
Government of Guam Retirement Fund

Actuarial Experience Study
October 1, 2015 to September 30, 2020

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**Government of Guam Retirement Fund –
Actuarial Experience Study – October 1, 2015 to September 30, 2020**

As part of our engagement with the Board of Trustees, we have performed an actuarial experience study for the Government of Guam Retirement Fund for the period from October 1, 2015 to September 30, 2020. The purpose of this study is to review the actuarial assumptions used in the preparation of the actuarial valuation, and to provide the Fund with recommendations for revisions where appropriate.

In preparing this report, we relied, without audit, on information supplied by the Government of Guam Retirement Fund's staff. This information includes, but is not limited to, financial information, member census data, and plan provisions. We found this information to be reasonably consistent and comparable with information used for other purposes. The results of the study depend on the integrity of this information. If any of this information is inaccurate or incomplete the results may be different and the calculations may need to be revised.

All costs, liabilities, rates of interest, and other factors for the Plan are to be determined on the basis of actuarial assumptions and methods which are individually reasonable (taking into account the experience of the Plan and reasonable expectations); and which, in combination, offer our best estimate of anticipated experience affecting the Fund. Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. Due to the limited scope of our assignment, we did not perform an analysis of the potential range of future measurements. The Trustees have the final decision regarding the appropriateness of the assumptions.

The calculations in the enclosed report have been made on a basis consistent with our understanding of the Government of Guam Retirement Fund's funding requirements and goals. Determinations for other purposes may be significantly different from the results contained in this report. Accordingly, additional determinations may be needed for other purposes. The results were developed using models that use standard actuarial techniques. We have reviewed the models, including their inputs, calculations, and outputs for consistency, reasonableness, and appropriateness to the intended purpose and in the compliance with generally accepted actuarial practice and relevant actuarial standards of practice (ASOP).

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- (b) GGRF may provide a copy of Milliman's work, in its entirety, to other governmental entities, as required by law.

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The consultants who worked on this assignment are pension actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel.

The signing actuaries are independent of the plan sponsor. We are not aware of any relationship that would impair the objectivity of our work.


On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the principles prescribed by the Actuarial Standards Board and the *Code of Professional Conduct and Qualification Standards for Actuaries Issuing Statements of Actuarial Opinion in the United States*, published by the American Academy of Actuaries. We are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Sincerely,



Richard A. Wright, FSA, MAAA
Principal, Consulting Actuary

Sincerely,



Kevin Poenisch, FSA, MAAA
Actuary

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INTRODUCTION

Milliman, Inc. has been retained by the Government of Guam Retirement Fund to provide an actuarial experience study of the retirement fund for the period October 1, 2015 through September 30, 2020. The purpose of the study is to:

- Compare the actual experience of the Fund during the study period with the experience predicted by the actuarial assumptions.
- Review the current set of actuarial assumptions and methods and propose changes where appropriate. In this report, we estimated the impact on the actuarial valuation as of September 30, 2021, if the assumption and method changes are adopted for that valuation. The estimates are based upon the results of the actuarial valuation as of September 30, 2020, projected forward to September 30, 2021. The actual impact will depend upon the census data and audited plan assets as of September 30, 2021.

An actuarial valuation of the fund is performed annually to determine the present value of future benefits and the required employer contribution rate for the following fiscal year. The valuation makes certain assumptions regarding future events. These include economic assumptions such as investment return and member salary increases, and demographic assumptions such as life expectancy and rates of retirement.

KEY FINDINGS

- The current amortization period requiring 100% funding by May 1, 2033, results in a large drop in the employer contribution rate at that time and may result in substantial contribution rate volatility in the years leading up to 2033. We recommend the Fund propose legislation to change the amortization period to multiple layers of bases, which will provide more stability to the employer contribution rate and phase-in the projected employer contribution rate decrease as the plan approaches full funding. Exhibit 15 provides more details, and shows the impact of a 5, 7 or 10 year phase down period for the employer contribution rate.
- The Fund's expectations regarding long term investment returns have decreased since the last experience study. This is due to recent increases in equity markets and historically low interest rates. We propose to lower the investment return assumption from 7.00% to 6.70%. Exhibit 1 provides more details.
- Salary increases have been lower than expected during the study period. We propose to lower assumed salary increases. Exhibit 2 provides more details.
- Payroll growth has been lower than expected during the 5 years ending September 30, 2020, and also lower than expected over the last 20 years. We propose to lower the assumed payroll growth assumption. Exhibit 3 provides more details.
- We propose to remove the separate additional load for DB 1.75 administrative expenses, since the administration of the DB 1.75 plan is now fully reflected in budgeted expenses. Exhibit 4 provides more details.

- Mortality rates for healthy retirees have been lower than expected during the study period. We propose to update the mortality to the Society of Actuaries latest mortality tables for public pension systems: PUB-2010 tables, using 130% of the rates prior to age 80, along with various age set forwards. Exhibits 5 and 7 provide more details.
- We propose to increase the rate of future mortality improvement to 50% of the Society of Actuaries mortality improvement scale MP-2020. Exhibit 6 provides more details.
- Disability incidence during the study period has been lower than expected. We propose to lower the disability assumption for both males and females. Exhibit 8 provides more details.
- The number of withdrawals from active service prior to retirement were less than expected. We propose to decrease the assumed rates of withdrawal. Exhibit 9 provides more details.
- The number of retirements during the experience period were less than expected. We propose to reduce the assumed retirement rates when first eligible for unreduced retirement from 50% of those eligible to 40% of those eligible. Exhibit 10 has more details.
- Earnings increases due to the conversion of Sick and Annual Leave balances have been lower than expected. We propose to lower the assumed earnings increase. Exhibit 14 has more details.

