New Mexico Educational Retirement Board

Actuarial Experience Study
Through June 30, 2019

Presented to the Board of Trustees on April 17, 2020

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

Subject: Results of 2020 Actuarial Experience Study

Members of the Board:

We are pleased to present our report on the results of the 2020 Actuarial Experience Study for the New Mexico Educational Retirement Board (ERB). It includes our recommendations for new actuarial assumptions and methods to be effective for the June 30, 2020 actuarial valuation, and it describes the actuarial impact produced by these recommendations as though they had been effective for the June 30, 2019 actuarial valuation.

With the Board's approval of the recommendations in this report, we believe the actuarial condition of ERB will be more accurately portrayed. The Board's decisions should be based on the appropriateness of each recommendation individually, not on their collective effect on the funding period or the unfunded liability.

This study was conducted in accordance with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board. The signing actuaries are independent of the plan sponsor. Mr. Falls and Ms. Woolfrey are Enrolled Actuaries, Fellows of the Society of Actuaries, Members of the American Academy of Actuaries, and meet the Qualification Standards of the American Academy of Actuaries. Finally, they are experienced in performing valuations for large public retirement systems.

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

Respectfully submitted,
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SECTION A

EXECUTIVE SUMMARY

Summary of Recommendations

Our recommended changes to the current actuarial assumptions may be summarized as follows:

Economic Assumptions

1. We recommend setting the nominal investment return assumption to not more than the current assumption of 7.25%, with consideration for reducing to 7.00%.

2. We recommend decreasing the inflation assumption from 2.50% to 2.30%.

3. Currently, the investment return is assumed to be net of investment and administrative expenses. We recommend incorporating an explicit administrative expense assumption of 0.35% of pay per year into the anticipated payments from the plan, such that the investment return used will be net of investment expenses only.

4. We recommend a general wage inflation assumption of 0.70% above inflation, or 3.00%. This compares to the current assumption of 3.25%. This assumption is used to project future increases in salary for all members (regardless of service) and to index each cohort of new entrants used in the projections to determine the funding period.

5. We recommend modest adjustments, mostly increases, to the service-based merit component of the assumption, consistent with observed experience.

6. We recommend reducing the annual cost of living increase assumption from 1.90% to 1.80%. This reflects the underlying ties to inflation in the determination of the annual increase granted.

Mortality Assumptions

7. We recommend updating the base mortality assumption to the 2020 GRS Southwest Teacher Mortality Table with some plan-specific adjustments for the post-retirement mortality tables. We also recommend continuing to assume mortality rates will improve in the future using a fully generational approach, but recommend updating the projection scale to the ultimate rates of the Scale MP which we refer to as U–MP.

8. We recommend updating post-retirement mortality tables for disabled retirees to the proposed tables for non-disabled retirees, but with a three-year set forward for males and females to reflect the potential impact of their impairment. Additionally, minimum mortality rates of 4.00% and 2.00% will be applied for males and females, respectively. We also recommend assuming mortality rates will improve in the future using a fully generational approach with projection scale U–MP.

9. We recommend updating pre-retirement mortality tables for active employees to the most recently published national tables for teachers, the Pub-2010 Teacher Employee tables. We also recommend continuing to assume mortality rates will improve in the future using a fully generational approach with projection scale U–MP.

Other Demographic Assumptions

10. We recommend modest adjustments to male and female termination rates to better reflect observed plan experience.

11. We recommend modest adjustments to retirement rates for males and females based on observed plan experience.

Actuarial Methods and Policies

12. We recommend no change to the current process of estimating the valuation payroll for the upcoming fiscal year.

13. We recommend no change to the actuarial cost method nor the asset smoothing method.

The impact to key actuarial results as of June 30, 2019 are shown below based on current and proposed assumptions:

	June 30, 2019 Valuation	Recommended at 7.25%	Recommended at 7.00%
Unfunded AAL	$7.9 billion	$7.7 billion	$8.3 billion
Funded ratio	62.9%	63.4%	61.6%
Funding Policy Contribution	19.01% of pay	19.78% of pay	21.31% of pay
Funding Period (Open Group)	47 years	51 years	70 years

SECTION B

INTRODUCTION

Introduction

A periodic review and selection of the actuarial assumptions is one of many important components of understanding and managing the financial aspects of the New Mexico Educational Retirement Board (ERB). Use of outdated or inappropriate assumptions can result in understated costs which will lead to higher future contribution requirements or perhaps an inability to pay benefits when due; or, on the other hand, produce overstated costs which place an unnecessarily large burden on the current generation of members, employers, and taxpayers.

A single set of assumptions is typically not expected to be suitable forever. As the actual experience unfolds or the future expectations change, the assumptions should be reviewed and adjusted accordingly.

It is important to recognize that the impact from various outcomes and the ability to adjust from experience deviating from the assumption are not symmetric. Due to compounding economic forces, legal limitations, and moral obligations, outcomes from underestimating future liabilities are much more difficult to manage than outcomes of overestimates. That asymmetric risk should be considered when the assumption set, investment policy and funding policy are created. As such, the assumption set used in the valuation process needs to represent the best estimate of the future experience of the retirement system and be at least as likely, if not more than likely, to overestimate the future liabilities versus underestimate them.

Using this strategic mindset, each assumption was analyzed compared to the actual experience of ERB and general experience of other large public employee retirement systems. Changes in certain assumptions and methods are suggested upon this comparison to remove any bias that may exist and to perhaps add in a slight margin for future adverse experience where appropriate. Next, the assumption set as a whole was analyzed for consistency and to ensure that the projection of liabilities was reasonable and consistent with historical trends.

The following report provides our recommended changes to the current actuarial assumptions.

Summary of Process

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

- Retirement rates
- Mortality rates
- Turnover 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 others, such as the investment return assumption, the link between past and future results is much weaker. In either case, actuaries should review the plan's assumptions periodically and

determine whether these assumptions are consistent with actual past experience and with anticipated future experience.

The last such actuarial experience investigation was performed following the June 30, 2016 actuarial valuation and the recommendations were adopted on April 21, 2017. For this experience study, we have reviewed ERB's experience for the six-year period from June 30, 2014 through June 30, 2019. However, for some analysis, such as salary and mortality, we utilized data from the previous experience study dating back to June 30, 2011.

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-to-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 could water down real changes that may be occurring, such as mortality improvement or a change in the ages at which members retire.

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 of "expected" decrements 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 gender, by age, and by service.

