

**NEW MEXICO EDUCATIONAL RETIREMENT BOARD**  
ACTUARIAL EXPERIENCE STUDY  
AS OF JUNE 30, 2016

April 21, 2017

Board of Trustees  
Educational Retirement Board of New Mexico  
701 Camino de los Marquez  
Santa Fe, NM 87501

**Subject: Results of 2016 Experience Study**

Dear Members of the Board:

We are pleased to present our report on the results of the 2016 Experience Study for the New Mexico Educational Retirement Board (ERB). It includes a discussion of recent experience, it presents our recommendations for new actuarial assumptions and methods, and it provides information about the actuarial impact of these recommendations on the liabilities and other key actuarial measures.

With the Board's approval of the recommendations in this report, we believe the actuarial condition of the retirement system will be more accurately portrayed. Additionally, investment returns and inflation will have a notable impact on the future financial health of ERB. The recommended changes to these two assumptions will significantly reduce the risk to ERB that these assumptions are not met in the future which will translate to more prudent projections of ERB's financial health today.

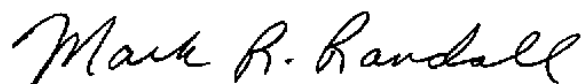
The study was conducted in accordance with generally accepted actuarial principles and practices, and with all of the Actuarial Standards of Practice issued by the Actuarial Standards Board. The undersigned both meet all of the Qualification Standards of the American Academy of Actuaries and both are experienced in performing actuarial valuations for large public retirement systems.

We wish to thank the Executive Director and staff for their assistance in this project.

Respectfully submitted,  
**Gabriel, Roeder, Smith & Company**



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**SECTION I**  
INTRODUCTION

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## Introduction

In determining liabilities, contribution rates and funding periods for retirement plans, actuaries must make assumptions about the future. Among the assumptions that must be made are:

- Retirement rates
- Mortality rates
- Termination rates
- Disability rates
- Investment return rate
- Salary increase rates
- Inflation rate

For some of these assumptions, such as the mortality rates, past experience provides important evidence about the future. For other assumptions, such as the investment return rate, the link between past and future results is much less relevant. In either case, though, actuaries should review their assumptions periodically and determine whether these assumptions are consistent with actual past experience and with anticipated future experience.

In conducting experience studies, actuaries generally use data over a period of several years. This is necessary in order to gather enough data so that the results are statistically significant. In addition, if the study period is too short, the impact of the current economic conditions may lead to misleading results. It is known, for example, that the health of the general economy can impact salary increase rates and withdrawal rates. Using results gathered during a short-term boom or bust will not be representative of the long-term trends in these assumptions. Also, the adoption of legislation, such as plan improvements or changes in salary schedules, will sometimes cause a short-term distortion in the experience. For example, if an early retirement window was opened during the study period, we would usually see a short-term spike in the number of retirements followed by a dearth of retirements for the following two, or four, years. Using a longer period prevents giving too much weight to such short-term effects. On the other hand, using a much longer period would increase the difficulty of identifying changes in behavior, such as mortality improvement or a change in the ages at which members retire. In our view, using a six-year period is reasonable.

In an experience study, we first determine the number of deaths, retirements, etc. that occurred during the period. Then we determine the number expected to occur, based on the current actuarial assumptions. The number “expected” is determined by multiplying the probability of the occurrence at the given age, by the “exposures” at that same age. For example, let’s look at a rate of retirement of 15% at age 55. The number of exposures can only be those members who are age 55 and eligible for retirement at that time. Thus they are considered “exposed” to that assumption. Finally we calculate the A/E ratio, where "A" is the actual number (of retirements, for example) and "E" is the expected number. If the current assumptions were "perfect", the A/E ratio would be

100%. When it varies much from this figure, it is a sign that new assumptions may be needed. (However, in some cases we prefer to set our assumptions to produce an A/E ratio a little above or below 100%, in order to introduce some conservatism.) Of course we not only look at the assumptions as a whole, but we also review how well they fit the actual results by sex, by age, and by service.

Finally, if the data leads the actuary to conclude that new assumptions are needed, the actuary "graduates" or smoothes the results since the raw results can be quite uneven from age to age or from service year to service year.

Please bear in mind that, while the recommended assumption set represents our best estimate, there are other reasonable assumptions sets that could be supported. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rates and funding periods.

## **ORGANIZATION OF REPORT**

Section II contains our findings and recommendations for each actuarial assumption. The impact of adopting our recommendations on liabilities and contribution rates is shown in Section III. Section IV summarizes the recommended changes. Section V provides a summary of the entire set of proposed actuarial assumptions and methods. Finally, Section VI presents detailed summaries of the data and comparisons of the A/E ratios.

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## **SECTION II**

### ANALYSIS OF EXPERIENCE AND RECOMMENDATIONS

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## Analysis of Experience and Recommendations

We will begin by discussing the economic assumptions: inflation, the investment return rate, and the salary increase assumption. Next we will discuss the demographic assumptions: mortality, disability, termination and retirement. Finally we will discuss the actuarial methods used.

### **ECONOMIC ASSUMPTIONS**

Actuarial Standards of Practice (ASOP) No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*, provides guidance to actuaries on giving advice on selecting economic assumptions for measuring obligations for defined benefit plans. In September 2013, the Actuarial Standard Board adopted changes to ASOP No. 27 which significantly reduced the reasonable range for an acceptable investment return assumption. The effective date for this new standard is for measurement dates on or after September 30, 2014. Generally speaking, the recently adopted version indicates that economic assumptions should be based on the actuary's estimate of future experience and no longer includes the "best-estimate range" standard.

Generally, the economic assumptions are much more subjective in nature than the demographic assumptions. As no one knows what the future holds, it is necessary for the actuary to estimate possible future economic outcomes. These estimates are based on a mixture of past experience, future expectations, and professional judgment. The actuary should consider a number of factors, including the purpose and nature of the measurement, and appropriate recent and long-term historical economic data.

### **INFLATION**

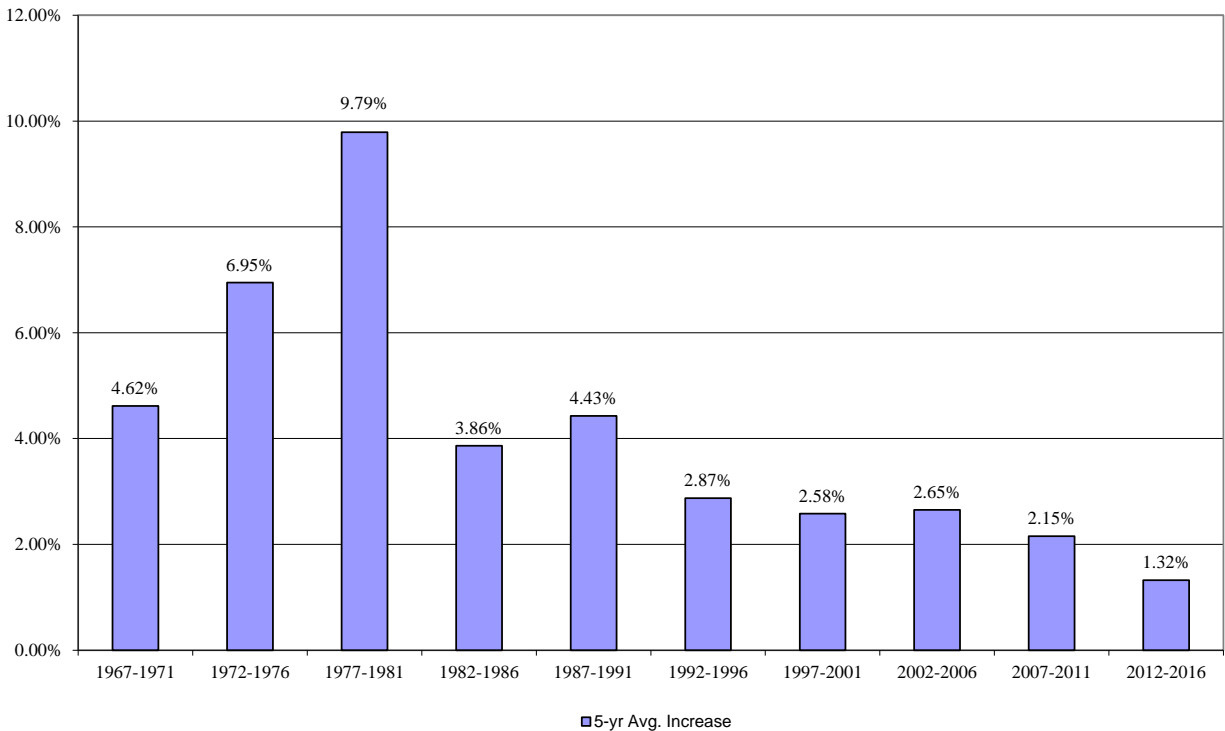
By "inflation," we mean price inflation, as measured by annual increases in the Consumer Price Index (CPI). This inflation assumption underlies most of the other economic assumptions. It primarily impacts investment return and salary increases. The current annual inflation assumption for ERB is 3.00%.

The chart on the next page shows the average annual inflation in each of the ten consecutive five-year periods over the last fifty years.

The table below the chart shows the average inflation over various periods, ending June 2016.



Average Annual Inflation  
CPI-U, Five Fiscal Year Averages



Periods Ending June 2016	Average Annual Increase in CPI-U
Last five (5) years	1.32%
Last ten (10) years	1.74%
Last fifteen (15) years	2.04%
Last twenty (20) years	2.18%
Last thirty (30) years	2.66%
Since 1913 (first available year)	3.16%

Source: Bureau of Labor Statistics, CPI-U, all items, not seasonally adjusted

Inflation has been relatively low over the last 30 years. You have to look at a period longer than 35 years to find a period where inflation has averaged close to 3.00% per year or higher.