The table below estimates the effect of these proposed assumption and method changes if they are adopted for the actuarial valuation as of September 30, 2021. The estimates are based upon the actuarial valuation as of September 30, 2020, projected forward to September 30, 2021 using the following assumptions:

- Investment return of 18.5% for the fiscal year ending September 30, 2021
- Payroll growth of 2.75% for the fiscal year ending September 30, 2021

The actual impact of the assumption and method changes will depend upon the census data, total payroll and audited plan assets for the fiscal year ending September 30, 2021, and may differ from the results shown in the table below.

	Actuarial Valuation Results as of 9/30/2020 projected to 9/30/2021		
	Actuarial Accrued Liability <i>(in millions)</i>	Employer Contribution Rate	Estimated Employer Contribution <i>(in millions)</i>
Actuarial valuation as of September 30, 2020	\$ 3,228.1	28.32%	\$ 151.15
Security Ratio	63.62%		
Estimated results projected to September 30, 2021	\$ 3,228.4	28.07%	\$ 153.96
Security Ratio	65.52%		
1. Lower investment return assumption	87.5	1.79%	9.81
2. Decrease member salary increase assumption	(24.5)	(1.51%)	(8.29)
3. Lower payroll growth assumption	0.0	0.28%	1.51
4. Remove load for DB 1.75 administrative expenses	0.0	(0.16%)	(0.87)
5,7. Update mortality table	41.0	0.89%	4.89
6. Update projection scale	14.2	0.31%	1.68
8. Decrease rates of disability incidence	(0.6)	(0.06%)	(0.32)
9. Decrease rates of active withdrawal	(10.2)	0.30%	1.65
10. Decrease rates of retirement	(17.1)	(0.44%)	(2.40)
14. Decrease adjustment for Sick and Annual Leave	<u>(6.2)</u>	<u>(0.15%)</u>	<u>(0.82)</u>
Total assumption changes	84.1	1.25%	6.84
15. Change in amortization period			
a. 5 year phase-down (10/1/31 - 9/30/36) ¹	0.0	(0.75%)	(4.11)
b. 7 year phase-down (10/1/30 - 9/30/37) ¹	0.0	(0.44%)	(2.41)
c. 10 year phase-down (10/1/29 - 9/30/39) ¹	0.0	(0.70%)	(3.81)
With Proposed Actuarial Assumptions and Methods			
a. 5 year phase-down (10/1/31 - 9/30/36) ¹	\$ 3,312.5	28.57%	\$ 156.69
b. 7 year phase-down (10/1/30 - 9/30/37) ¹	\$ 3,312.5	28.88%	\$ 158.39
c. 10 year phase-down (10/1/29 - 9/30/39) ¹	\$ 3,312.5	28.62%	\$ 156.99
Security Ratio with Proposed Assumptions and Methods	63.85%		

¹ The years shown are the fiscal years during which the employer contribution rates would be phased down.

EXHIBIT 1. INVESTMENT RETURN

Current Assumption:	7.00% (effective 2003)
2011-2015 Study:	No change
Current Expected Average Return:	6.68%
Proposed Assumption:	6.70%

Actuarial Standard of Practice No. 27 (ASOP 27), which was adopted by the Actuarial Standards Board in December 1996, provides guidance for selecting pension plan economic assumptions. We have calculated an expected average investment return in accordance with the guidance provided by this standard.

The Fund's expected 30-year returns on various asset classes, as determined by GGRF's investment consultant, are shown below. The target asset allocation is the expected long-term asset allocation based on the Fund's current investment policy. The total expected return calculated by GGRF's investment consultant includes 0.50% of expected alpha from investment manager performance.

Asset Class	Target Asset Allocation	Expected Return
U.S. Equities	30.0%	6.53%
Non-U.S. Equities	20.0	7.18
Core Fixed Income	24.0	3.30
Risk Parity	8.0	6.93
High Yield Bonds	8.0	5.38
Global Real Estate (REITs)	2.5	6.40
Global Minimum Volatility	7.5	6.90
Total Expected Return		6.68%

ASOP 27 section 3.8.3.d. states that "The actuary should not assume that superior or inferior returns will be achieved, net of investment expenses, from an active investment management strategy compared to a passive investment management strategy unless the actuary believes, based on relevant supporting data, that such superior or inferior returns represent a reasonable expectation over the measurement period." We were not provided enough relevant supporting data to ascertain whether such superior returns represent a reasonable expectation. Therefore we are relying on the 0.50% alpha assumption provided by the investment manager.

Ranges of Returns

The actual return of the portfolio will, of course, vary each year. In any given year, the difference between actual and expected results may be large. However, over longer time horizons, the accumulated returns should approach the expected long-term returns. We have developed the

SECTION II. ECONOMIC ASSUMPTIONS

following ranges of returns for different time horizons using Milliman’s ASOP 27 model. The ranges of returns shown below include the 0.50% adjustment for expected alpha.