In many circumstances, we enhance this process by using an amount-weighted analysis. An amount-weighted analysis will generally use amounts such as benefits, pay, or liabilities to complete the analysis. From the perspective of the mortality assumption, there are two reasons for using an amount-weighted approach. First, mortality experience across the U.S. has been shown to vary depending on income level. Amount-weighting takes into account differing benefit levels. Second, selecting an assumption based on headcount-weighting is consistent with estimating expected deaths, but selecting an assumption based on amount-weighting is consistent with minimizing gains and losses associated with expected deaths. By weighting the data by annuity amounts, we are giving more weight to members who have larger annuities (and thus have larger liabilities). The same concepts apply when the amount-weighted approach is applied to other demographic assumptions such as termination and retirement.

If the data leads the actuary to conclude that new tables are needed, the actuary may "graduate" or smooth the results, since the raw results can be quite uneven from age to age or from service to service.

Please bear in mind that, while the recommended assumption set represents our best estimate, there are other reasonable assumptions sets that could be supported. Some reasonable assumption sets would show higher or lower liabilities or costs.

Section E Exhibits

The exhibits in Section E should generally be self-explanatory. For example, on page E-3, we show an exhibit analyzing the termination rates for male members by years of service. The second column shows the total number of male members with 18 or fewer years of service who terminated during the study period, weighted by liability. This excludes members who died, became disabled or retired. Column (3), labeled "Total Count" shows the total exposures of this group, again weighted by liability. This is the number of members who meet the criteria who could have terminated during any of the years. On this exhibit, the exposures exclude anyone eligible for unreduced retirement. A member is counted in each year they could have terminated, so the total shown is the total exposures for the six-year period. Column (4) shows the probability of termination based on the raw data.

That is, it is the result of dividing the actual number of terminations (col. 2) by the number exposed (col. 3). Column (5) shows the new recommended termination rate. Column (6) shows the expected number of terminations based on the proposed termination assumptions. Column (7) shows the Actual-to-Expected ratios under the proposed termination assumptions.

SECTION C

ANALYSIS OF EXPERIENCE AND RECOMMENDATIONS

Analysis of Experience and Recommendations

We will begin by discussing the economic assumptions: inflation, the investment return rate, the general wage increase assumption, the salary increase assumption for individuals, cost-of-living increases if applicable, and the payroll growth rate used for projecting total contributions. Then we will discuss the demographic assumptions: mortality, disability, termination and retirement. Finally we will discuss the actuarial methods used.

Inflation and Investment Return 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. ASOP No. 27 was revised and adopted by the Actuarial Standards Board (ASB) in September 2013.

As no one knows what the future holds, it is necessary for an actuary to estimate possible future economic outcomes. Recognizing that there is not one right answer, the current standard calls for an actuary to develop a reasonable economic assumption. A reasonable assumption is one that is:

1. appropriate for the purpose of the measurement,
2. reflects the actuary's professional judgment,
3. takes into account historical and current economic data that is relevant as of the measurement date,
4. is an estimate of future experience; an observation of market data; or a combination thereof,
5. and has no significant bias except when provisions for adverse deviation or plan provisions that are difficult to measure are included.

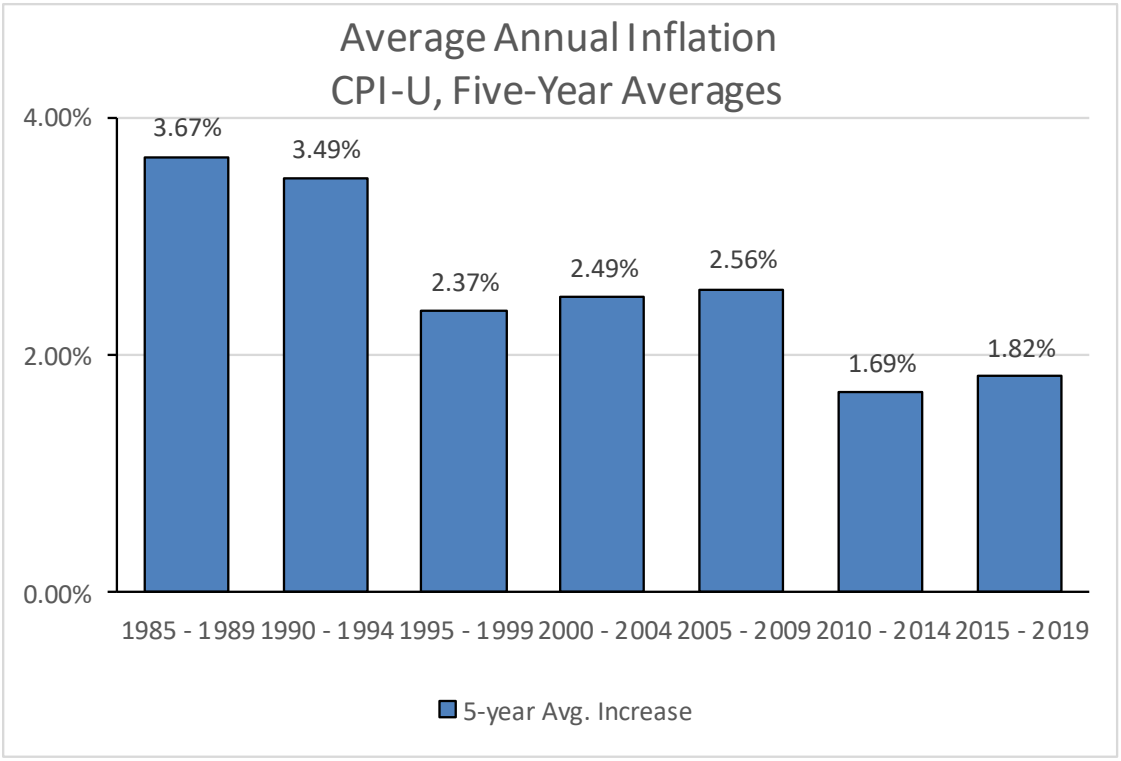
However, the standard explicitly advises an actuary not to give undue weight to recent experience.

Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with every other economic assumption over the measurement period. Generally, the economic assumptions are much more subjective in nature than the demographic assumptions.

Inflation Assumption

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 impacts investment return, salary increases, and overall payroll growth. The current annual inflation assumption is 2.50%.

The following chart shows the average annual inflation, as measured by the increase in the Consumer Price Index (CPI-U), in each of the seven consecutive five-year periods over the last 35 years.



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

The table below shows the average inflation over various periods, ending December 2019.