All of the investment consulting firms that we survey, in setting their capital market assumptions, currently assume that inflation will be less than 3.00%. We examined the 2016 capital market assumption sets for seven investment consulting firms: BNY Mellon, PCA, NEPC, Aon Hewitt, JP Morgan, Wilshire, and R.V. Kuhns. The average assumption for inflation was 2.15%, with a range of 1.56% to 2.50%. It should be noted that most of these investment consulting firms set their assumptions based on approximately a ten-year outlook, while actuaries must make much longer projections.

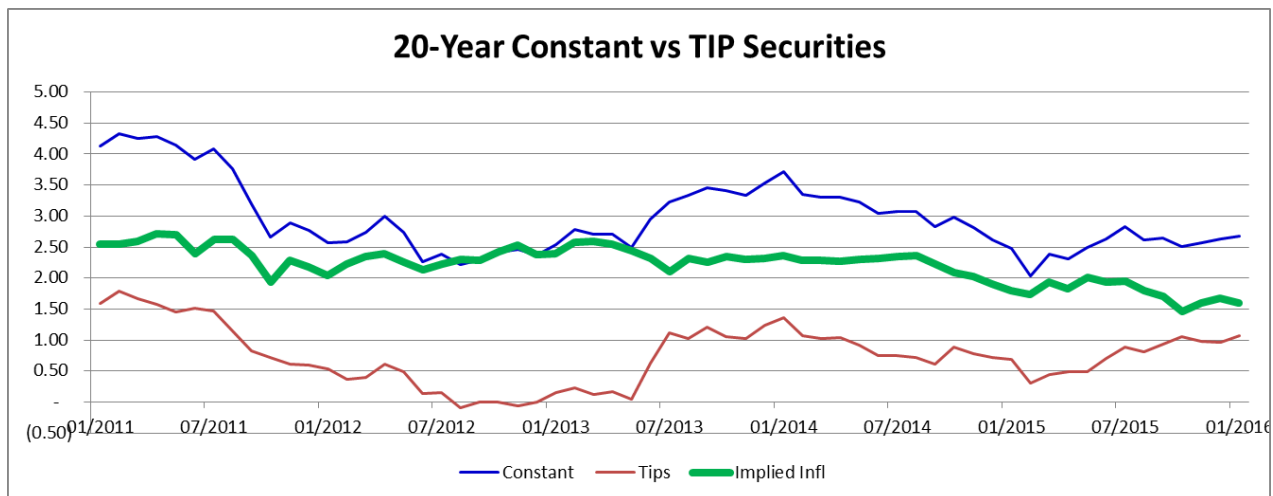
In the Social Security Administration’s 2016 Trustees Report, the Office of the Chief Actuary is projecting a long-term average annual inflation rate of 2.6% under the intermediate cost assumption. (The low cost assumption was 2.0% and the high cost assumption was 3.2%.) Since

2013, the spread between the low and high cost assumptions has narrowed by 0.8% and the intermediate cost assumption decreased by 0.2%.

The Philadelphia Federal Reserve conducts a quarterly survey of the Society of Professional Forecasters. In their fourth quarter of 2016 report, their forecast for inflation over the next ten years is to average 2.22%.

Another source of information about future inflation is the market for U.S. Treasury bonds. The December 31, 2015 yield for a 20-year inflation indexed Treasury bond (20-year TIPS) was 1.07% plus actual inflation. The yield for a 20-year non-indexed U.S. Treasury bond was 2.67%. This means the bond market was predicting that inflation over the next twenty years would average 1.60% =  $[(1 + 2.67\%) / (1 + 1.07\%) - 1]$  per year. However, this analysis is known to be imperfect. It ignores the inflation risk premium that buyers of US Treasury bonds should ask for, and it ignores the differences in liquidity between US Treasury bonds and TIPS.

The chart below shows the historical market implied inflation from January 1, 2011 through December 31, 2015.



**Recommendation**

The current explicit inflation assumption for ERB is 3.00%. Experience has been considerably less than 3.00% for the past three decades. In addition, most forward looking indicators and many economists forecast inflation rates considerably lower than the current 3.00% assumption. Because of this, we are recommending the inflation assumption be lowered from 3.00% to 2.50%.

**COST OF LIVING ADJUSTMENTS**

Every year, ERB provides a cost-of-living adjustment (COLA) to every eligible annuitant. Additionally, this COLA is related to actual inflation. Specifically, the COLA is determined based on the following:

- If inflation (CPI-U) is greater than two percent, then the COLA is  $\frac{1}{2}$  of the percentage increase of the inflation (CPI), not to exceed four percent, nor be less than two percent.
- Otherwise, the COLA is equal to actual inflation for the year.

Recent reforms have modified this COLA in cases when ERB's funded ratio is less than 100%. However, the actuarial valuation assumes that the full COLA will always be provided to annuitants.

Combining this COLA provision and the current inflation assumption of 3.00%, the current assumption for future COLAs is 2.00% per year. We modeled many scenarios for future inflation based on the lower recommended inflation assumption of 2.50% which resulted in average future COLAs for ERB of between 1.85% and 1.90%. As a result, we recommend lowering the assumption for future COLAs to 1.90% per year.

## INVESTMENT AND ADMINISTRATIVE EXPENSES

There are two primary types of expenses that are paid from the trust. First, administrative expenses are those expenses associated with running the retirement system (e.g., staff salaries, office space, actuarial fees, etc.). The other primary type of expense is investment expenses that are paid from the trust (transaction costs, investment consultants, etc.). Since the trust fund pays these expenses from plan assets, it is necessary to incorporate the expected expenses into the actuarial valuation.

There are two common approaches to incorporating these expenses into the actuarial valuation. Plan expenses may be explicitly assumed as a direct increase to the annual normal cost or implicitly assumed by developing an investment return assumption that is expected to meet the return target after paying plan expenses from the investment earnings. Our past practice has been to set the investment return assumption as the net return after payment of both investment and administrative expenses (implicit assumption for all expenses).

This chart shows the administrative and investment expenses for the last five years expressed as a percentage of the assets, adjusted for cash flow, each year:

Annual Expenses Expressed as a Percentage Assets			
Fiscal Year	Administrative	Investment	Total
2016	0.09%	0.15%	0.24%
2015	0.09%	0.17%	0.26%
2014	0.17%	0.13%	0.30%
2013	0.12%	0.16%	0.28%
2012	0.13%	0.11%	0.24%
Average	0.12%	0.14%	0.26%

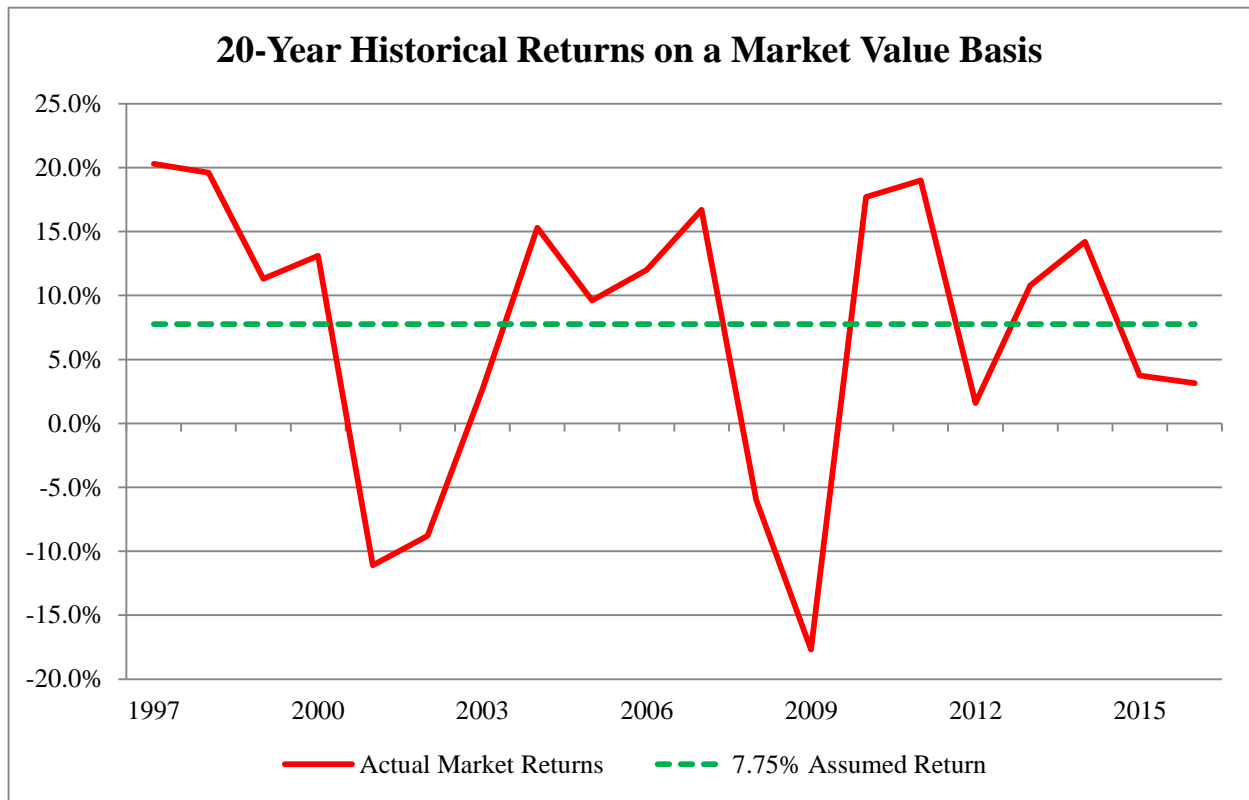
We recommend that the current implicit assumption for administrative and investment expenses be maintained. The following section will outline how these expenses are incorporated into the analysis of the investment return assumption.

## INVESTMENT RETURN

The investment return assumption is one of the principal assumptions in any actuarial valuation of a retirement plan. It is used to discount future expected benefit payments to the valuation date, in order to determine the liabilities of the plans. Even a small change to this assumption can produce significant changes to the liabilities and actuarially determined contribution rates.