	Time Horizon (years)					
	1	5	10	20	30	50
25 th Percentile	-0.98%	3.19%	4.21%	4.93%	5.25%	5.58%
50 th Percentile	6.70%	6.70%	6.70%	6.70%	6.70%	6.70%
75 th Percentile	14.97%	10.32%	9.24%	8.49%	8.16%	7.83%

The 25th percentile indicates the rate at which there is a 25% probability that the investment return of the portfolio will be less than that rate over the time period. Conversely, the 75th percentile indicates the rate at which there is a 25% probability that the investment return of the portfolio over that time period will exceed that rate.

Recommendation

Based upon the 30-year expected return of 6.68%, we recommend decreasing the investment return assumption from 7.00% to 6.70%. This recommendation is based on the capital market model produced by GGRF's investment consultant and their assumption that superior management can produce 0.50% alpha.

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SECTION II. ECONOMIC ASSUMPTIONS

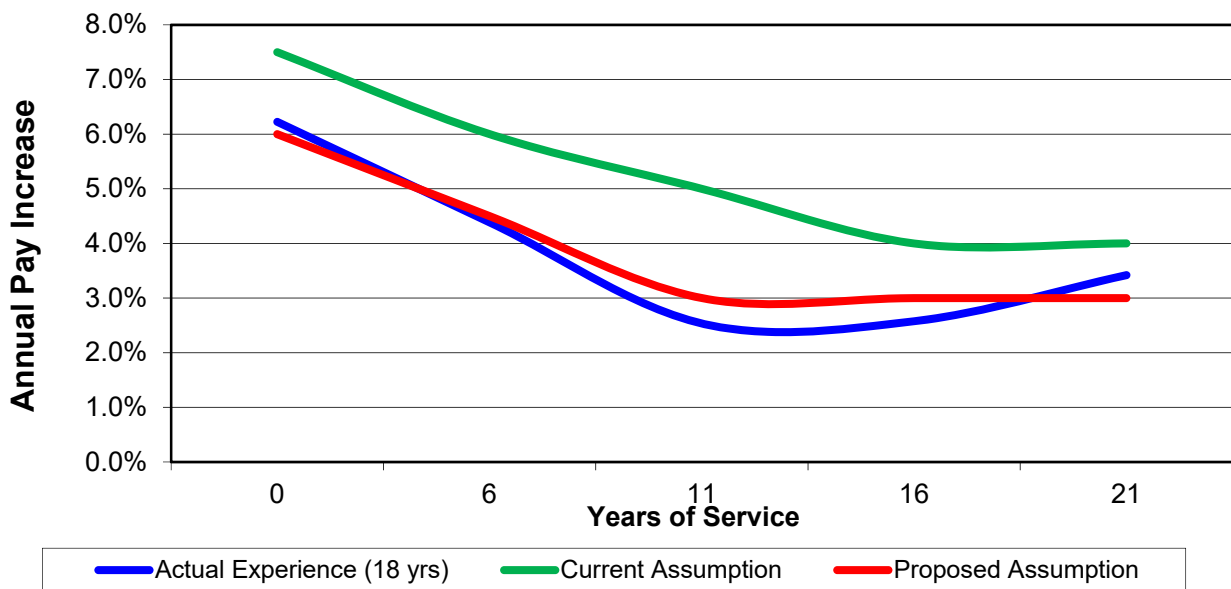
EXHIBIT 2. MEMBER SALARY INCREASES

Current Assumption:	Ranges from 7.5% for employees with between 0 and 5 years of service, to 4.0% for members with over 20 years of service (effective 2016)
2011-2015 Study:	Adopted current assumption.
Proposed Assumption:	Ranges from 6.0% for employees with between 0 and 5 years of service, to 3.0% for members with over 20 years of service

Salaries of retirement fund members are assumed to increase each year by a percentage that depends on the member’s years of service with the Government of Guam. The following table summarizes the average annual salary increases for various service groups.

Years of Service	Active Count as of 9/30/20	Current Assumption	Proposed Assumption	Average Annual Increases			
				2015-2020	2011-2020	2007-2020	2002-2020
0 to 5	467	7.5%	6.0%	1.5%	4.8%	5.1%	6.2%
6 to 10	829	6.0%	4.5%	1.3%	3.2%	3.7%	4.4%
11 to 15	614	5.0%	3.0%	0.6%	0.7%	1.8%	2.5%
16 to 20	487	4.0%	3.0%	1.4%	0.9%	2.0%	2.6%
Over 20	2,043	4.0%	3.0%	1.7%	2.3%	2.9%	3.4%
Average for 30-year career		5.1%	3.8%	1.3%	2.4%	3.1%	3.8%

Salary Scale by Years of Service



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Recommendation

Over the 5-year study period from 10/1/15 to 9/30/20, the average annual salary increases were lower than the current assumption and produce an average salary increase for a 30-year career of 1.3%.

Over the last 18 years, the average annual salary increases were lower than the current assumption and produce an average salary increase for a 30-year career of 3.8%.

