	8.5%	33.0	10.0%	33.0	10.0%
28	268	31	11.6%	26.8	10.0%	26.8	10.0%
29	225	24	10.7%	33.8	15.0%	33.8	15.0%
30	182	26	14.3%	182.0	100.0%	36.4	20.0%
31	161	20	12.4%	161.0	100.0%	48.3	30.0%
32	160	15	9.4%	160.0	100.0%	64.0	40.0%
33	133	15	11.3%	133.0	100.0%	66.5	50.0%
34	107	13	12.1%	107.0	100.0%	80.3	75.0%
35	87	45	51.7%	87.0	100.0%	87.0	100.0%
Total	5,200	513	9.9%	1,328.4	25.5%	869.4	16.7%

Appendix G-4
Rate of Disability - Active Lives

Age	Exposure	Actual Disabilities	Actual Rate	Current Expected	Current Rate	Proposed Expected	Proposed Rate
20	-	-	0.000%	-	0.020%	-	0.020%
21	21	-	0.000%	0.0	0.020%	0.0	0.020%
22	92	-	0.000%	0.0	0.020%	0.0	0.020%
23	208	-	0.000%	0.0	0.020%	0.0	0.020%
24	337	-	0.000%	0.1	0.020%	0.1	0.020%
25	435	-	0.000%	0.1	0.020%	0.1	0.020%
26	519	-	0.000%	0.1	0.020%	0.1	0.020%
27	579	-	0.000%	0.1	0.020%	0.1	0.020%
28	630	-	0.000%	0.1	0.020%	0.1	0.020%
29	703	-	0.000%	0.1	0.020%	0.1	0.020%
30	722	-	0.000%	0.3	0.040%	0.3	0.040%
31	733	1	0.136%	0.3	0.040%	0.3	0.040%
32	760	1	0.132%	0.3	0.040%	0.3	0.040%
33	769	1	0.130%	0.3	0.040%	0.3	0.040%
34	752	1	0.133%	0.3	0.040%	0.3	0.040%
35	737	-	0.000%	0.4	0.060%	0.4	0.060%
36	759	-	0.000%	0.5	0.060%	0.5	0.060%
37	762	-	0.000%	0.5	0.060%	0.5	0.060%
38	794	2	0.252%	0.5	0.060%	0.5	0.060%
39	783	1	0.128%	0.5	0.060%	0.5	0.060%
40	845	-	0.000%	0.7	0.080%	0.7	0.080%
41	860	-	0.000%	0.7	0.080%	0.7	0.080%
42	796	2	0.251%	0.6	0.080%	0.6	0.080%
43	699	1	0.143%	0.6	0.080%	0.6	0.080%
44	595	1	0.168%	0.5	0.080%	0.5	0.080%
45	500	-	0.000%	0.5	0.100%	0.5	0.100%
46	415	-	0.000%	0.4	0.100%	0.4	0.100%
47	327	1	0.306%	0.3	0.100%	0.3	0.100%
48	259	-	0.000%	0.3	0.100%	0.3	0.100%
49	208	-	0.000%	0.2	0.100%	0.2	0.100%
50	173	-	0.000%	0.2	0.120%	0.2	0.120%
51	151	-	0.000%	0.2	0.120%	0.2	0.120%
52	112	-	0.000%	0.1	0.120%	0.1	0.120%
53	90	-	0.000%	0.1	0.120%	0.1	0.120%
54	75	-	0.000%	0.1	0.120%	0.1	0.120%
Total	17,200	12	0.070%	10.0	0.058%	10.0	0.058%

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Appendix G-5
Rate of Termination of Employment