Currently, ERB assumes an investment return rate of 7.75%, net of investment and administrative expenses. This investment return rate is generally developed through a “building block” method of adding an assumption for inflation with an assumption for real investment returns based on the plan’s investment allocation. As a result, the 7.75% assumption is composed of the “building blocks” of a 3.00% assumed inflation rate plus a 4.75% assumed real return.

The chart below shows a 20-year year history of ERB market returns through FY 2016 compared to the current assumption of 7.75%.



The returns in the chart above are market returns, net of investment and administrative expenses, as reported in the actuarial valuations. ERB exceeded the expected 7.75% return assumption in

12 of the last 20 years with an average market return during this period of 6.8%, which is less than the 7.75% assumption.

However, for this assumption, past performance, even averaged over a twenty-year period, is not a reliable indicator of future performance. The actual asset allocation of the trust fund will significantly impact the overall performance, so returns achieved under a different allocation are not meaningful. More importantly, the real rates of return for many asset classes, especially equities, vary so dramatically from year to year that even a twenty-year period is not long enough to provide reasonable guidance.

We believe an appropriate approach to reviewing an investment return assumption is to determine the median expected portfolio return given the retirement plan's target allocation and a given set of capital market assumptions. For this purpose, we have analyzed this following investment policy for ERB:

Asset Class	Target
Domestic Equities – Large Cap	16%
Domestic Equities – Small/Mid Cap	3%
International Equities – Developed	5%
International Equities – Emerging Markets	9%
Fixed Income – Core Bonds	6%
Fixed Income – Emerging Market Debt	2%
Alternatives – Real Estate	7%
Alternatives – Real Assets	8%
Alternatives – Private Equity	13%
Alternatives – Private Debt	18%
Alternatives – Absolute Return	5%
Alternatives – Global Tactical Asset Allocation	4%
Alternatives – Risk Parity	3%
Cash	1%
<b>Total</b>	<b>100%</b>

Because GRS does not develop or maintain its own capital market assumptions, we reviewed assumptions developed and published by the following investment consulting firms:

- JP Morgan
- NEPC
- PCA
- Wilshire
- RV Kuhns
- BNY Mellon
- Aon Hewitt

These investment consulting firms issue reports that describe their capital market assumptions, which include their estimates of expected returns, volatility, and correlations. While these assumptions are developed based upon historical analysis, many of these firms also incorporate forward looking adjustments to better reflect near-term expectations.

Given the current strategic target asset allocation set for ERB and the investment firms' capital market assumptions for 2016, the development of the average nominal return, net of investment and administrative expenses paid from the trust, is provided in the following table:

Investment Consultant	Investment Consultant Expected Nominal Return	Investment Consultant Inflation Assumption	Expected Real Return (2)-(3)	Actuary Inflation Assumption	Expected Nominal Return (4)+(5)	Plan Incurred Administrative Expenses	Expected Nominal Return Net of Expenses (6)-(7)	Standard Deviation of Expected Return (1-Year)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	6.93%	2.20%	4.73%	2.50%	7.23%	0.12%	7.11%	10.87%
2	7.34%	2.50%	4.84%	2.50%	7.34%	0.12%	7.22%	13.65%
3	7.35%	2.00%	5.35%	2.50%	7.85%	0.12%	7.73%	11.84%
4	7.76%	2.26%	5.50%	2.50%	8.00%	0.12%	7.88%	11.51%
5	7.75%	2.25%	5.50%	2.50%	8.00%	0.12%	7.88%	13.46%
6	7.17%	1.56%	5.61%	2.50%	8.11%	0.12%	7.99%	12.08%
7	8.17%	2.25%	5.92%	2.50%	8.42%	0.12%	8.30%	13.60%
<b>Average</b>	<b>7.50%</b>	<b>2.15%</b>	<b>5.35%</b>	<b>2.50%</b>	<b>7.85%</b>	<b>0.12%</b>	<b>7.73%</b>	<b>12.43%</b>

We determined, for each firm, the expected nominal return rate based on ERB's target allocation and then subtracted that investment consulting firm's expected inflation to arrive at their expected real return in column (4). Then we added back ERB's recommended 2.50% inflation and subtracted 0.12% for administrative expenses to arrive at an expected nominal return net of expenses. As the table shows, the resulting **average arithmetic one-year return of the seven firms is 7.73%**.

The forward-looking capital market assumptions and return forecasts developed by investment consulting firms already reflect expected investment expenses. Their return estimates for core investments (i.e., fixed income, equities, and real estate) are generally based on anticipated returns produced by passive index funds that are net of investment related fees. Investment return expectations for the alternative asset class such as private equity and hedge funds are also net of investment expenses. Therefore, we did not make any additional adjustments to account for investment related expenses. This analysis also assumes that investment managers will generate enough alpha to at least cover the cost of the active management. No additional alpha for active management has been considered.

In addition to examining the expected one-year return, it is important to review anticipated volatility of the investment portfolio and understand the range of long-term net returns that could be expected to be produced by the investment portfolio. Therefore, the following table provides the 40<sup>th</sup>, 50<sup>th</sup>, and 60<sup>th</sup> percentiles of the 20-year geometric average of the expected nominal return, net of administrative and investment expenses paid from the trust, as well as the probability of exceeding the current 7.75% assumption versus a proposed assumption of 7.25%.

Investment Consultant	Distribution of 20-Year Average Geometric Net Nominal Return			Probability of exceeding 7.75%	Probability of exceeding 7.25%
	40th	50th	60th		
(1)	(2)	(3)	(4)	(5)	(5)
1	5.95%	6.56%	7.17%	31.2%	38.8%
2	5.60%	6.36%	7.13%	32.4%	38.5%
3	6.42%	7.08%	7.75%	40.0%	47.5%
4	6.62%	7.27%	7.91%	42.5%	50.3%
5	6.30%	7.05%	7.80%	40.7%	47.3%
6	6.64%	7.32%	8.00%	43.6%	51.0%
7	6.70%	7.46%	8.22%	46.2%	52.8%
<b>Average</b>	<b>6.32%</b>	<b>7.01%</b>	<b>7.71%</b>	<b>39.5%</b>	<b>46.6%</b>

The table above documents that the resulting the **20-year geometric average of the expected nominal return is 7.01%**. Additionally, the table above documents that the average probability of exceeding the current 7.75% investment return assumption over a 20-year period is 39.5%, while that probability increases to 46.6% with an investment return assumption of 7.25%.

### Arithmetic versus Geometric

A long-standing debate on forecasting future portfolio value has focused on the relative merits of the geometric versus arithmetic average return as a compounding rate. We have shown analytically that when these averages must be estimated subject to sampling error, neither approach yields unbiased forecasts. **For typical investment horizons, the proper compounding rate is in between these two values** [emphasis added].

*Eric Jacquier, Alex Kane, and Alan J. Marcus. "Geometric or Arithmetic Mean: A Reconsideration." Financial Analysts Journal, November/December 2003, p.52*

Arguments for arithmetic average:

- On a forward looking basis, the arithmetic return provides an unbiased estimate of future asset growth (i.e., there will be no expected actuarial gains and/or losses).
- Expected value of asset gain equals expected value of asset loss in any given year

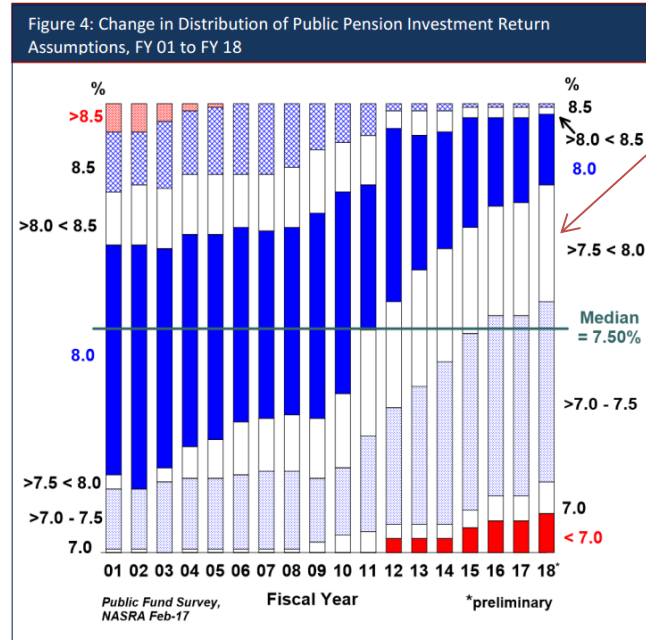
Arguments for median:

- In the long run, there is less than a 50%/50% chance of achieving the arithmetic return
- Using the median, the likelihood of asset gains is equal to the likelihood of asset losses

**Other Sources of Investment Return Forecasts**

As a point of reference, National Association of State Retirement Administrators (NASRA) published an Issue Brief in February 2017 that reviewed the investment return assumptions for 127 large public retirement systems. The survey reflects the nominal assumption in use, or announced for use, as of the date of the survey. The average investment return assumption for responding systems was 7.52% and the median was 7.50%. The table to the right illustrates how the investment return assumptions for the systems included in the survey have changed over the past 18 years.

While we do not recommend the Board select an assumption based on this information, it is still informative to see ERB’s assumption in relation to its peers. The table shows that the current 7.75% assumption is above the mean and median in the survey (and has been for a number of years).



**Recommendation**

Based on this analysis, we recommend that ERB maintain the current real return assumption of 4.75%, but incorporate the recommended inflation assumption of 2.50%. As a result, we recommend lowering the current nominal investment return assumption from 7.75% to 7.25%, where the 7.25% assumption is composed of the “building blocks” of a 2.50% assumed inflation rate plus the 4.75% assumed real return.



## SALARY INCREASE RATES

The current salary increase rates assumed for the valuation vary by service. They range from 12.50% for new members to 3.75% for members with 10 or more years of service.