Periods Ending Dec. 2016	Average Annual Increase in CPI-U
Last five (5) years	1.82%
Last ten (10) years	1.75%
Last fifteen (15) years	2.02%
Last twenty (20) years	2.14%
Last twenty-five (25) years	2.18%
Last thirty (30) years	2.40%
Since 1913 (first available year)	3.11%

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

As you can see, inflation has been relatively low over the last twenty-five years, and historically so over the past 10 years.

Forecasts from NEPC (ERS Investment Consultant)

The 2020 Capital Market Assumptions for NEPC, ERB's Investment Consultant, are using 2.30% as the price inflation assumption for the next 10 years.

Forecasts from Other Investment Consulting Firms

We examined the 2019 capital market assumption sets for 14 investment consulting firms and the average assumption for inflation was 2.18%, with a range of 1.70% to 2.50%. All but two of the investment consulting firms in our survey, in setting their capital market assumptions, currently assume that inflation will be less than 2.50%.

Expectations Implied in the Bond Market

Another source of information about future inflation is the market for US Treasury bonds. Simplistically, the difference in yield between non-indexed and indexed treasury bonds should be a reasonable estimate of what the bond market expects on a forward looking basis for inflation. As of the end of December, the difference for 20-year bonds implies that inflation over the next twenty years would average 1.85%. The difference in yield for 30-year bonds implies 1.80% inflation over the next 30 years.

However, this analysis is known to be imperfect as it ignores the inflation risk premium that buyers of US Treasury bonds often demand as well as possible differences in liquidity between US Treasury bonds and TIPS.

Forecasts from Social Security Administration

In the Social Security Administration's 2019 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. Similarly, the low cost scenario is 2.0% and the high cost scenario is 3.2%.

Survey of Professional Forecasters and Fed Policy

The Philadelphia Federal Reserve conducts a quarterly survey of the Society of Professional Forecasters. Their most recent forecast (fourth quarter of 2019) was for inflation over the next ten years (2019 to 2028) to average 2.20%.

Additionally, the Fed has openly stated that they have a target 2.00% inflation rate.

Recommendation

As a result, we find a reasonable range for this assumption to be 2.00% to 2.50% and are recommending lowering the assumption to 2.30%. This change will bring the assumption closer to recent inflation levels, more consistent with NEPC's assumption, and closer to the levels expected in the financial markets. As you will see, this change also affects all other economic assumptions.

Investment and Administrative Expenses

Since the trust fund pays expenses in addition to member benefits and refunds, we must make some assumption about these. Almost all actuaries treat investment expenses as an offset to the investment return assumption. That is, the investment return assumption represents expected return after payment of investment expenses.

In regards to investment expenses, investment consulting firms periodically issue reports that describe their capital market assumptions. The 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. The 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 adjustments to account for investment related expenses. Some of the retirement systems may also employ active management investment strategies that result in higher investment expenses compared to strategies that invest in passive index funds. We have assumed that active management strategies would result in the same returns, net of investment expenses, as passive management strategies.

On the other hand, there is a divergence of practice on the handling of administrative expenses. Some actuaries make an assumption that administrative expenses will be some fixed or increasing dollar amount. Others assume that the administrative expenses will be some percentage of the plan's actuarial liabilities or normal cost. And others treat administrative expenses like investment expenses, as an offset to the investment return assumption.

Historically, ERB has treated administrative expense like an investment expense, assuming that excess returns will cover these costs. We recommend that going forward, ERB explicitly incorporate administrative expenses into the anticipated annual payments from the plan. Using an explicit approach maximizes transparency, aligns better with the standards of the Governmental Accounting Standards Board, and maintains a parallel between the investment returns used by the investment consultant and the actuary.

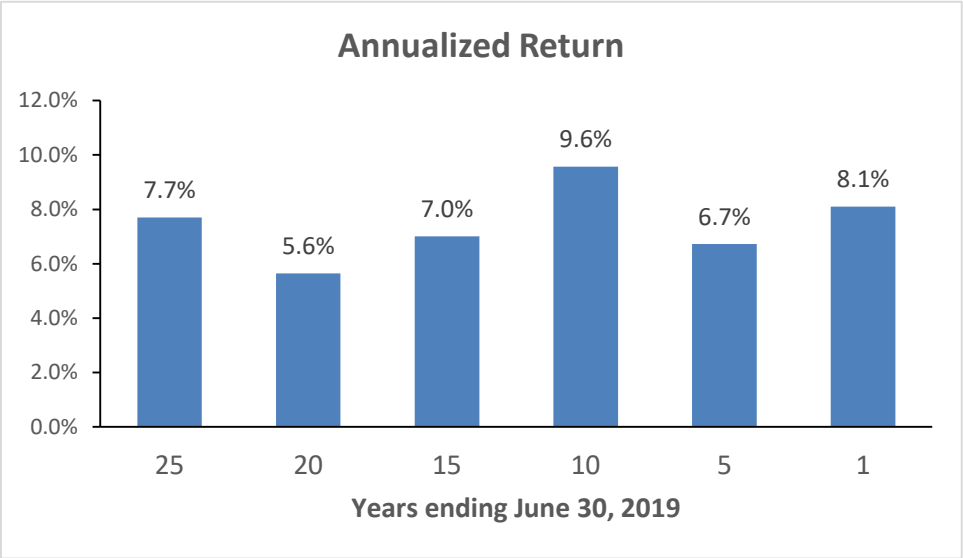
The following table provides the actual administrative expenses as a percentage of covered payroll for the last four years, along with our recommended assumption.

FY19	FY18	FY17	FY16	Average	Recommended Assumption
0.34%	0.36%	0.36%	0.35%	0.35%	0.35%

Investment Return Rate

The investment return assumption is one of the principal assumptions used 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 contribution rates. Currently, it is assumed that future investment returns will average 7.25% per year, net of investment and administrative expenses.

The chart below shows the historical annualized history of ERB's market returns through FY 2019.