Duration	Exposure	Actual Terminations	Actual Rate	Current Expected	Current Rate	Proposed Expected	Proposed Rate
0	1,805	279	15.46%	361	20.00%	271	15.00%
1	1,466	170	11.60%	191	13.00%	176	12.00%
2	1,202	119	9.90%	96	8.00%	120	10.00%
3	995	95	9.55%	60	6.00%	80	8.00%
4	956	69	7.22%	57	6.00%	67	7.00%
5	856	49	5.72%	34	4.00%	51	6.00%
6	896	44	4.91%	36	4.00%	45	5.00%
7	961	37	3.85%	38	4.00%	43	4.50%
8	893	24	2.69%	36	4.00%	36	4.00%
9	789	26	3.30%	32	4.00%	28	3.50%
10	787	29	3.68%	31	4.00%	24	3.00%
11	699	21	3.00%	10	1.50%	17	2.50%
12	694	24	3.46%	10	1.50%	14	2.00%
13	742	12	1.62%	11	1.50%	11	1.50%
14	773	12	1.55%	12	1.50%	8	1.00%
15	799	8	1.00%	12	1.50%	8	1.00%
16	761	10	1.31%	8	1.00%	8	1.00%
17	720	7	0.97%	7	1.00%	7	1.00%
18	639	4	0.63%	6	1.00%	6	1.00%
19	1	-	0.00%	0	1.00%	0	1.00%
Total	17,434	1,039	5.96%	1,049	6.02%	1,019	5.85%

Experience Study 2012-2017
Appendix G-6
Total Salary Scale

Duration	Initial Salary (Millions)	Subsequent Salary (Millions)	Actual Rate	Current Expected (Millions)	Current Rate	Proposed Expected (Millions)	Proposed Rate
1	51.1	55.5	8.60%	57.8	13.00%	56.2	10.00%
2	45.9	48.8	6.44%	50.1	9.30%	50.0	9.00%
3	39.7	42.4	6.91%	43.2	8.90%	42.9	8.00%
4	40.5	43.3	6.70%	44.0	8.50%	43.6	7.50%
5	38.2	40.5	6.06%	41.3	8.10%	41.0	7.50%
6	42.4	45.3	6.69%	45.7	7.70%	45.6	7.50%
7	48.6	51.7	6.19%	52.2	7.30%	52.2	7.25%
8	48.2	51.0	5.94%	51.5	6.90%	51.5	7.00%
9	44.4	47.2	6.32%	47.3	6.50%	47.4	6.75%
10	45.7	48.1	5.33%	48.5	6.15%	48.6	6.50%
11	42.1	44.1	4.93%	44.5	5.80%	44.8	6.50%
12	42.3	44.9	5.97%	44.6	5.45%	45.1	6.50%
13	47.6	50.2	5.44%	50.0	5.10%	50.2	5.50%
14	51.5	53.7	4.32%	54.0	4.75%	54.0	4.75%
15	54.4	56.8	4.45%	57.0	4.70%	56.7	4.25%
16	52.8	54.6	3.48%	55.3	4.65%	54.8	3.75%
17	50.5	52.0	2.96%	52.8	4.60%	52.4	3.75%
18	45.4	46.9	3.35%	47.5	4.55%	47.1	3.75%
19	40.4	41.7	3.41%	42.2	4.50%	41.9	3.75%
20	34.5	35.7	3.46%	36.1	4.50%	35.8	3.75%
21	36.5	37.7	3.30%	38.1	4.50%	37.8	3.75%
22	37.6	38.8	3.15%	39.3	4.50%	39.0	3.75%
23	38.6	39.5	2.51%	40.3	4.50%	40.0	3.75%
24	33.0	34.0	3.03%	34.5	4.50%	34.3	3.75%
25	29.5	30.1	2.20%	30.8	4.50%	30.6	3.75%
26	24.6	25.0	1.64%	25.7	4.50%	25.5	3.50%
27	19.1	19.7	3.08%	20.0	4.50%	19.8	3.50%
28	16.6	17.0	2.30%	17.3	4.50%	17.2	3.50%
29	12.9	13.2	2.49%	13.5	4.50%	13.4	3.50%
30	11.9	12.2	2.38%	12.5	4.50%	12.4	3.50%
Total	1,166.6	1,221.9	4.74%	1,237.5	6.08%	1,231.8	5.59%