Historically, the average pay increases for members active in consecutive valuations for the last eight years, with at least one year of service, are as follows:

Period	Increase
FY 2008 to FY 2009	6.58%
FY 2009 to FY 2010	2.68%
FY 2010 to FY 2011	1.41%
FY 2011 to FY 2012	2.05%
FY 2012 to FY 2013	2.48%
FY 2013 to FY 2014	3.46%
FY 2014 to FY 2015	5.25%
FY 2015 to FY 2016	3.16%

The geometric average of these is 3.37%.

Salary increases are composed of both wage inflation and service-based promotional or merit increases. Wage inflation is currently assumed to be 3.75% (“building blocks” of 3.00% price inflation plus 0.75% productivity increases) with additional merit increases during the first 10 years of employment of up to 8.75%. The following will analyze these two components separately in developing our overall salary increase assumption.

### Wage Inflation for Long-Service Employees

Salary increases for longer-service employees are almost entirely driven by wage inflation. Many of the factors that result in pay increases are largely inapplicable or have diminished importance for longer-service employees. Step or service-related increases have ceased or are minimal. Promotions occur with less frequency. Additional training or acquisition of advanced degrees usually occurs early in the career. Thus, longer service employees’ wages are assumed to grow at the overall rate of wage inflation. Wage inflation is also the increase in the average wage of all members of the workforce of the employer.

Wage inflation is currently assumed to be 3.75%, and this is the assumed salary increase for longer-service members with at least 10 years of service.

In 2003, New Mexico adopted a new three-tier licensure system for compensating classroom teachers. Once the system was adopted, it took a number of years before the majority of the classroom teachers were being compensated consistent with the new system. As a result, analyzing the individual salary increases over the past decade has not always been the best predictor of the average increase classroom teachers will expect to receive in the future from the new system. However, an analysis of the pay increases over the past eight years should provide a

reasonable estimate of how the pay will increase for an average classroom teacher in the future. For members with 10 or more years of service, the observed average salary increase during the last eight years was 1.72%. Inflation during this six-year period averaged 1.22%. Therefore, long-service employees received an average salary increase of 0.50% above inflation.

In the last experience study as of June 30, 2014, the Board lowered the productivity portion of the wage inflation from 1.25% to 0.75%. As a result of the large change two years ago, we recommend maintaining the current productivity portion of the wage inflation at 0.75%. When we incorporate the recommended inflation assumption of 2.50%, the new wage inflation would be 3.25%, where the 3.25% assumption is composed of the “building blocks” of a 2.50% assumed inflation rate plus the 0.75% productivity component.

### **Additional Merit Increases for Shorter-Service Employees**

Members who are early in their career typically have salary increases that include both wage inflation as well as a component for promotion. This additional component is part of the service-based component of the salary scale. This component of the salary scale ranges from 8.75% (in addition to wage inflation) in the member’s first year of employment to 0.50% in the member’s ninth year of employment. The table on the last page of the report contains additional details on these results.

The table on the last page of the report indicates that the actual service-based increases have generally been close to the current assumption. As a result, we are not recommending a change at this time to the service-based component of the salary scale for members with less than 10 years of service.

We will continue to monitor this service-based component of the salary scale and will recommend a change in the assumption to the Board when we believe it is necessary

If we combine this result with our 3.25% recommendation for wage inflation, the result is a total salary increase assumption ranging from 12.00% for new members to 3.25% for members with 10 or more years of service.

### **PAYROLL GROWTH RATE**

The salary increase rates discussed above are assumptions applied to individuals. They are used in projecting future benefits. We also use a separate payroll growth assumption, currently 3.50%, in determining the charge needed to amortize the unfunded actuarial accrued liability. The amortization payments are calculated to be a level percentage of payroll, so as payroll increases over time, these charges do as well. The amortization percentage is dependent on the rate at which payroll is assumed to increase.

Note that the payroll growth assumption is also used in our projections to project future ARP contributions.

The chart below shows the membership and payroll growth for the last six years:

Fiscal Year	Membership Growth	Payroll Growth	Adjusted Payroll Growth
2016	-1.54%	0.07%	1.63%
2015	-0.29%	2.81%	3.11%
2014	-0.01%	0.87%	0.88%
2013	0.53%	0.88%	0.35%
2012	-1.33%	-1.14%	0.19%
2011	-2.56%	-2.02%	0.56%
Geometric Average	-0.87%	0.23%	1.11%

Payroll has grown at 0.23% over the last six years, 1.64% over the last ten years, and 3.12% over the last 20 years. Part of this increase, though, comes from the growth in the number of active members. If we adjust to remove the effect of the increase in membership, payroll growth has averaged 1.11% over the last six years, 1.93% over the last ten years, and 2.75% since 1996 (the last 20 years). Finally, the primary component of payroll growth is inflation (as with all economic assumptions). If we adjust the actual payroll growth rate experience for the difference between actual and assumed inflation, the normalized experience now becomes 2.42%, 3.20%, and 3.57%, respectively.

Payroll can grow at a rate different from the average pay increase for individual members. There are two reasons for this. First, when older, longer-service members terminate, retire or die, they are generally replaced with new teachers who have a lower salary. Because of this, in most populations that are not growing in size, the growth in total payroll will be smaller than the average pay increase for members. Second, payroll can grow due to an increase in the size of the group. However, this assumption is generally set such that anticipated membership growth is excluded in setting the payroll growth assumption.

Theoretically, over the long term the total payroll for a population of constant size should grow at about the rate that starting pays increase. These will generally rise with inflation, plus some adjustment for the excess of wage inflation over price inflation, plus an industry-specific adjustment. However, because of the lack of turnover in the last few years combined with stagnant individual wage increases, payroll growth has been less than assumed. Additionally, because of the baby boomer retirements expected over the next 10-15 years, we expect actual payroll growth to lag behind the wage inflation assumption. Based on this analysis and the proposed wage inflation of 3.25%, we recommend lowering the payroll growth assumption to 3.00%.

## DEMOGRAPHIC ASSUMPTIONS

As previously mentioned, actuaries are guided by the Actuarial Standards of Practice (ASOP) adopted by the Actuarial Standards Board (ASB). One of these standards is ASOP No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*. This standard provides guidance to actuaries giving advice on selecting noneconomic assumptions for measuring obligations under defined benefit plans. We believe the recommended assumptions in this report were developed in compliance with this standard.

## POST-RETIREMENT MORTALITY RATES

ERB's liability depends in part on how long retirees live. If members live longer, benefits will be paid for a longer period of time, and the liability will be larger. Additionally, teachers have longer life expectancies compared to the general population. This experience is also true for the retired teachers and educators in ERB, and it will be important to reflect this in the mortality assumption used in the valuation.

The mortality table currently being used for non-disabled retirees and for beneficiaries receiving benefits is the RP-2000 Combined Healthy Mortality Table with White Collar Adjustments, no set back, projected forward using Scale BB from the table's base year of 2000 for males and the GRS Southwest Region Teacher Mortality Table, set back one year, projected forward using Scale BB from the table's base year of 2012 for females. These assumptions were implemented as of the prior study and are considered "generational" mortality projections. A generational mortality projection does not build in a margin up front, but the mortality is assumed to improve every future year in the valuation projection. Since this form of mortality projection assumes continual mortality improvements, there should be less need to periodically reestablish margin for future mortality improvements in the mortality assumption.

To analyze the data, we begin by determining the expected number of deaths in each year at each age for males and females. Then we compare the actual number to the expected number. The ratio of the actual deaths to the expected deaths—the A/E ratio—then tells us whether the assumptions are reasonable.

There were 2,040 deaths among male retirees and 2,729 deaths among female retirees during the last six years. (These figures exclude deaths among beneficiaries and disabled retirees.) Based on the current mortality assumption, we expected 2,118 and 2,687 deaths respectively. This produced A/E ratios of 96% for males and 102% for females. This is a reasonably good match overall since the ratios should be close to 100%. Two years ago, when the current assumption was set, the A/E ratios were 96% for males and 99% for females based on the same mortality assumption. This experience suggests that the generational improvements mechanism that was built into the assumption as of the prior study is doing a good job of modelling improvements in life expectancy for the retired members. Therefore, we are recommending no change to the assumption as of this time.

The Society of Actuaries' Retirement Plans Experience Committee recently initiated another Pension Mortality Study that is based on public pension sector data (as opposed to the private

sector data that was used to create the RP-2000 tables that are the basis of the current assumption). That study is expected to be completed prior to the next experience study for ERB. Once this Study is published, we will review the findings of the Study and report on the applicability and appropriateness of the Study to ERB at the next experience study.

## **DISABLED MORTALITY RATES**

This assumption has a much smaller impact on the actuarial valuation as there are relatively few disability occurrences and disability benefits comprise a small portion of the total benefits provided by the retirement system. There were 95 deaths among the male disabled retirees and 106 deaths among female disabled retirees during the last six years. Based on the current mortality assumptions, we expected 103 and 107 deaths for males and females respectively. This produces A/E ratios of 92% for males and 99% for females compared to 103% for males and 108% for females in the prior experience study.

This assumption was also reset as of the last experience study. The number of disabled retirees is relatively low so this assumption does not have a significant impact on the total liability calculations. Since the A/E ratios are still relatively close to 100%, we recommend no change to this assumption at this time.

## **ACTIVE MORTALITY RATES**

This is another minor assumption with a relatively small impact on the actuarial valuation as the probability of death for a member during their working career is low. In fact, mortality across employee groups is generally lower than the mortality rates in the post-retirement mortality tables.

This assumption was also reset as of the last experience study to bring the A/E ratios back closer to 100%. However, the number of reported deaths by ERB continues to be very low for the six-year period. This is a common occurrence for many of our clients, especially when the beneficiary of a deceased active member only receives a refund of contributions, because the data we receive generally indicates that the active member terminated. Because of situations similar to this, we augmented the data by performing a check against the Social Security Administration (SSA) database for additional deaths among the members originally reported as terminations. However, even with the additional check against the SSA database, the number of deaths has been steadily decreasing. For instance, there were 73 deaths counted in the 2009 fiscal year that were included in the prior experience analysis but only 21 deaths in the 2016 fiscal year. Because of this decrease, the A/E ratios have decreased significantly since the prior study.