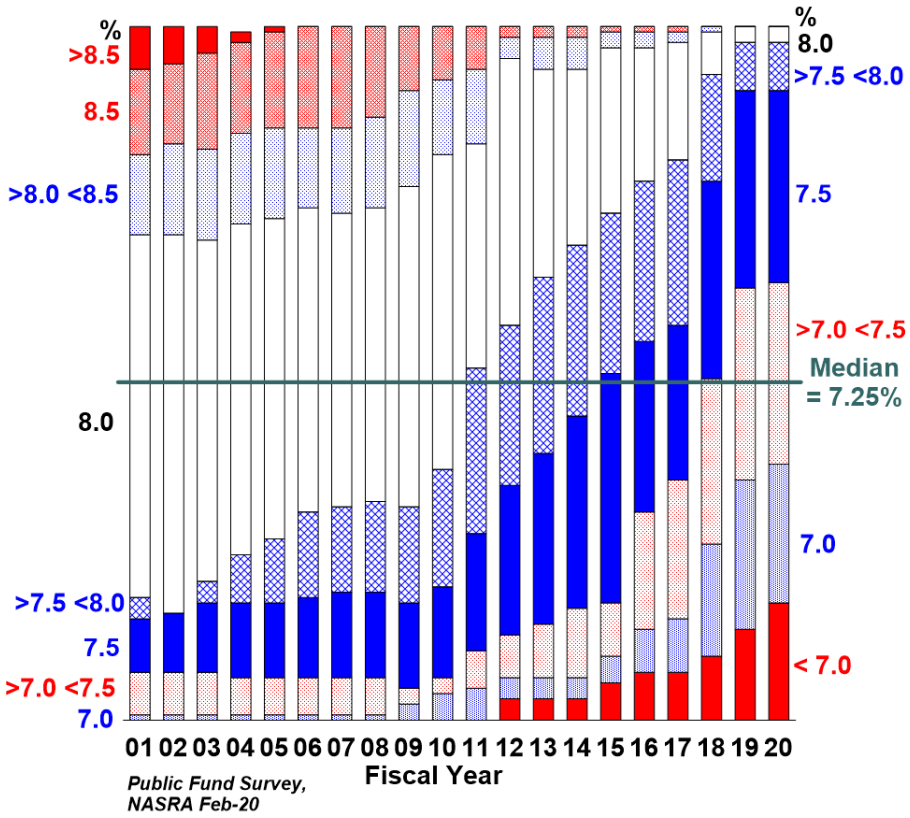
The returns in the chart above are market returns, net of administrative and investment expenses, as reported in the actuarial valuations. ERB did exceed the expected 7.25% return assumption in 16 of the last 25 years, and had an average annualized market return during this period of 7.7%. Over the same period inflation averaged 2.2%, producing an average realized real return of 5.5%.

However, for this assumption, past performance, even averaged over a twenty-five 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-five year period is not long enough to provide reasonable guidance. There are strong reasons to believe the next twenty-five years will be different than the last twenty-five, in large part because current bond yields are significantly lower than they were 25 years ago.

Assumption Comparison to Peers

We do not recommend the selection of an investment return assumption based on prevalence information. However, it is still informative to identify where the investment return assumption for ERB is compared to its peers. The chart below shows the distribution of the investment return assumptions, as reported by NASRA in February, 2020.



The median rate of return is 7.25%. However, this chart does not tell the entire story. Several of the data points, including the one for ERB, have not been examined in a few years, meaning even the current survey data is a little stale.

Asset Allocation

We believe the most appropriate approach to selecting an investment return assumption is to identify expected returns given the funds' asset allocation mapped to forward-looking capital market assumptions. For this purpose, we have analyzed the ERB Investment Policy Statement with the following Target Weights:

Asset Class	Target Weight
Domestic Equities – Large Cap	14%
Domestic Equities – Small/Mid Cap	3%
International Equities – Developed	5%
International Equities – Emerging Markets	9%
Fixed Income – Opportunistic Credit	16%
Fixed Income – Core Bonds	6%
Fixed Income – Emerging Market Debt	2%
Alternatives – Real Estate	8%
Alternatives – Real Assets	9%
Alternatives – Private Equity	15%
Alternatives – Global Tactical Asset Allocation	2%
Alternatives – Risk Parity	3%
Alternatives – Other	7%
Cash	1%
Total	100%

In order to develop an appropriate estimate for an investment return assumption, we have utilized the forward-looking return expectations developed by several investment consulting firms and industry surveys.

Our survey includes 14 sets of expectations. Based on the average of these sets of expectations, and the proposed 2.30% inflation assumption, the expected compound return over the short term (generally, 7 to 10 year horizon) is 7.2%, with a range of outcomes from 5.3% to 8.4%. The expected compound return over the long term (generally, 20 to 30 year horizon), for those investment consultants that provide long term forecasts, is 7.9%. Thus, much of the investment community is anticipating lower returns over the next decade compared to longer time frames.

The NEPC expected compound return, based on their 2020 capital market assumptions (developed as of December 31, 2019) and the ERB asset allocation, is 7.3% over the short term and 8.1% over the longer term.

Recommendation

Based on this analysis, we are recommending the Board reduce the investment return assumption to no higher than 7.25%. This would be comprised of a 4.95% net real return and a 2.30% inflation assumption.

Even though we are comfortable with a 7.25% assumption for a longer term, if the Board is uncomfortable with what is likely a less than 50% probability of achieving the 7.25% over the next decade, it should consider adopting a 7.00% return assumption. An achievable investment return assumption is important for any plan, but all the more so for a fixed rate plan like ERB.

Cost-of-Living Increase Assumption

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 ½ 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.

There are further adjustments 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 2.50%, the current assumption for future COLAs is 1.90% per year. Based on modeling of future volatility using the proposed reduced inflation expectations, we recommend lowering the assumption for future COLAs to 1.80% per year.

General Wage Inflation

A General Wage Inflation (GWI) assumption represents the real wage growth over time in the general economy, or, is the assumption on how much the pay scales themselves will change year to year, not necessarily how much the pay increases received by individuals are, or even necessarily how the payroll in total may change, which can be impacted by population changes, etc. This assumption should be applicable to a local economy, not necessarily one group inside a retirement system. This assumption is also used to

index the pay of each group of new entrants used in the open group projections. In an open group projection, projected terminations from the current active population are replaced with projected new entrants.

Historically, General Wage Inflation has almost always exceeded price inflation. This is because wage inflation is in theory the result of (a) price inflation, and (b) productivity gains being passed through to wages. Since 1951, for the national economy as a whole, wage inflation has been about 1.00% larger than price inflation each year. For the last 10 years, for the national economy as a whole, wage inflation has been 2.35%, outpacing price inflation by about 0.60%. However, that spread will likely be viewed as overstated due to the historically low inflation during the past decade.