We recommend changing the member salary increase assumption to the rates shown in the table on the previous page. The proposed assumptions will produce an average salary increase for a 30-year career of 3.8%

SECTION II. ECONOMIC ASSUMPTIONS

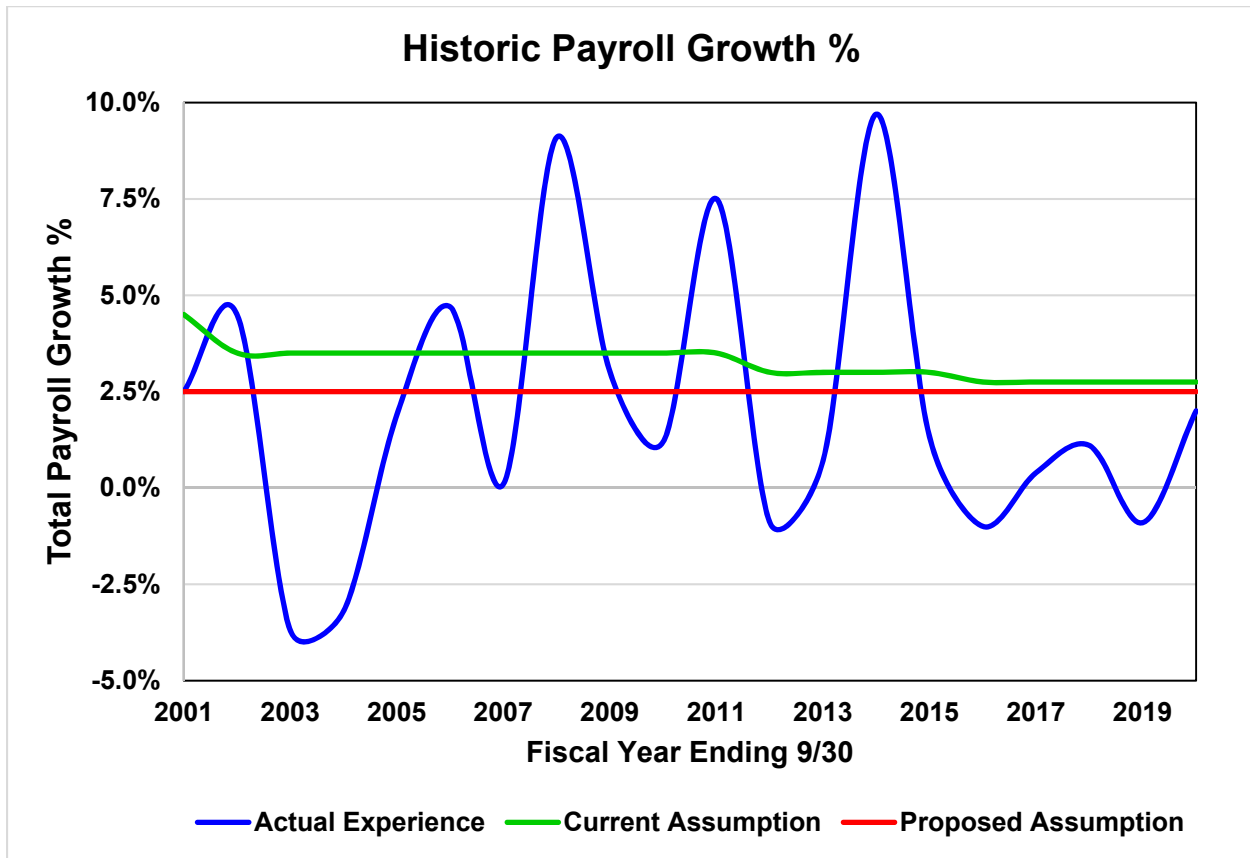
EXHIBIT 3. PAYROLL GROWTH

Current Assumption:	2.75% per year (effective 2016)
2011-2015 Study:	Lowered assumption from 3.00% to 2.75%
Proposed Assumption:	2.50% per year

Payroll growth for the past 20 fiscal years is summarized below.

Fiscal Year Ending 9/30	Total Government Covered Payroll ¹	Percentage Increase ¹
2020	\$519,500,410	2.0%
2019	509,497,662	-0.9%
2018	513,866,473	1.1%
2017	508,300,483	0.4%
2016	506,322,283	-1.0%
2015	511,366,411	1.3%
2014	504,943,471	9.7%
2013	460,347,780	0.7%
2012	456,985,288	-0.9%
2011	461,210,949	7.5%
2010	429,044,092	1.2%
2009	423,774,000	3.0%
2008	411,383,039	9.1%
2007	377,049,000	0.1%
2006	376,604,000	4.7%
2005	359,850,000	1.9%
2004	353,229,000	-3.2%
2003	364,936,000	-3.7%
2002	378,916,000	4.5%
2001	362,599,000	2.5%
Annual Average for Last 5 Years		0.3%
Annual Average for Last 10 Years		1.9%
Annual Average for Last 15 Years		2.5%
Annual Average for Last 20 Years		1.9%

¹ Information for the years from 2000 to 2001 was derived from the 1997-2001 experience study.



Recommendation

The current payroll growth assumption of 2.75% has been in effect since the fiscal year ending 9/30/16. From fiscal year ending 9/30/02 to fiscal year ending 9/30/11 the assumption was 3.50% and for fiscal year ending 9/30/12 to fiscal year ending 9/30/15 the assumption was 3.00%. The current assumption is based upon assumed inflation of 2.50%, wage productivity growth of 0.25%, and personnel growth of 0.00%.