There were 261 actual deaths (136 males and 125 females), while there were 380 expected deaths (188 males and 192 females). This produced A/E ratios of 72% for males and 65% for females.

Even though the number of deaths among active members is decreasing, this is still a minor assumption with a relatively small impact on the actuarial valuation. As a result, we recommend no change to this assumption at this time.

## **DISABILITY RATES**

Disability is a minor assumption with a relatively small impact on the actuarial valuation as the occurrence of disability is significantly less frequent than termination and retirement rates. Even though the occurrence is somewhat infrequent, the value of the benefit for the disabled member can be significant.

This is another assumption where the number of reported disabilities each year has been steadily decreasing (e.g. 40 reported disabilities in the 2009 fiscal year, but only 21, 17, and 23 reported disabilities in the last three years, respectively). There were 148 new disabled retirees (53 males and 95 females) during the period, while we expected 192 (66 males and 126 females). The A/E ratios were 80% for males and 75% females. Although the A/E ratios have decreased slightly, we recommend no change to the current assumption at this time.

## **RETIREMENT RATES**

We currently use retirement rates that vary by age, service, and sex. There were 3,570 male retirements during the six-year period, and there were 8,518 female retirements. This includes only members who retired from active status. It excludes those who were inactive for over a year before retiring.

The analysis shows A/E ratios of 107% for males and 105% for females. (Rates less than 100% are conservative.) In the last study, the A/E was 102% for males and 97% for females. For the current study, the A/E's for members with at least 25 years of service—these are the members with the largest liability—are 116% for males and 104% for females. The A/E's for members who met the Rule of 75 (with at least age 60) are 98% for males and 104% for females. However, the A/E's for members who became eligible for normal retirement upon attaining age 65 with 5 years of service are 95% for males and 98% for females. Additionally, the average retirement age for males is 60.5 (actual) compared to 61.2 (expected). For females, these ages are 60.1 (actual) and 60.5 (expected). In the last experience study, the actual ages at retirement were 60.2 (males) and 59.9 (females).

Although the retirement experience has increased since the prior study, we believe this is a reflection of the short-term changes in retirement behavior during the Great Recession and the subsequent recovery over the last six years. Immediately after the stock market event in 2009, the unemployment rate rose significantly, individual retirement savings took a painful hit, and many employees were reluctant to leave their jobs and delayed their retirement. As a result, actual retirement experience tended to be lower than expected during the period from about 2009-2010. However, once employees reestablished their retirement savings somewhat and were more confident that the economic recovery was sustainable, retirements started to pick up again as this “pent-up” demand was released. The net result is that the prior study reflected a period of low retirements during 2009-2010 and a period of higher than expected retirements during 2012-2014

whereas this current study no longer reflects the low experience early on but does include the short-term higher experience in the more recent years. Therefore, we think the increase in the A/E ratios is a short-term “blip” and should level out again as the higher retirement experience in 2012-2014 drops off the radar. In other words, we think future experience will be more in line with the current assumption and we recommend no change to the assumption at this time.

Currently, members who joined ERB by June 30, 2010 are eligible for a Normal Retirement Benefit upon the earliest of age 65 with 5 years of service, Rule of 75 (with at least age 60), or 25 years of service. This group makes up virtually all of the plan experience over the past six years. As a result, we have enough experience to develop reasonable experience-based tables that reflect the retirement patterns for members eligible to retire under these provisions.

Alternatively, members who joined ERB after June 30, 2010 are eligible for a Normal Retirement Benefit upon the earliest of age 67 with 5 years of service, Rule of 80 (with at least age 65), or 30 years of service. It should be noted that members who joined ERB after June 30, 2013 that retire with 30 years of service will have their benefit reduced prior to age 55.

As of the prior study, we implemented a revision to the assumed retirement rates for this group to account for the fact that they must work a little longer to retire. There is still virtually no experience on which to analyze and base this assumption so we recommend no change at this time. However, the first members in this group now have at last five years of experience so we should start seeing more retirements going forward.

## **TERMINATION RATES**

Termination rates reflect members who leave for any reason other than death, disability, or service retirement. They apply whether the termination is voluntary or involuntary, and whether the member takes a refund or keeps their account balance on deposit. The current termination rates reflect the member’s gender and service. This assumption is more significant than the disability assumption since the counts are so much higher but less significant than the retirement assumption since these members leave at younger ages with smaller benefits and less liability.

There were 36,829 terminations (16,465 males and 20,364 females) during the period, while we expected 34,396 (15,787 males and 18,609 females). As a result, the current assumptions produced an A/E ratio of 104% for males and 109% for females compared to 99% for males and 102% for females in the prior experience study. For this assumption, A/E ratios over 100% are conservative.

The most recent experience is still pretty consistent with the experience from the prior study and the assumption. For similar reasons as discussed with the retirement rate section (i.e. members delaying retirement or termination in 2009-2011 but experience increasing since then), we believe this increase is probably a short-term result and consequently we are not recommending any change to the assumed termination rates. However, we will continue to monitor the experience for females in particular and if the A/E ratio remains a little high, we will consider modifying this assumption in the next study.

<b>Termination Rates – Males</b>			
		<i>Current Assumption</i>	
Service Years	Actual terms	Expected terms	A/E ratio
0-4	12,704	12,456	102%
5-9	2,584	2,331	111%
10 or more	1,177	1,000	118%
Totals	16,465	15,787	104%

<b>Termination Rates – Females</b>			
		<i>Current Assumption</i>	
Service Years	Actual terms	Expected terms	A/E ratio
0-4	12,081	11,291	107%
5-9	5,131	4,528	113%
10 or more	3,152	2,790	113%
Totals	20,364	18,609	109%

## **OTHER ASSUMPTIONS AND REFUNDS**

There are other assumptions made in the course of a valuation, such as the percentage of members who are married, the age difference between husbands and wives (both of which only impact the death benefit liability), the likelihood that a terminating employee will take a refund, etc, all of which have a minor impact on liabilities. We reviewed these, and believe these are generally realistic or conservative, so we decided to recommend no changes to these other assumptions.

## **ACTUARIAL METHODS**

### **Actuarial Funding Cost Method**

We have reviewed the actuarial cost method being used—the Entry Age Normal (EAN) cost method—and we continue to believe that this is the method of choice for this plan, since this method usually does the best job of keeping costs level as a percentage of payroll. It is by far the most commonly used actuarial cost method for large public retirement systems.

The plan specifically uses the Individual Entry Age Normal actuarial cost method. This method will base the normal cost calculation on the individual members currently in the valuation and the benefit provisions that apply to that individual (as opposed to basing the normal cost on a hypothetical group of new entrants). For instance, that means the normal cost for Tier 1



members will be based on their benefits and eligibilities and, likewise, the normal cost for Tier 2 and Tier 3 members will be based on their respective benefits and eligibilities.

### **Asset Valuation Method**

We believe the method used to determine the actuarial value of assets (AVA) is appropriate, since it does a good job of smoothing asset gains and losses, and reduces fluctuations in the funding period. The current method smoothes the differences between the expected returns (based on the annual investment return assumption) and actual returns, net of expenses, over a five-year period. This method of determining the actuarial value of assets is very common. It does not distinguish between types of return (interest, dividends, realized gains/losses, and unrealized gains/losses) like some other methods. It treats different asset classes and different investment styles the same. We do not believe the method has a bias relative to market. In other words, we expect the ratio of the AVA to MVA to average about 100% over the very long term. Therefore, we recommend no change to this method.

### **Membership Growth**

After the completion of the annual actuarial valuation, a thirty-year open group projection is prepared on ERB's funded ratio and Funding Policy Contribution. This projection takes into account a number of factors that are not incorporated in the annual actuarial valuation: (i) lower normal cost rate in the future since all new members will be eligible for Tier 3 benefits, (ii) the known deferred asset gains and losses that are reflected in the actuarial value of assets and that will be recognized over the next four years, and (iii) anticipated cost-of-living adjustments less than the assumed 2% per year.

These projections currently assume the active membership remains constant (based on counts) each year over the projection period. Over the last ten years, the membership has been virtually flat or decreasing. Besides 2012, the current active headcount of 60,057 is the lowest number of active members participating in ERB since 2002. (See the payroll growth assumption discussion earlier in this report for additional detail regarding recent membership growth.)

The recent recession and budget constraints may have affected hiring patterns. However, even if the ERB membership is expected to grow over the short term, it may be too aggressive to assume that the membership will experience sustained growth for the next 30 for a mature plan like ERB. Therefore, we recommend maintaining the assumption that the active membership will remain constant going forward. Since the contributions received on the payroll of members hired after July 1, 2013 exceed their normal cost, every additional member assumed to participate in ERB will serve to pay down the unfunded liability over a shorter period of time (i.e., lower population growth results in a lower projected funded ratio). This assumption is also consistent with the methods used by peer retirement systems.

It should be noted that this assumption has no impact on the stated results of the annual actuarial valuation for the current fiscal year (i.e., funded ratio, unfunded liability, and funding policy contribution) since the valuation is a snapshot based only on the plan membership on the valuation date.

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## **SECTION III**

### ACTUARIAL IMPACT OF RECOMMENDATIONS

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## Actuarial Impact of Recommendations

ERB's Funding Policy Contribution is determined actuarially, based on the plan provisions in effect as of the valuation date, the actuarial assumptions adopted by the Board, and the methodology set forth in the statutes. The member and employer contribution rates are set in statute and are not directly impacted by the annual actuarial valuation. However, the actuarial valuation assesses the adequacy of the statutory contribution rates on an annual basis.

The Funding Policy Contribution and plan liabilities are computed using the Entry Age actuarial cost method. The Funding Policy Contribution is the sum of two pieces: the employer normal cost rate and the amortization rate. The total normal cost rate is determined as a percent of pay. The employer normal cost is the difference between the total normal cost rate and the member contribution rate. The amortization rate is determined as a level percent of pay. It is the amount required to amortize the unfunded actuarial accrued liability over the stated number of years (26 in the examples below).