Over the past 20 years, the average salary for an ERB member has increased 2.4% per year, and 1.0% per year over the past 10 years. Over the same periods, the national average wage changed by 3.0% and 2.4%, respectively. This ERB experience would indicate that pays have actually lagged price inflation, however, when we look at the individual pay increases for long-service members, they have outpaced inflation by about 0.70%. It may be that the covered membership is more heavily distributed to lower paid roles than it has been historically which accounts for the slow growth in the average pay.

We are recommending a 0.70% real productivity growth assumption, or a nominal 3.00% GWI assumption.

Salary increase rates

Salary increases are composed of both wage inflation and service-based promotional or merit increases. Wage inflation is currently assumed to be 3.25% ("building blocks" of 2.50% 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 3.25%, and this is the assumed salary increase for longer-service members with at least 10 years of service. When looking at the experience over the last eight years, we found that the merit/promotion component continued out past 10 years and did not level off until about 15 years. As such, we have extended the schedule of merit/promotion increases from 10 to 15 years. For members with 15 or more years of service, the observed average salary increase during the last eight years was 2.26%. Inflation during this six-year period averaged 1.59%. Therefore, long-service employees received an average salary increase of 0.67% above inflation. In addition to reflecting the reduced inflation assumption of 2.30%, we recommend reducing the productivity component of the salary increases to 0.70% for a base salary increase of 3.00%.

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 been slightly higher than the current merit increases, with the exception of the period between 10 and 15 years where we continued to see merit increases, but had assumed none. We recommend slight reductions to the current rates prior to 10 years and inclusion of a 25 basis point merit increase between 10 and 15 years.

The overall result, after considering both the changes to base wage inflation and the merit increases, is a reduction in average salary increase of about 0.10%.

Payroll Growth Rate

The salary increase rates discussed above are assumptions applied to individuals. They are used in projecting future benefits. The GWI assumption above reflects how wages will change in the general economy. The GWI assumption is used in projections and to compare the reasonableness of the assumption set to national trends.

The payroll growth rate is used in determining the contributions 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 contributions also increase. Thus, the amortization percentage is dependent on the rate at which payroll is assumed to increase.

This plan has different benefit groups (with decreasing normal costs) using a fixed rate funding strategy so much of the focus is on the open group projection and associated funding period. However, the funding policy contribution and closed valuation funding period do rely on a payroll growth rate assumption of 3.25%.

The best way to estimate this assumption is from the open group projection. We have performed open group projections, based on the proposed salary scales, demographic assumptions, and increasing the payroll for each cohort of new entrants by the 3.00% GWI assumption. These projections show that payroll will grow over the next couple of decades by approximately 2.6%. Therefore, we are recommending a payroll growth assumption of 2.6%.

Demographic Assumptions

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:

> 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
>
> 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

These assumptions 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.

In analyzing the mortality experience, we have weighted the analysis by the amount of the member's monthly annuity. By weighting the data by annuity amounts, we are giving more weight to members who have larger annuities (and thus have larger liabilities). Using this method is expected to minimize gains and losses from mortality.

We begin by determining the expected deaths in each year at each age for males and females. Then we compare the actual to the expected . The ratio of the actual deaths to the expected deaths (the A/E ratio), weighted by benefit amounts, tells us whether the assumptions are reasonable. When using a generational approach for mortality improvement, an A/E of 100% is targeted. However, we will also focus on the pattern across all ages and life expectancy created at individual ages when determining whether the assumption is appropriate. We will discuss this in two parts, the recommended base mortality assumption, and the recommended mortality improvement assumption.

Recommended Base Mortality Assumption

Experience used to examine the fit of the current assumption was for non-disabled retirees for the eight-year period ending June 30, 2019. Based on benefit-weighted mortality experience, overall actual to expected ratios were 87% and 97% for males and females, respectively. This low male actual to expected ratio may suggest that lower-paid participants have notably higher rates of mortality. Once the experience is more heavily weighted to the higher-paid group, the current tables are no longer a good fit.

The Society of Actuaries recently conducted a study using specifically public sector data and released new standard tables called Pub-2010. These tables included a variant of the tables specific to retired teacher experience. GRS considered these tables, but did not find them to be a particularly good fit.

GRS works with teacher retirement systems across the country and, in particular, many teacher retirement systems in the Southwest region of the United States. We have generally found that the published mortality tables do not provide a good match to the mortality experience of retired teachers in this region. As a result, GRS has developed specialized mortality tables for retired teachers in the Southwest region. Based on the experience of ERB over the past eight years, this specialized table provides a superior fit to the mortality experience of ERB. We recommend updating the base mortality assumption to the 2020 GRS Southwest Teacher Mortality Table, with a one year set-forward for males and females and a 95% multiplier for males.

Recommended Mortality Improvement Assumption

The current mortality assumption includes a fully generational approach to projecting mortality improvement. Because of this strategy of building in continuous mortality improvement, life expectancies for today's younger active members are expected to be materially longer than those of today's retirees, and this has a significant impact on actuarial liabilities contribution requirements. Specifically, mortality is assumed to improve in accordance with Scale BB which was published by the Society of Actuaries.

The Society of Actuaries' Retirement Plans Experience Committee (RPEC) initiated a pension mortality study in 2010. At an early stage of its analysis, RPEC noticed that mortality experience since 2000 has improved at a faster rate than anticipated by Scale AA. As a result, RPEC issued another mortality improvement scale, Scale BB, in the year 2012 as an alternative mortality improvement assumption for pension actuaries to use. In October 2014, RPEC issued final reports of the mortality study that was originally initiated in 2010. These final reports included the release of another mortality improvement assumption, Scale MP-2014. A significant difference between the MP-2014 improvement scales and the prior improvement scales is that the MP tables are a two-dimensional improvement assumption that is a function of the age and calendar year, whereas prior scales were only a function of age.

In 2015 through 2019, the RPEC issued updates to the mortality improvement assumption called Scale MP-xxxx, where xxxx represents the given years. MP-2015 reflected an additional two years of mortality experience, MP-2016 reflected an additional three years of mortality experience, etc. Since the original MP-2014 study, rates of projection have materially decreased, meaning the original MP-2014 table was found to be too conservative. In addition, it has been stated that new projection scales will continue to be published each year.

After approximately 15 years, all MP tables reflect the same improvement rate at each future calendar year (the ultimate mortality improvement rates). In order to balance the two objectives of reflecting the most recent data available, while maintaining stability of results from year to year, GRS recommends the use of the ultimate mortality improvement rates in the MP tables for all years, which we will refer to as U-MP.