Payroll growth averaged over the last 5, 10, 15 and 20 years is below the current assumption. We recommend lowering the current assumption to 2.50%, to reflect a revised inflation assumption of 2.25%, wage productivity growth of 0.25%, and personnel growth of 0.00%.

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SECTION II. ECONOMIC ASSUMPTIONS

EXHIBIT 4. ADMINISTRATIVE EXPENSES

Current Assumption:	Budgeted expenses plus 5% of DB 1.75 Normal Cost
2011-2015 Study:	No change to assumption of budgeted expenses
Proposed Assumption:	Budgeted expenses

Administrative expenses are a component of the required employer contribution.

Beginning with the fiscal year ending 9/30/17, the administrative expense assumption was updated from budgeted expenses to budgeted expenses plus 5% of DB 1.75 Normal Cost to account for the increased administration for the DB 1.75 Plan.

The following table shows assumed administrative expenses over the past 10 years.

Fiscal Year Ending 9/30	Assumed Administrative Expenses				
	Budgeted Defined Benefit	5% of DB 1.75 NC	Budgeted Defined Contribution	Total	As % of Expected Payroll
2020	\$ 4,507,300	\$ 872,193	\$ 1,391,700	\$ 6,771,193	1.29%
2019	4,582,900	900,750	1,964,100	7,447,750	1.42%
2018	4,733,400	918,998	2,126,600	7,778,998	1.49%
2017	4,957,000	891,203	2,125,000	7,973,203	1.53%
2016	4,457,000		1,887,000	6,344,000	1.22%
2015	4,361,000		1,717,000	6,078,000	1.21%
2014	4,146,000		1,660,000	5,806,000	1.22%
2013	4,008,000		1,479,000	5,487,000	1.17%
2012	5,228,000		1,435,000	6,663,000	1.40%
2011	5,226,000		1,412,000	6,638,000	1.49%

The following table shows actual administrative expenses over the past 10 years.

Fiscal Year Ending 9/30	Actual Administrative Expenses			
	Defined Benefit	Defined Contribution	Total	As % of Actual Payroll
2020	\$ 3,283,436	\$ 1,765,301	\$ 5,048,737	0.97%
2019	3,755,801	1,637,586	5,393,387	1.06%
2018	3,794,742	2,076,658	5,871,400	1.14%
2017	3,817,771	2,068,107	5,885,878	1.16%
2016	2,896,563	2,107,552	5,004,115	0.99%
2015	3,058,912	2,076,034	5,134,946	1.00%
2014	2,678,396	1,950,681	4,629,077	0.92%
2013	2,685,830	1,577,819	4,263,649	0.93%
2012	2,807,624	1,707,794	4,515,418	0.99%
2011	3,047,424	1,596,283	4,643,707	1.01%

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Recommendation

For fiscal years ending 9/30/11 through 9/30/20, assumed administrative expenses have been between 1.17% and 1.53% of the expected defined benefit and defined contribution payroll. Over the same period, actual administrative expenses have ranged from 0.92% to 1.16% of actual payroll. Because the administrative costs of the DB 1.75 Plan are included in the budgeted expenses, we recommend a return to the use of budgeted expenses in the actuarial valuation, with no additional load for expected DB 1.75 administrative costs.

SECTION III. DEMOGRAPHIC ASSUMPTIONS

EXHIBIT 5. HEALTHY ANNUITANT MORTALITY

Current Assumption:	RP-2000 mortality table (Males +3, Females +2) projected generationally from 2016 using 30% of mortality improvement scale BB (effective 2016)
2011-2015 Study:	Adopted the current assumption.
Proposed Assumption:	For healthy retirees, PUB-2010 General Healthy Retiree Amount-Weighted mortality table (Males +4, Females +2), using 130% of the rates before age 80 and projected generationally from 2010 using 50% of mortality improvement scale MP-2020 For healthy beneficiaries, PUB-2010 General Contingent Survivors Amount-Weighted mortality table (Males +3, Females +4), using 130% of the rates before age 80 and projected generationally from 2010 using 50% of mortality improvement scale MP-2020. Healthy retiree mortality is applied to spouses prior to retiree death.

The current mortality assumption for retired members and surviving spouses is the RP-2000 mortality combined healthy table set forward by 3 years for males and 2 year for females. With the set forward, the base mortality rate for a 65 year old male uses the age 68 rate from the specified table, and the base mortality rate for a 65 year old female uses the age 67 rate from the specified table.

The following table summarizes total mortality experience for non-disabled retired members and surviving spouses during the study period and compares it with expected mortality based on the current assumption. Mortality experience for active members was not included in the review, because withdrawal and mortality experience are combined for active members.

Current Assumption Deaths During 2015-2020	Retirees			Surviving Spouses		
	Male	Female	Total	Male	Female	Total
Actual Deaths	508	353	861	56	228	284
Expected Deaths	<u>544</u>	<u>454</u>	<u>998</u>	<u>63</u>	<u>197</u>	<u>260</u>
Actual/Expected Ratio	93%	78%	86%	89%	116%	109%

Recommendation

We recommend updating the mortality table to PUB-2010, a more recently published mortality table that is based on mortality experience specific to public-sector plans. A more recently published mortality table is expected to better estimate future mortality experience. Also, since retiree experience and surviving spouse experience are showing different patterns, we recommend using separate mortality tables intended specifically for retirees and survivors after retiree death.