The funded ratio (the ratio of the actuarial value of assets to the actuarial accrued liability) is a standard measure of a plan's funded status. In the absence of benefit improvements and assuming that the contribution rates are sufficient to pay for at least the normal cost and the interest accruing on the unfunded liability, the funded ratio should increase over time until it reaches 100%.

### Impact on Valuation Results

The combined impact of all proposed assumption changes, compared to the results of the June 30, 2016 actuarial valuation, is summarized in the following table. As a reminder, all of the proposed assumption changes result from lowering the assumed rate of inflation from 3.00% to 2.50%.

	June 30, 2016 <u>Actuarial Valuation</u>	Impact of <u>Experience Study</u>
Normal Cost % (member and employer)	13.00%	13.62%
Unfunded actuarial accrued liability (UAAL)	\$ 6,630 million	\$ 7,438 million
Funded Ratio	64.2%	61.5%
Funding Policy Contribution (employer only)	17.30%	19.85%
Funding Period – Actuarial Valuation	44.9 years	139.4 years
Funding Period – Open Group Projection	46 years	84 years

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## **SECTION IV**

### SUMMARY OF RECOMMENDATIONS

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## Summary of Recommendations

As noted previously, we recommend making the following changes to the current actuarial assumptions and actuarial methods:

- Decrease inflation assumption from 3.00% to 2.50%
- Maintain real rate of return assumption of 4.75%
- Decrease nominal investment return assumption from 7.75% to 7.25%
- Decrease wage inflation from 3.75% to 3.25%
- Decrease payroll growth assumption from 3.50% to 3.00%
- Decrease the annual assumed COLA from 2.00% to 1.90%

We recommend that the Board formally accept this report and adopt the proposed assumptions for the June 30, 2017 and June 30, 2018 actuarial valuations.

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## **SECTION V**

SUMMARY OF ASSUMPTIONS  
AND METHODS INCORPORATING  
THE RECOMMENDED ASSUMPTIONS

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I. Valuation Date

The valuation date is June 30th of each plan year. This is the date as of which the actuarial present value of future benefits and the actuarial value of assets are determined.

II. Actuarial Cost Method

The contribution rate is set by statute for both employees and for the employers. The funding period is determined, as described below, using the Individual Entry Age Normal actuarial cost method.

The Individual Entry Age Normal actuarial cost method assigns the plan's total unfunded liabilities (the actuarial present value of future benefits less the actuarial value of assets) to various periods. The unfunded actuarial accrued liability is assigned to years prior to the valuation, and the normal cost is assigned to the year following the valuation. The remaining costs are the normal costs for future years. Then each year's contribution is composed of (i) that year's normal cost, plus (ii) a payment used to reduce the unfunded actuarial accrued liability.

The normal contribution is determined using the Entry Age Normal method. Under this method, a calculation is made to determine the rate of contribution which, if applied to the compensation of each individual member during the entire period of anticipated covered service, would be required to meet the cost of all benefits payable on his behalf. The salary-weighted average of these rates is the normal cost rate. This calculation reflects the plan provisions that apply to each individual member. The employer normal cost rate is equal to (i) the normal cost rate, minus (ii) the member contribution rate.

The actuarial accrued liability is the difference between the total present value of future benefits and the actuarial present value of future normal costs. The unfunded actuarial accrued liability is the excess of the actuarial accrued liability over the actuarial value of assets.

The balance of the employers' contributions--the remainder after paying their share of the normal cost--is used to reduce the unfunded actuarial accrued liability. The funding period is the length of time required for the unfunded actuarial accrued liability to be completely amortized, assuming that the portion used to reduce the unfunded liability remains level as a percentage of total payroll, which is assumed to grow 3.00% per year. The 3.00% contribution made by employers to ERB on behalf of employees who elected to participate in the Alternative Retirement Plan is also used to amortize the unfunded actuarial accrued liability.

It is assumed that contributions are made monthly at the end of the month.

III. Actuarial Value of Assets

The actuarial value of assets is based on the market value of assets with a five-year phase-in of actual investment return in excess of (less than) expected investment income. Expected investment income is determined using the assumed investment return rate and the market value of assets (adjusted for receipts and disbursements during the year). Returns are measured net of all investment and administrative expenses.

IV. Actuarial Assumptions

A. Economic Assumptions

1. Investment return: 7.25%, compounded annually, net of expenses. This is made up of a 2.50% inflation rate and a 4.75% real rate of return.
2. Salary increase rate: Inflation rate of 2.50% plus productivity increase rate of 0.75% plus step-rate/promotional as shown:

Years of Service	Annual Step-Rate/Promotional Component Rates of Increase	Total Annual Rate of Increase
0	8.75%	12.00%
1	3.00%	6.25%
2	2.00%	5.25%
3	1.50%	4.75%
4	1.25%	4.50%
5	1.00%	4.25%
6	0.75%	4.00%
7	0.50%	3.75%
8	0.50%	3.75%
9	0.50%	3.75%
10 or more	0.00%	3.25%



3. Cost-of-living increases: 1.90% per year, compounded annually. Note that increases are deferred until July 1 following the year a member retires, or the year in which a member attains the age of 65, whichever is later or, for disabled retirees, until July 1 of the third year following retirement.
4. Payroll growth: 3.00% per year (with no allowance for membership growth)
5. Contribution accumulation: Member contributions are assumed to have grown at 5.50% per year, with 4.00% interest, compounded annually, applicable to the account balances in the past as well as the future.

B. Demographic Assumptions

1. Mortality after termination or retirement:
  - a. Healthy males – RP-2000 Combined Healthy mortality table for males with White Collar Adjustments, no set back. Generational mortality improvements in accordance with Scale BB from the table’s base year of 2000.
  - b. Healthy females – GRS Southwest Region Teacher Mortality Table, set back one year. Generational mortality improvements in accordance with Scale BB from the table’s base year of 2012.
  - c. Disabled males – RP-2000 Mortality Table for disabled males, set back three years. Static mortality improvement from the table’s base year of 2000 to the year 2016 in accordance with Scale BB.
  - d. Disabled females – RP-2000 Mortality Table for disabled females, no set back. Static mortality improvement from the table’s base year of 2000 to the year 2016 in accordance with Scale BB.

Mortality Improvement: The nondisabled annuity mortality assumption includes an explicit generational mortality improvement assumption. To account for future mortality improvement for disabled annuitants, the tables and table multipliers selected above were chosen so that the assumed mortality rates are slightly smaller than the rates observed in the last experience study, covering experience for FY 2009 – FY 2014. The ratio of the actual number of deaths occurring during this period to the expected number based on the selected assumptions was 103% for disabled male annuitants and 108% for disabled female annuitants.

2. Mortality rates of active members – RP-2000 Employee Mortality Tables, with males set back two years and scaled at 80%, and females set back five years and scaled at 70%. Static mortality improvement from the table’s base year of 2000 to the year 2016 in accordance with Scale BB. No future improvement was assumed for pre-retirement mortality.

3. Disability Incidence – As shown below for selected ages (rates are only applied to eligible members, which are members with at least 10 years of service):

Age	Occurrence of Disability per 100 Members	
	Males	Females
25	.007	.010
30	.007	.020
35	.042	.050
40	.091	.080
45	.133	.120
50	.168	.168
55	.182	.168

4. Retirement – Select and ultimate as shown below for selected ages (rates are only applied to members eligible for retirement):

**Retirement Per 100 Members**

Age	Males - Years of Service					
	0-4	5-9	10-14	15-19	20-24	25+
45	0.00	0.00	0.00	0.00	0.00	15.00
50	0.00	0.00	0.00	0.00	0.00	18.00
55	0.00	0.00	0.00	0.00	5.00	20.00
60	0.00	0.00	0.00	15.00	20.00	25.00
62	0.00	0.00	30.00	30.00	30.00	30.00
65	0.00	40.00	35.00	30.00	30.00	30.00
67	0.00	25.00	25.00	25.00	30.00	30.00
70	100.00	100.00	100.00	100.00	100.00	100.00

Age	Females - Years of Service					
	0-4	5-9	10-14	15-19	20-24	25+
45	0.00	0.00	0.00	0.00	0.00	15.00
50	0.00	0.00	0.00	0.00	0.00	18.00
55	0.00	0.00	0.00	0.00	6.00	23.00
60	0.00	0.00	0.00	20.00	15.00	25.00
62	0.00	0.00	40.00	30.00	30.00	35.00
65	0.00	35.00	40.00	40.00	40.00	40.00
67	0.00	25.00	25.00	25.00	30.00	30.00
70	100.00	100.00	100.00	100.00	100.00	100.00

The retirement assumption was further modified for members who joined after June 30, 2010. The probability of retirement upon first eligibility for Normal Retirement reflects the accumulated probability of retirement from the first eligibility for members who joined ERB by June 30, 2010 (generally, 25 years of service or Rule of 75) to their actual first eligibility for Normal Retirement (generally, 30 years of service or Rule of 80).

**Early Retirement Per 100 Members – Members joined after June 30, 2010**

Age	Years of Service					
	Males			Females		
	15-19	20-24	25-29	15-19	20-24	25-29
55			5.00			6.00
60		20.00	20.00		15.00	15.00
62	30.00	30.00	30.00	30.00	30.00	30.00
65	30.00	30.00	30.00	40.00	40.00	40.00

5. Termination (for causes other than death, disability or retirement) – Service-based rates are applied as follows:

Completed Service	Terminations per 100 Members	
	Males	Females
0	43.4	31.4
1	28.1	23.8
2	19.6	17.2
3	14.3	13.5
4	11.9	10.6
5	10.0	9.8
6	9.1	8.6
7	7.3	7.2
8	6.1	6.3
9	5.7	5.5
10	5.2	5.0
11	4.2	4.7
12	4.0	4.2
13	3.4	3.6
14	3.4	3.5
15	3.1	3.3
16	2.2	2.3
17	2.3	2.7
18	2.3	2.1
19 and over	0.0	0.0

Rates are not applied after the member is eligible for reduced or unreduced retirement benefits.