Disabled Mortality Rates

Because the rate of disability incidence is so low for ERB and the disabled mortality rates apply to a very small subsection of plan participants, this is a minor assumption that has little impact on the liabilities of ERB. We recommend using the healthy post-retirement tables , set forward three years for males and females (two year set forward as compared to one year setback on healthy), with a minimum mortality rate of 4.0% and 2.0%, for males and females, respectively. Additionally, we recommend continuing to apply future mortality improvements using the ultimate mortality improvement rates in the MP tables.

Active Mortality Rates

Active mortality is also a minor assumption. Incidence of active deaths is very low in comparison to terminations and retirements. For active mortality rates, we recommend using the Pub-2010 Teacher Employee mortality tables with future mortality improvements modeled using the ultimate mortality improvement rates in the MP tables.

Disability Rates

Disability is a low-incidence, low impact assumption. We recommend no change to this assumption at this time.

Retirement Rates

We currently use retirement rates that vary by age, service, and sex. Based on liability-weighted experience, the analysis shows A/E ratios of 90% for males and 93% for females (rates less than 100% are conservative). These overall A/E ratios seem very appropriate; however, upon examining the individual A/E ratios at specific age and service levels, we found some areas where we felt the rates warranted modification.

For both males and females, we observed that increased rates were needed specifically at 25 years of service prior to age 55. For males, slightly higher rates were needed when Rule of 75 was attained prior to age 60. For both males and females, rates were reduced at some tenures where the member had already been eligible for retirement for several years. Overall, it was largely a reassignment of expected retirements, and the revised A/E ratios were 93% for both males and females.

Currently, members who joined ERB by July 1, 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.

Currently the rates for the post-2010 members are based on the pre-2010 member rates, adjusted for post-2010 eligibilities and accounting for pent up demand when they are eligible for retirement at a later date. There is still very little experience on which to analyze the intricacies of this assumption at the various eligibilities and so we recommend continuing to use this approach with the new pre-2010 recommended rates.

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.

On a counts-weighted basis, the current assumptions produced an A/E ratio of 120% for males and 120% for females compared to 104% for males and 109% for females in the prior experience study. For this assumption, A/E ratios over 100% are conservative. This would suggest that termination rates could be increased. However, more terminations than expected should generally be creating liability gains. Instead, we continue to observe termination losses. This suggests that much of the termination experience may be coming from the lower-paid employees, and we need to use liability-weighted experience. On a liability-weighted basis, A/E ratios were 93% for males and 97% for females. In addition, experience indicated that lower termination rates were needed at short and long tenures, but higher rates at mid-career. We recommend modest adjustment to the rates to reflect the enhanced liability-weighted procedure and the observed experience.

The results are shown below ($ in 100,000s for liability weighted):

Termination Rates – Males (Counts Weighted)					
		Current Assumption		*Proposed Assumption*	
Service Years	Actual terms	Expected terms	A/E ratio	Expected terms	A/E ratio
0-4	11,332	10,689	106%	9,334	121%
5-9	2,630	2,196	120%	2,234	118%
10-18	1,094	979	112%	980	112%
Totals	15,056	13,864	**109%**	12,547	**120%**

Termination Rates – Males (Liability Weighted)					
		Current Assumption		*Proposed Assumption*	
Service Years	Actual terms	Expected terms	A/E ratio	Expected terms	A/E ratio
0-4	84	111	76%	101	83%
5-9	125	120	104%	122	102%
10-18	129	134	96%	133	97%
Totals	338	365	**93%**	356	**95%**

Termination Rates – Females (Counts Weighted)					
		Current Assumption		*Proposed Assumption*	
Service Years	Actual terms	Expected terms	A/E ratio	Expected terms	A/E ratio
0-4	15,665	13,930	112%	12,746	123%
5-9	4,800	3,890	123%	4,159	115%
10-18	2,979	2,741	109%	2,693	111%
Totals	23,444	20,561	**114%**	19,597	**120%**

Termination Rates – Females (Liability Weighted)					
		Current Assumption		*Proposed Assumption*	
Service Years	Actual terms	Expected terms	A/E ratio	Expected terms	A/E ratio
0-4	117	140	84%	133	88%
5-9	213	190	112%	203	105%
10-18	324	345	94%	333	97%
Totals	654	675	**97%**	669	**98%**

Other Assumptions

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 Cost Method

We recommend continuing to use the Individual Entry Age Normal (IEAN) actuarial cost method. IEAN will generally produce level contribution amounts for each member as a percentage of salary from year to year, and allocates costs among various generations of taxpayers in a reasonable manner. It is by far the most commonly used actuarial cost method for large public retirement systems and the method used for accounting disclosures under GASB Statement No. 67.

For a plan that receives contributions as a fixed percent of payroll, the IEAN method does, however, eliminate the ability to perform a simple and algebraic calculation of the funding period and contribution requirements. Thus, we will continue to include a funding period determined based on an open group projection. The open group projection incorporates the fact that the normal cost rate will trend down over time and reduced COLAs may be paid in the future based on the funded status of the plan. Otherwise, the projection is built to assume no gains or losses on the actuarial accrued liability.

Asset Valuation (Smoothing) Method

The purpose of asset smoothing is to reduce short-term volatility in actuarial valuation results which are intended for long-term decision making and funding. Periods of poor returns are often followed by some amount of recovery or vice versa, and a market value (unsmoothed) approach, may result in overreaction to short-term market volatility.

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 smooths 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 and does not have 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.

SECTION D

SUMMARY OF ASSUMPTIONS AND METHODS

Summary of Assumptions and Methods
Incorporating the Recommended Assumptions

The assumptions and methods applied in this actuarial valuation may be adopted by the Board of Trustees on May 20, 2020 based on the experience investigation that covered the period ending June 30, 2019.

I. Valuation Date

The valuation date is June 30 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 eliminated, assuming that the portion used to reduce the unfunded liability remains level as a percentage of total payroll. New entrant pay is assumed to increase 3.00% per year for each new group of new entrants incorporated into the open group projection. The contribution made by employers to ERB on behalf of employees who elected to participate in the Alternative Retirement Plan is also used to eliminate 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: 7.00% per year, net of investment-related expenses (composed of an assumed 2.30% inflation rate and a 4.70% real rate of return)

2. Salary increase rate: Inflation rate of 2.30% plus productivity increase rate of 0.70% plus step-rate/promotional as shown

Years of Service	Annual Step-Rate/Promotional Component Rates of Increase	Total Annual Rate of Increase
0	7.00%	10.00%
1	3.50%	6.50%
2	2.75%	5.75%
3	2.25%	5.25%
4	1.75%	4.75%
5	1.50%	4.50%
6	1.25%	4.25%
7	1.00%	4.00%
8	0.75%	3.75%
9	0.50%	3.50%
10-14	0.25%	3.25%
15 or more	0.00%	3.00%

3. Cost-of-living increases: 1.80% 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 (67 for Tier 3 and Tier 4), whichever is later or, for disabled retirees, until July 1 of the third year following retirement.