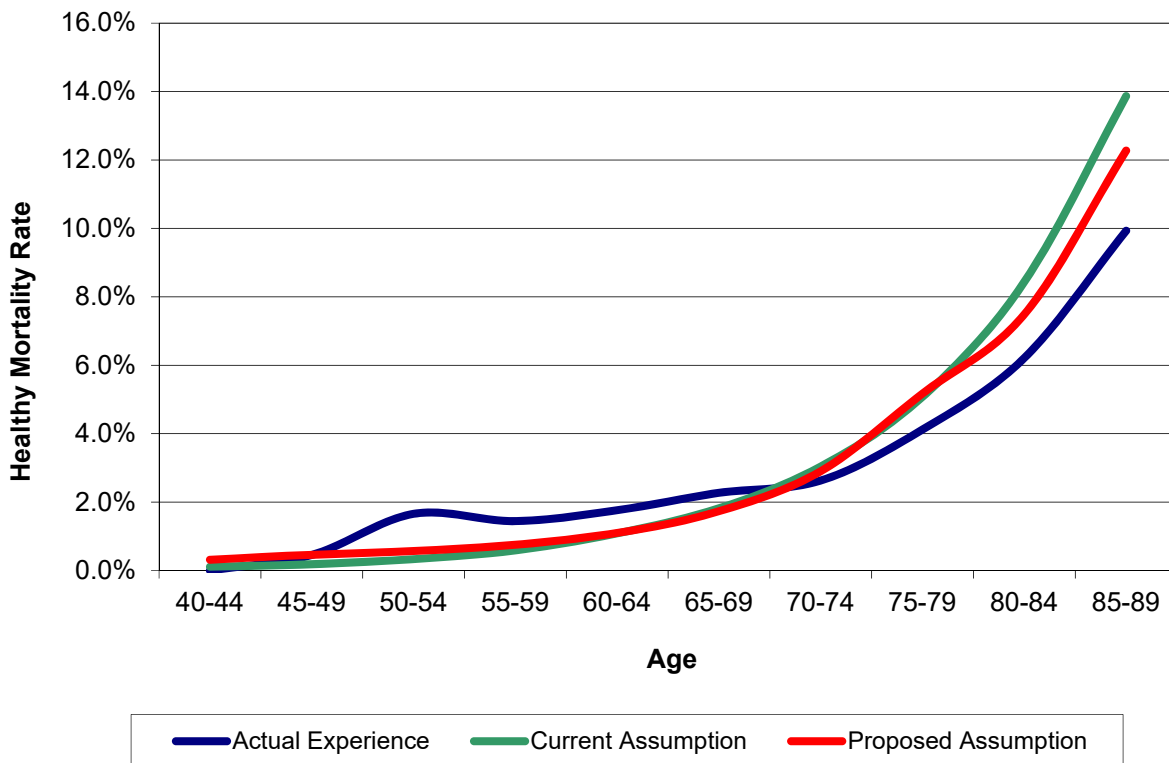
The mortality experienced by the fund over the 5 year study period is higher than the base rates in PUB-2010 table. Therefore, we recommend using a multiplier for both the retiree and beneficiary tables. Because the fund’s mortality experience is higher than the PUB-2010 table at younger ages and lower than the PUB-2010 table at higher ages, we recommend using a table multiplier of 130% for ages 79 and younger and 100% for ages 80 and older.

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SECTION III. DEMOGRAPHIC ASSUMPTIONS

To further customize the mortality table to reflect mortality experience, we recommend a set forward of healthy retirees of 4 years for males and 2 year for females, and for healthy beneficiaries, 3 years for males and 4 years for females. A comparison of actual experience with mortality expected under the proposed assumption is shown below.

Proposed Assumption Deaths During 2015-2020	Retirees			Surviving Spouses		
	Male	Female	Total	Male	Female	Total
Actual Deaths	508	353	861	56	228	284
Expected Deaths	<u>524</u>	<u>394</u>	<u>918</u>	<u>55</u>	<u>225</u>	<u>282</u>
Actual/Expected Ratio	97%	90%	94%	99%	101%	101%



The current and proposed mortality rates are shown in Appendix A – Table 1. The table below shows the life expectancy (Expected Death Age) for the current and proposed assumptions for healthy 65 year old retired males and females.

	Current Assumption	Proposed Retiree	Proposed Survivor
Male age 65 in 2021	80.8	81.1	80.8
Female age 65 in 2021	84.2	85.3	83.0