C. Other Assumptions

1. Age difference: Males are assumed to be three years older than females. All beneficiaries are assumed to be spouses.
2. Percent electing annuity on death: It is assumed that beneficiaries of deceased members will elect to receive the refund of contributions with interest, unless the member is eligible for early or normal retirement, in which case the beneficiary will elect to receive the survivor annuity.
3. Percent electing deferred termination benefit: All vested active members terminating prior to eligibility for a retirement benefit are assumed to elect the more valuable of (i) an immediate refund, or (ii) a deferred annuity commencing when the member is eligible for an unreduced retirement benefit.
4. Assumed age for commencement of deferred benefits: Members electing to receive a deferred benefit are assumed to commence receipt when eligible for an unreduced benefit (or attained age if later).
5. Investment and administrative expenses: The assumed investment return rate is intended to be the net rate of return after payment of all investment and administrative expenses.
6. Percent married: For valuation purposes 100% of members are assumed to be married.

V. Participant Data

Participant data was supplied on an electronic file for (i) active members, (ii) inactive members, who are entitled to either a future deferred benefit or a refund of their employee contributions and the accumulated interest, and (iii) members and beneficiaries receiving benefits.

The data for active and inactive, non-retired members included birth date, sex, years of service, salary, and accumulated employee contributions (without interest). For retired members and beneficiaries, the data included date of birth, sex, beneficiary or joint annuitant date of birth (where applicable), current monthly benefit, date of retirement, and a form of payment code.

Salary supplied for the current year was the total earnings for the year preceding the valuation date. We have not subjected this data to any auditing procedures, but have examined the data for reasonableness and consistency with the prior year's data.

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## **SECTION VI**

### SUMMARY OF DATA AND EXPERIENCE

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**NON-DISABLED EMPLOYEES  
POST-RETIREMENT MORTALITY - MALE**

Age	Actual Deaths	Total Count	Actual Rate	Assumed Rate		Expected Deaths		Actual/Expected	
				Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
50-54	7	1,497	0.0047	0.0024	0.0024	4	4	185%	185%
55-59	35	5,009	0.0070	0.0039	0.0039	20	20	173%	173%
60-64	89	11,769	0.0076	0.0065	0.0065	81	81	110%	110%
65-69	176	16,431	0.0107	0.0117	0.0117	193	193	91%	91%
70-74	237	13,721	0.0173	0.0196	0.0196	270	270	88%	88%
75-79	330	9,919	0.0333	0.0348	0.0348	344	344	96%	96%
80-84	418	7,152	0.0584	0.0616	0.0616	436	436	96%	96%
85-89	404	3,937	0.1026	0.1084	0.1084	418	418	97%	97%
90-94	248	1,514	0.1638	0.1885	0.1885	273	273	91%	91%
95-99	85	272	0.3125	0.2846	0.2846	73	73	117%	117%
100-104	9	14	0.6429	0.3621	0.3621	5	5	188%	188%
Other	2	209	0.0096			0	0	588%	588%
Totals	2,040	71,444				2,118	2,118	96%	96%



**NON-DISABLED EMPLOYEES  
POST-RETIREMENT MORTALITY - FEMALE**

Age	Actual Deaths	Total Count	Actual Rate	Assumed Rate		Expected Deaths		Actual/Expected	
				Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
50-54	5	2,706	0.0018	0.0028	0.0028	8	8	65%	65%
55-59	41	10,892	0.0038	0.0031	0.0031	34	34	120%	120%
60-64	112	26,447	0.0042	0.0042	0.0042	115	115	97%	97%
65-69	224	33,467	0.0067	0.0065	0.0065	218	218	103%	103%
70-74	239	25,061	0.0095	0.0106	0.0106	267	267	90%	90%
75-79	352	16,948	0.0208	0.0200	0.0200	339	339	104%	104%
80-84	466	11,699	0.0398	0.0405	0.0405	472	472	99%	99%
85-89	540	6,705	0.0805	0.0800	0.0800	526	526	103%	103%
90-94	456	3,175	0.1436	0.1491	0.1491	454	454	100%	100%
95-99	246	990	0.2485	0.2228	0.2228	213	213	116%	116%
100-104	45	136	0.3309	0.3007	0.3007	39	39	115%	115%
Other	3	293	0.0000			3	3	119%	119%
Totals	2,729	138,519				2,687	2,687	102%	102%

**POST-RETIREMENT DISABILITY MORTALITY - MALE**

Age	Actual Deaths	Total Count	Actual Rate	Assumed Rate		Expected Deaths		Actual/Expected	
				Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
40 - 44	0	12	0.0000	0.0215	0.0215	0	0	0%	0%
45 - 49	2	104	0.0192	0.0215	0.0215	2	2	88%	88%
50 - 54	10	198	0.0505	0.0264	0.0264	5	5	189%	189%
55 - 59	9	346	0.0260	0.0325	0.0325	11	11	80%	80%
60 - 64	18	496	0.0363	0.0369	0.0369	18	18	98%	98%
65 - 69	5	357	0.0140	0.0405	0.0405	14	14	35%	35%
70 - 74	6	258	0.0233	0.0468	0.0468	12	12	49%	49%
75 - 79	16	236	0.0678	0.0609	0.0609	14	14	112%	112%
80 - 84	18	166	0.1084	0.0812	0.0812	13	13	135%	135%
85 - 89	6	59	0.1017	0.1059	0.1059	6	6	99%	99%
90 - 94	1	14	0.0714	0.1395	0.1395	2	2	51%	51%
95 +	4	14	0.2857	0.2240	0.2240	3	3	117%	117%
Totals	95	2,260				103	103	92%	92%

**POST-RETIREMENT DISABILITY MORTALITY - FEMALE**

Age	Actual Deaths	Total Count	Actual Rate	Assumed Rate		Expected Deaths		Actual/Expected	
				Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
40 - 44	0	26	0.0000	0.0071	0.0071	0	0	0%	0%
45 - 49	1	131	0.0076	0.0085	0.0085	1	1	86%	86%
50 - 54	7	412	0.0170	0.0128	0.0128	5	5	130%	130%
55 - 59	13	662	0.0196	0.0167	0.0167	11	11	117%	117%
60 - 64	22	837	0.0263	0.0199	0.0199	17	17	131%	131%
65 - 69	14	711	0.0197	0.0258	0.0258	18	18	77%	77%
70 - 74	16	465	0.0344	0.0353	0.0353	16	16	98%	98%
75 - 79	14	272	0.0515	0.0491	0.0491	13	13	106%	106%
80 - 84	10	197	0.0508	0.0678	0.0678	13	13	75%	75%
85 - 89	5	89	0.0562	0.0944	0.0944	8	8	61%	61%
90 - 94	2	20	0.1000	0.1384	0.1384	3	3	78%	78%
95 +	2	3	0.6667	0.2019	0.2019	1	1	312%	312%
Totals	106	3,825				107	107	99%	99%

**MALE PRE-RETIREMENT MORTALITY**

Age	Actual Deaths	Total Count	Actual Rate	Assumed Rate		Expected Deaths		Actual/Expected	
				Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 20	-	195	0.0000	0.0002	0.0002	0	0	0%	0%
20-24	-	3,140	0.0000	0.0003	0.0003	1	1	0%	0%
25-29	3	9,542	0.0003	0.0003	0.0003	3	3	109%	109%
30-34	1	12,035	0.0001	0.0003	0.0003	4	4	23%	23%
35-39	21	19,475	0.0011	0.0006	0.0006	11	11	183%	183%
40-44	8	15,804	0.0005	0.0008	0.0008	13	13	61%	61%
45-49	16	15,835	0.0010	0.0011	0.0011	18	18	88%	88%
50-54	15	17,194	0.0009	0.0016	0.0016	28	28	53%	53%
55-59	23	17,134	0.0013	0.0023	0.0023	40	40	58%	58%
60-64	24	12,448	0.0019	0.0035	0.0035	43	43	56%	56%
65-69	15	4,404	0.0034	0.0050	0.0050	21	21	70%	70%
70-74	5	946	0.0053	0.0062	0.0062	6	6	89%	89%
75 and over	5	-	N\A	0.0000	0.0000	-	-	N\A	N\A
Totals	136	128,152				188	188	72%	72%

**FEMALE PRE-RETIREMENT MORTALITY**

Age	Actual Deaths	Total Count	Actual Rate	Assumed Rate		Expected Deaths		Actual/Expected	
				Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 20	-	107	0.0000	0.0001	0.0001	0	0	0%	0%
20-24	1	3,152	0.0003	0.0001	0.0001	0	0	244%	244%
25-29	-	12,997	0.0000	0.0001	0.0001	2	2	0%	0%
30-34	2	20,370	0.0001	0.0001	0.0001	3	3	65%	65%
35-39	12	26,888	0.0004	0.0002	0.0002	6	6	189%	189%
40-44	4	31,686	0.0001	0.0004	0.0004	12	12	34%	34%
45-49	6	34,997	0.0002	0.0006	0.0006	20	20	30%	30%
50-54	19	40,099	0.0005	0.0009	0.0009	36	36	53%	53%
55-59	27	37,325	0.0007	0.0013	0.0013	49	49	55%	55%
60-64	40	22,920	0.0017	0.0019	0.0019	42	42	94%	94%
65-69	10	6,396	0.0016	0.0027	0.0027	17	17	60%	60%
70-74	4	1,358	0.0029	0.0038	0.0038	5	5	80%	80%
75 and over	-	94	0.0000	0.0000	0.0000	0	0	0%	0%
Totals	125	238,389				192	192	65%	65%