4. Payroll growth: 2.60% per year (with no allowance for membership growth)

5. Contribution accumulation: The accumulated member account balance with interest is estimated at the valuation date by assuming that member contributions increased 5.50% per year for all years prior to the valuation date. Contributions are credited 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 – 2020 GRS Southwest Region Teacher Mortality Table, set back one year and scaled at 95%. Generational mortality improvements in accordance with the Ultimate MP scales are projected from the year 2020.

   b. Healthy females – 2020 GRS Southwest Region Teacher Mortality Table, set back one year. Generational mortality improvements in accordance with the Ultimate MP scales are projected from the year 2020.

   c. Disabled males – 2020 GRS Southwest Region Teacher Mortality Table, set forward three years with minimum rates at all ages of 4.0%. Generational mortality improvements in accordance with the Ultimate MP scales are projected from the year 2020.

   d. Disabled females – 2020 GRS Southwest Region Teacher Mortality Table, set forward three years with minimum rates at all ages of 2.0%. Generational mortality improvements in accordance with the Ultimate MP scales are projected from the year 2020.

2. Mortality rates of active members – Pub-2010 Teachers Active Employee Mortality table. Generational mortality improvements in accordance with the Ultimate MP scales are projected from the year 2010.

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)

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

	Males - Years of Service						
Age	0-4	5-9	10-14	15-19	20-24	25	26+
45	0	0	0	0	0	25	15
50	0	0	0	0	0	25	18
55	0	0	0	0	5	20	18
60	0	0	0	15	20	25	25
62	0	0	30	30	30	25	25
65	0	40	35	30	30	25	25
67	0	25	25	25	30	25	25
70	100	100	100	100	100	100	100

	Females - Years of Service						
Age	0-4	5-9	10-14	15-19	20-24	25	26+
45	0	0	0	0	0	25	15
50	0	0	0	0	0	25	18
55	0	0	0	0	6	25	23
60	0	0	0	20	15	25	25
62	0	0	40	30	30	30	30
65	0	35	40	40	40	40	40
67	0	25	25	25	30	30	30
70	100	100	100	100	100	100	100

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

	Years of Service					
	Males			Females		
Age	15-19	20-24	25-29	15-19	20-24	25-29
55			5			6
60		20	20	0	15	15
62	30	30	30	30	30	30
65	30	30	30	40	40	40

5. Termination (for causes other than death, disability or retirement):

Completed Service	Terminations per 100 Members	
	Males	Females
0	30.0	24.0
1	24.0	20.0
2	19.0	16.5
3	14.0	13.5
4	11.5	11.5
5	10.0	10.0
6	9.0	9.0
7	7.5	7.5
8	6.5	7.0
9	6.0	6.0
10	5.3	5.5
11	4.6	4.7
12	4.1	4.2
13	3.4	3.6
14	3.1	3.2
15	2.8	2.8
16	2.5	2.5
17	2.2	2.2
18	1.9	1.9
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-related expenses. Administrative Expenses are assumed to be 0.35% of valuation payroll per year.

6. Percent married: For valuation purposes 100% of members are assumed to be married.

V. Valuation 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.

SECTION E

SUMMARY OF DATA AND EXPERIENCE

Non-Disabled Post-Retirement Mortality – Male

Benefit-Weighted

Eight-Year Period Ending June 30, 2019

	Counts		Annuities		Crude	Sample Rates*		Expected Deaths**		A/E Ratio	
Age	Deaths	Exposure	Deaths	Exposure	Rates	Old	New	Old	New	Old	New
40-44	-	13	$ -	$ 0.1	0.0000	0.0010	0.0007	$ 0.0	$ 0.0	0%	0%
45-49	-	279	-	5.4	0.0000	0.0015	0.0011	0.0	0.0	0%	0%
50-54	7	1,956	0.2	47.6	0.0034	0.0024	0.0018	0.1	0.1	134%	162%
55-59	41	6,499	0.8	166.7	0.0049	0.0039	0.0034	0.7	0.6	124%	140%
60-64	116	15,351	2.4	384.0	0.0064	0.0063	0.0050	2.6	2.0	95%	120%
65-69	225	24,362	4.2	552.6	0.0075	0.0114	0.0090	6.3	5.0	66%	83%
70-74	376	20,634	7.0	466.5	0.0149	0.0187	0.0161	8.8	7.5	79%	92%
75-79	478	14,627	9.6	331.4	0.0289	0.0338	0.0294	11.1	9.6	87%	99%
80-84	563	10,020	11.3	223.1	0.0506	0.0588	0.0525	13.1	11.7	86%	97%
85-89	569	5,673	12.0	122.5	0.0980	0.1054	0.0956	12.5	11.4	96%	106%
90-94	377	2,307	7.2	44.7	0.1614	0.1835	0.1709	7.8	7.2	92%	99%
95-99	124	458	2.1	7.6	0.2760	0.2824	0.3108	2.0	2.1	106%	99%
100-104	13	31	0.2	0.4	0.4063	0.3600	0.4856	0.1	0.2	120%	88%
105-109	-	-	-	-	N\A	0.4000	0.4885	-	-	0%	0%
Other	-	-	-	-	N\A			-	-	0%	0%
Totals	2,889	102,210	$ 56.9	$ 2,352.6	0.0242	0.0276	0.0245	$ 65.0	$ 57.6	87%	99%