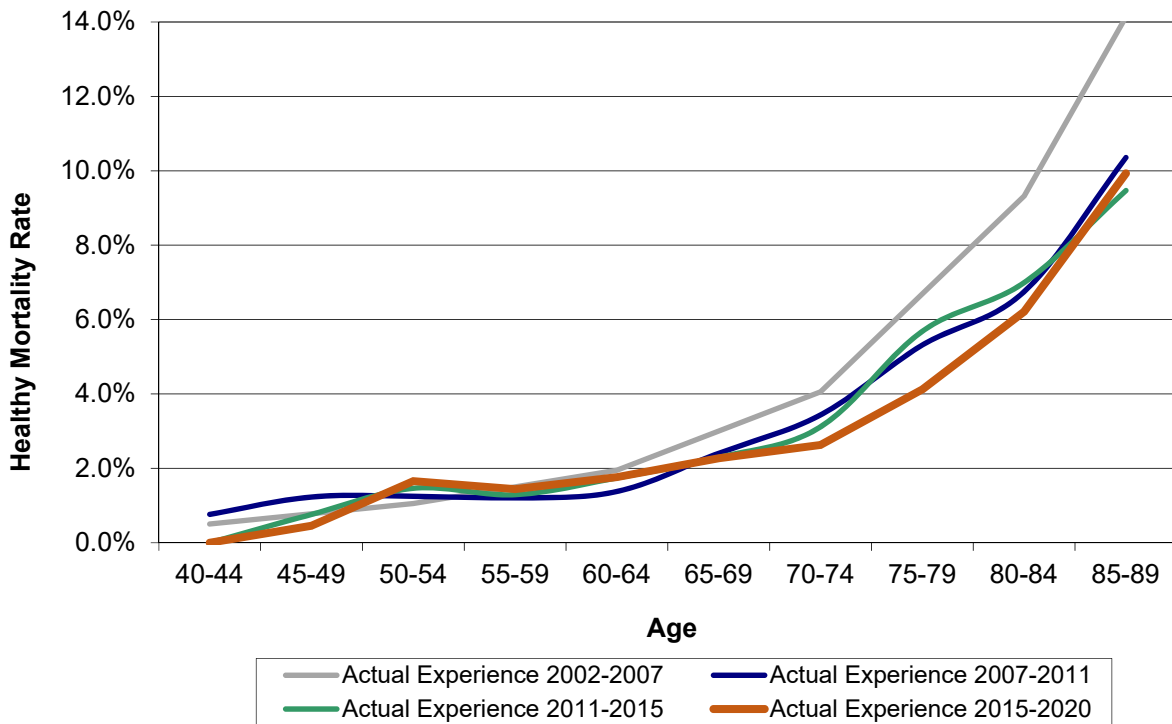
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SECTION III. DEMOGRAPHIC ASSUMPTIONS

EXHIBIT 6. MORTALITY PROJECTION SCALE

Current Assumption:	Project generationally from 2016 using 30% of mortality improvement scale BB (effective 2016)
2011-2015 Study:	Adopted the current assumption
Proposed Assumption:	Project generationally from 2010 using 50% of mortality improvement scale MP-2020 published by Society of Actuary in October, 2020

The graph below summarizes the Fund’s mortality experience for the current experience study as well as three preceding studies (2002-2007, 2007-2011, and 2011-2015)



Recommendation

A generational mortality projection means that the mortality rates vary both by the age of the individual and the year of birth of the individual. For example, a retiree who attains age 65 in 2040 is projected to live longer than a retiree who attains age 65 in 2020.

The most recent four experience studies have shown a general trend of mortality improvement. To account for possible future improvements in mortality, we recommend increasing the percentage of the mortality scale used from 30% to 50%. In addition, we recommend updating the mortality improvement scale to MP-2020, published by the Society of Actuaries in October, 2020

The table below shows the life expectancy (Expected Death Age) for the current and proposed assumptions for healthy 65 year old retired males and females and healthy 65 year old surviving beneficiaries.

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SECTION III. DEMOGRAPHIC ASSUMPTIONS

	Comparison of Life Expectancy (Expected Age at Death) for a 65 year old in 2021 and 2041			
	Healthy Retiree		Healthy Surviving Beneficiary	
	Male	Female	Male	Female
Age 65 in 2021				
Current Mortality, 30% Scale BB	80.8	84.2	80.8	84.2
Proposed Mortality, 50% Scale MP-2020	81.1	85.3	80.8	83.0
Change in life expectancy	+0.3	+1.1	0.0	-1.2
Age 65 in 2041				
Current Mortality, 30% Scale BB	81.5	84.6	81.5	84.6
Proposed Mortality, 50% Scale MP-2020	82.1	86.2	81.8	84.0
Change in life expectancy	+0.6	+1.6	+0.3	-0.6

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SECTION III. DEMOGRAPHIC ASSUMPTIONS

EXHIBIT 7. DISABLED RETIREE MORTALITY

Current Assumption:	RP-2000 Disability mortality table set forward by 6 years for males and 4 years for females. (effective 2016)
2011-2015 Study:	Adopted current assumption
Proposed Assumption:	PUB-2010 Disabled Retiree Amount Weighted mortality table set forward (Males +4, Females +2), using 130% of the rates before age 80 and projected generationally from 2010 using 50% of mortality improvement scale MP-2020

The current mortality assumption for disabled retired members is the RP-2000 Disability mortality table set forward by 6 years for males and 4 years for females.

The following summarizes the mortality experience for disabled retired members during the study period and compares it with expected mortality based on the current assumption.

Current Assumption Deaths During 2015 - 2020	Disabled Retirees		
	Male	Female	Total
Actual Deaths	42	46	88
Expected Deaths	<u>34</u>	<u>28</u>	<u>63</u>
Actual/Expected Ratio	123%	162%	141%

Recommendation

The actual mortality for disabled retirees has been higher than expected. We recommend revising the disabled retiree mortality assumption to 130% for ages 79 and younger and 100% for age 80s and older of PUB-2010 Disabled Retiree Amount Weighted mortality table set forward 4 years for males and 2 years for females.