**MALE DISABILITY EXPERIENCE**

Age	Actual Disabilities	Total Count	Actual Rate	Assumed Rate		Expected Disabilities		Actual/Expected	
				Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 20	-	-	N\A	0.0001	0.0001	-	-	N\A	N\A
20-24	-	-	N\A	0.0001	0.0001	-	-	N\A	N\A
25-29	-	-	N\A	0.0001	0.0001	-	-	N\A	N\A
30-34	-	858	0.0000	0.0001	0.0001	0	0	0%	0%
35-39	1	3,164	0.0003	0.0006	0.0006	2	2	48%	48%
40-44	5	5,793	0.0009	0.0011	0.0011	6	6	78%	78%
45-49	12	7,583	0.0016	0.0015	0.0015	11	11	107%	107%
50-54	14	9,085	0.0015	0.0018	0.0018	16	16	88%	88%
55-59	11	9,681	0.0011	0.0018	0.0018	17	17	63%	63%
60-64	9	6,789	0.0013	0.0016	0.0016	11	11	82%	82%
65-69	-	2,140	0.0000	0.0008	0.0008	2	2	0%	0%
70-74	1	164	0.0061	0.0003	0.0003	0	0	2000%	2000%
75 and over	-	-	N\A	0.0003	0.0003	-	-	N\A	N\A
Totals	53	45,257				66	66	80%	80%

**FEMALE DISABILITY EXPERIENCE**

Age	Actual Disabilities	Total Count	Actual Rate	Assumed Rate		Expected Disabilities		Actual/Expected	
				Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 20	-	-	N\A	0.0001	0.0001	-	-	N\A	N\A
20-24	-	-	N\A	0.0001	0.0001	-	-	N\A	N\A
25-29	-	51	0.0000	0.0001	0.0001	0	0	0%	0%
30-34	-	2,117	0.0000	0.0004	0.0004	1	1	0%	0%
35-39	2	9,104	0.0002	0.0005	0.0005	6	6	34%	34%
40-44	13	14,661	0.0009	0.0010	0.0010	14	14	91%	91%
45-49	18	19,396	0.0009	0.0016	0.0016	30	30	60%	60%
50-54	33	25,715	0.0013	0.0017	0.0017	43	43	76%	76%
55-59	19	25,775	0.0007	0.0012	0.0012	32	32	59%	59%
60-64	10	-	N\A	0.0000	0.0000	-	-	N\A	N\A
65-69	-	-	N\A	0.0000	0.0000	-	-	N\A	N\A
70-74	-	-	N\A	0.0000	0.0000	-	-	N\A	N\A
75 and over	-	-	N\A	0.0000	0.0000	-	-	N\A	N\A
Totals	95	96,819				126	126	75%	75%

**TERMINATION EXPERIENCE**  
**MALE**

Service	Actual Terminations	Total Count	Actual Rate	Assumed Rate		Expected Terminations		Actual/Expected	
				Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
0	2,467	6,043	0.408	0.434	0.434	2,623	2,623	94%	94%
1	4,596	16,822	0.273	0.281	0.281	4,727	4,727	97%	97%
2	2,807	13,141	0.214	0.196	0.196	2,576	2,576	109%	109%
3	1,688	10,400	0.162	0.143	0.143	1,487	1,487	114%	114%
4	1,146	8,763	0.131	0.119	0.119	1,043	1,043	110%	110%
5	846	7,594	0.111	0.100	0.100	759	759	111%	111%
6	650	6,515	0.100	0.091	0.091	593	593	110%	110%
7	446	5,637	0.079	0.073	0.073	411	411	109%	109%
8	355	5,028	0.071	0.061	0.061	307	307	116%	116%
9	287	4,586	0.063	0.057	0.057	261	261	110%	110%
10	244	4,111	0.059	0.052	0.052	214	214	114%	114%
11	215	3,856	0.056	0.042	0.042	162	162	133%	133%
12	144	3,590	0.040	0.040	0.040	144	144	100%	100%
13	127	3,378	0.038	0.034	0.034	115	115	110%	110%
14	112	3,108	0.036	0.034	0.034	106	106	106%	106%
15	92	2,890	0.032	0.031	0.031	90	90	102%	102%
16	60	2,663	0.023	0.022	0.022	59	59	102%	102%
17	47	2,485	0.019	0.023	0.023	57	57	82%	82%
18	37	2,287	0.016	0.023	0.023	53	53	70%	70%
19 & over	99	12,042						N/A	N/A
Totals	16,465	124,939				15,787	15,787	104%	104%



**TERMINATION EXPERIENCE**  
**FEMALE**

Service (1)	Actual Terminations (2)	Total Count (3)	Actual Rate (4)	Assumed Rate		Expected Terminations		Actual/Expected	
				Current (5)	Proposed (6)	Current (7)	Proposed (8)	Current (2) / (7) (9)	Proposed (2) / (8) (10)
0	1,364	4,150	0.329	0.314	0.314	1,303	1,303	105%	105%
1	4,497	18,413	0.244	0.238	0.238	4,382	4,382	103%	103%
2	2,752	14,637	0.188	0.172	0.172	2,518	2,518	109%	109%
3	2,006	13,115	0.153	0.135	0.135	1,771	1,771	113%	113%
4	1,462	12,421	0.118	0.106	0.106	1,317	1,317	111%	111%
5	1,328	12,381	0.107	0.098	0.098	1,213	1,213	109%	109%
6	1,189	12,414	0.096	0.086	0.086	1,068	1,068	111%	111%
7	984	12,154	0.081	0.072	0.072	875	875	112%	112%
8	897	11,911	0.075	0.063	0.063	750	750	120%	120%
9	733	11,313	0.065	0.055	0.055	622	622	118%	118%
10	637	10,770	0.059	0.050	0.050	538	538	118%	118%
11	493	10,189	0.048	0.047	0.047	479	479	103%	103%
12	425	9,690	0.044	0.042	0.042	407	407	104%	104%
13	364	9,195	0.040	0.036	0.036	331	331	110%	110%
14	307	8,595	0.036	0.035	0.035	301	301	102%	102%
15	262	7,916	0.033	0.033	0.033	261	261	100%	100%
16	184	7,221	0.025	0.023	0.023	166	166	111%	111%
17	149	6,696	0.022	0.027	0.027	181	181	82%	82%
18	110	6,013	0.018	0.021	0.021	126	126	87%	87%
19 & over	221	27,867						N/A	N/A
Totals	20,364	227,061				18,609	18,609	109%	109%

**RETIREMENT EXPERIENCE  
MALE**

Age	Actual Retirement	Total Count	Expected Retirement		Actual/Expected	
			Current	Proposed	Current (2) / (4)	Proposed (2) / (5)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Under 50	104	395	59	59	176%	176%
50	43	222	40	40	108%	108%
51	80	376	53	53	151%	151%
52	71	464	57	57	125%	125%
53	102	628	69	69	147%	147%
54	126	765	75	75	169%	169%
55	118	877	103	103	114%	114%
56	147	968	116	116	127%	127%
57	165	1,073	129	129	128%	128%
58	147	1,116	139	139	106%	106%
59	217	1,214	166	166	131%	131%
60	240	1,211	240	240	100%	100%
61	315	1,184	331	331	95%	95%
62	303	1,061	318	318	95%	95%
63	238	914	253	253	94%	94%
64	265	859	253	253	105%	105%
65	329	1,063	365	365	90%	90%
66	205	740	196	196	105%	105%
67	149	566	150	150	100%	100%
68	109	454	120	120	91%	91%
69	97	375	99	99	98%	98%
Total	3,570	16,525	3,332	3,332	107%	107%

**RETIREMENT EXPERIENCE  
FEMALE**

Age	Actual Retirement	Total Count	Expected Retirement		Actual/Expected	
			Current	Proposed	Current (2) / (4)	Proposed (2) / (5)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Under 50	207	885	133	133	156%	156%
50	107	511	92	92	116%	116%
51	142	795	117	117	121%	121%
52	173	1,064	144	144	121%	121%
53	217	1,421	171	171	127%	127%
54	299	1,771	195	195	154%	154%
55	358	2,117	276	276	130%	130%
56	392	2,366	354	354	111%	111%
57	435	2,666	446	446	98%	98%
58	509	2,955	529	529	96%	96%
59	657	3,105	620	620	106%	106%
60	687	3,019	598	598	115%	115%
61	818	2,822	820	820	100%	100%
62	703	2,458	808	808	87%	87%
63	534	2,098	562	562	95%	95%
64	595	1,828	529	529	113%	113%
65	681	1,967	762	762	89%	89%
66	410	1,320	352	352	117%	117%
67	250	946	252	252	99%	99%
68	196	702	187	187	105%	105%
69	148	510	135	135	110%	110%
Total	8,518	37,326	8,080	8,080	105%	105%

**New Mexico ERB  
2016 Experience Study  
Salary Scale - Males & Females Combined (8 Years of Experience)**

Service	Current Salary Scales		Actual Experience (8 Years)			Proposed Salary Scale	
	Total	Step Rate/ Promotional	Total	Above inflation	Steprate/ Promotional	Total	Steprate/ Promotional
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
0	12.50%	8.75%	4.12%	2.91%	2.40%	12.00%	8.75%
1	6.75%	3.00%	4.02%	2.80%	2.30%	6.25%	3.00%
2	5.75%	2.00%	4.05%	2.83%	2.33%	5.25%	2.00%
3	5.25%	1.50%	3.28%	2.06%	1.55%	4.75%	1.50%
4	5.00%	1.25%	2.79%	1.58%	1.07%	4.50%	1.25%
5	4.75%	1.00%	2.55%	1.33%	0.82%	4.25%	1.00%
6	4.50%	0.75%	2.38%	1.16%	0.66%	4.00%	0.75%
7	4.25%	0.50%	2.22%	1.00%	0.50%	3.75%	0.50%
8	4.25%	0.50%	1.97%	0.75%	0.24%	3.75%	0.50%
9	4.25%	0.50%	1.83%	0.61%	0.11%	3.75%	0.50%
10+	3.75%	0.00%	1.72%	0.51%	0.00%	3.25%	0.00%

- a. Current Inflation Assumption 3.00%
- b. Current Productivity Component 0.75%
- c. Actual CPI-U Inflation for 6/30/09 - 6/30/16 1.22%
- d. Proposed Inflation Assumption 2.50%
- e. Apparent Productivity Component 0.51%
- f. Proposed Productivity Component 0.75%