Non-Disabled Post-Retirement Mortality – Female

Benefit-Weighted

Eight-Year Period Ending June 30, 2019

	Counts		Annuities		Crude	Sample Rates*		Expected Deaths**		A/E Ratio	
Age	Deaths	Exposure	Deaths	Exposure	Rates	Old	New	Old	New	Old	New
40-44	-	10	$ -	$ 0.1	0.0000	0.0017	0.0004	$ 0.0	$ 0.0	0%	0%
45-49	1	432	0.0	8.8	0.0037	0.0023	0.0008	0.0	0.0	150%	427%
50-54	5	3,716	0.1	92.3	0.0006	0.0028	0.0012	0.3	0.1	23%	46%
55-59	51	14,577	1.1	356.7	0.0031	0.0030	0.0021	1.1	0.8	99%	139%
60-64	164	36,648	3.3	820.7	0.0040	0.0041	0.0030	3.4	2.6	95%	125%
65-69	327	52,232	5.8	1,008.7	0.0058	0.0063	0.0057	6.4	5.8	91%	101%
70-74	391	39,512	6.3	688.5	0.0091	0.0102	0.0107	7.0	7.3	89%	86%
75-79	541	26,117	8.0	410.0	0.0194	0.0196	0.0205	7.9	8.3	100%	96%
80-84	649	17,037	9.9	252.9	0.0391	0.0391	0.0385	9.8	9.7	100%	102%
85-89	785	10,060	10.3	140.0	0.0737	0.0781	0.0738	10.6	10.1	97%	102%
90-94	631	4,484	7.9	55.7	0.1415	0.1453	0.1388	7.8	7.5	101%	106%
95-99	352	1,391	4.1	16.4	0.2495	0.2595	0.2654	4.0	4.1	102%	101%
100-104	69	208	0.8	2.4	0.3519	0.4285	0.5005	0.9	1.0	89%	79%
105-109	4	10	0.0	0.1	0.3296	0.5000	0.5142	0.0	0.0	66%	64%
Other	-	-	-	-	N\A			-	-	0%	0%
Totals	3,970	206,434	$ 57.6	$ 3,853.4	0.0149	0.0154	0.0149	$ 59.4	$ 57.4	97%	100%

Termination Experience – Male

Liability-Weighted

Six-Year Period Ending June 30, 2019

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	1	15	0.0497	0.4340	0.3000	7	5	11%	17%
1	14	112	0.1242	0.2810	0.2400	32	27	44%	52%
2	21	116	0.1842	0.1960	0.1900	23	22	93%	97%
3	24	162	0.1487	0.1430	0.1400	23	23	105%	106%
4	24	218	0.1106	0.1190	0.1150	26	25	93%	96%
5	29	269	0.1082	0.1000	0.1000	27	27	108%	108%
6	26	292	0.0896	0.0910	0.0900	27	26	97%	100%
7	24	318	0.0744	0.0730	0.0750	23	24	103%	99%
8	23	351	0.0666	0.0610	0.0650	21	23	111%	102%
9	23	378	0.0601	0.0570	0.0600	22	23	103%	100%
10	21	387	0.0534	0.0520	0.0530	20	21	104%	101%
11	20	417	0.0485	0.0420	0.0460	18	19	112%	105%
12	18	434	0.0420	0.0400	0.0410	17	18	107%	103%
13	15	451	0.0335	0.0340	0.0340	15	15	101%	99%
14	15	465	0.0320	0.0340	0.0310	16	14	93%	103%
15	13	478	0.0271	0.0310	0.0280	15	13	86%	97%
16	12	485	0.0248	0.0220	0.0250	11	12	109%	99%
17	7	481	0.0150	0.0230	0.0220	11	11	65%	68%
18	8	493	0.0154	0.0230	0.0190	11	9	69%	81%
Totals	338	6,323				365	356	93%	95%

Termination Experience – Female

Liability-Weighted

Six-Year Period Ending June 30, 2019

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	1	19	0.0449	0.3140	0.2400	6	4	14%	19%
1	22	177	0.1232	0.2380	0.2000	42	35	52%	62%
2	28	172	0.1648	0.1720	0.1650	30	28	95%	100%
3	32	231	0.1392	0.1350	0.1350	31	31	104%	103%
4	34	290	0.1165	0.1060	0.1150	31	33	109%	101%
5	39	346	0.1122	0.0980	0.1000	34	35	114%	112%
6	38	423	0.0897	0.0860	0.0900	36	38	105%	100%
7	40	521	0.0762	0.0720	0.0750	37	39	107%	102%
8	48	649	0.0737	0.0630	0.0700	41	45	117%	105%
9	49	766	0.0637	0.0550	0.0600	42	46	116%	106%
10	48	866	0.0554	0.0500	0.0550	43	48	112%	101%
11	45	963	0.0466	0.0470	0.0470	45	45	100%	99%
12	45	1,041	0.0431	0.0420	0.0420	44	44	102%	103%
13	41	1,103	0.0374	0.0360	0.0360	40	40	103%	104%
14	34	1,174	0.0290	0.0350	0.0320	41	38	83%	91%
15	34	1,235	0.0278	0.0330	0.0280	41	35	84%	99%
16	29	1,278	0.0223	0.0230	0.0250	29	32	98%	89%
17	25	1,295	0.0191	0.0270	0.0220	35	29	71%	87%
18	23	1,283	0.0179	0.0210	0.0190	27	24	85%	94%
Totals	654	13,833				675	669	97%	98%

Salary Experience

Eight-Year Period Ending June 30, 2019

	Current Salary Scales		Actual Experience (8 Years)			Proposed Salary Scale	
Service	Total	Step Rate/ Promotional	Total	Above inflation	Steprate/ Promotional	Total	Steprate/ Promotional
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	6.25%	3.00%	6.74%	5.15%	4.48%	6.50%	3.50%
2	5.25%	2.00%	6.94%	5.35%	4.68%	5.75%	2.75%
3	4.75%	1.50%	5.56%	3.97%	3.30%	5.25%	2.25%
4	4.50%	1.25%	4.67%	3.08%	2.41%	4.75%	1.75%
5	4.25%	1.00%	4.38%	2.79%	2.12%	4.50%	1.50%
6	4.00%	0.75%	4.26%	2.67%	2.00%	4.25%	1.25%
7	3.75%	0.50%	4.03%	2.43%	1.76%	4.00%	1.00%
8	3.75%	0.50%	3.30%	1.71%	1.04%	3.75%	0.75%
9	3.75%	0.50%	3.23%	1.64%	0.97%	3.50%	0.50%
10	3.25%	0.00%	2.95%	1.36%	0.69%	3.25%	0.25%
11	3.25%	0.00%	3.05%	1.46%	0.79%	3.25%	0.25%
12	3.25%	0.00%	2.86%	1.26%	0.59%	3.25%	0.25%
13	3.25%	0.00%	2.72%	1.12%	0.45%	3.25%	0.25%
14	3.25%	0.00%	2.62%	1.03%	0.36%	3.25%	0.25%
15+	3.25%	0.00%	2.26%	0.67%	0.00%	3.00%	0.00%