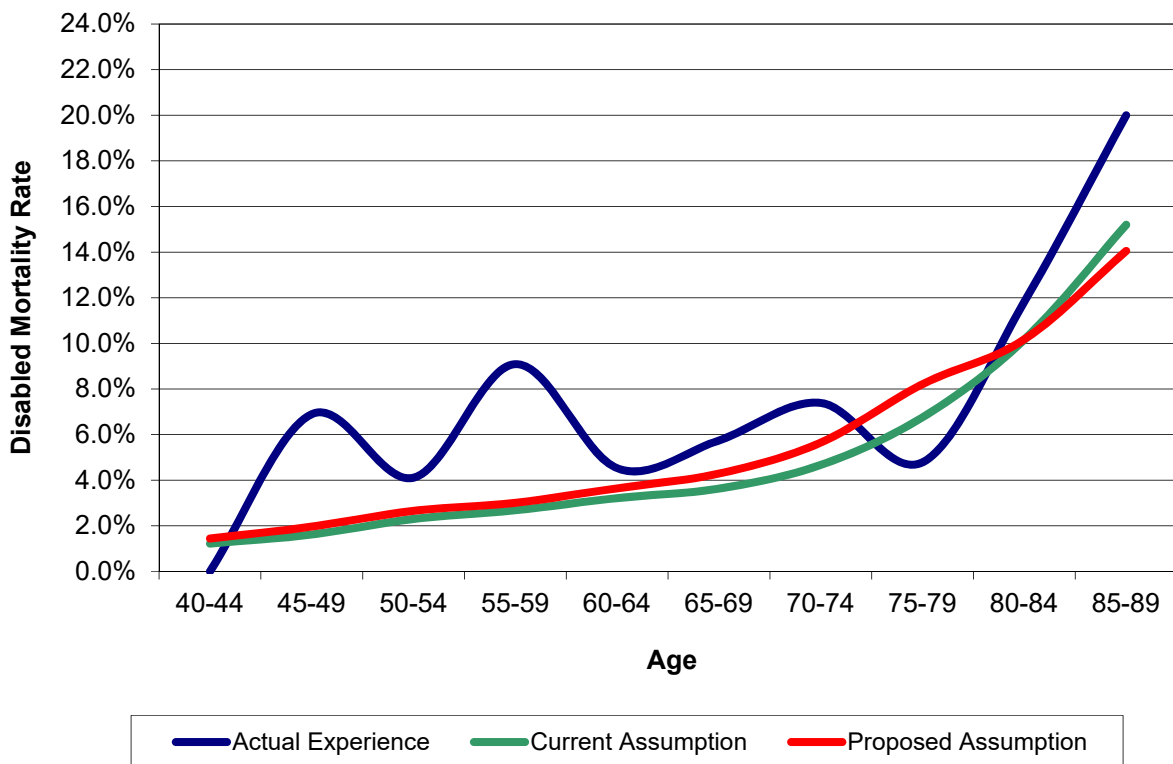
The Fund's population of disabled retirees is not sufficiently large to review experience with regard to disabled mortality improvement. We recommend applying the same generational mortality projection as for the healthy retiree mortality assumption, projecting from 2010 using 50% of MP-2020 published in October of 2020 by SOA.

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SECTION III. DEMOGRAPHIC ASSUMPTIONS

A comparison of actual experience with disabled mortality expected under the proposed assumption is shown below.

Proposed Assumption Deaths During 2015 - 2020	Disabled Retirees		
	Male	Female	Total
Actual Deaths	42	46	88
Expected Deaths	38	32	70
Actual/Expected Ratio	112%	142%	126%



The current mortality rates are shown in Appendix A – Table 2. The table below shows the life expectancy for the current assumption and proposed assumptions for disabled 65 year old male and female retirees.

Life Expectancy (Expected Death Age) for a 65 year old Disabled Retiree	Male	Female
	Current: RP-2000 Disability mortality table set forward by 6 years for males and 4 years for females.	74.6
Proposed: PUB-2010 Disabled Retiree Amount Weighted mortality table using 130% of the rates below 80, set forward (Males +4, Females +2) and projected generationally using 50% of mortality improvement scale MP-2020	77.1	80.3
Life Improvement in Years	2.5	1.5

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SECTION III. DEMOGRAPHIC ASSUMPTIONS

EXHIBIT 8. DISABILITY INCIDENCE

Current Assumption:	1974-78 Society of Actuaries Long Term Disability Non-Jumbo table, with rates reduced 50% for males and 75% for females (effective 2016)
2011-2015 Study:	Increased the reduction rates for active females from 50% to 75%
Proposed Assumption:	Custom table, see Appendix A – Table 5.

The current assumption for the incidence of disability for active members is the 1974-78 Society of Actuaries Long Term Disability Non-Jumbo table reduced by 50% for males and 75% for females.

The following summarizes the incidence of disability for active members during the study period and compares it with expected disability based on the current assumption.

Current Assumption 2015 - 2020	Disability Incidence from Active		
	Male	Female	Total
Actual Disabilities	8	4	12
Expected Disabilities	<u>23</u>	<u>12</u>	<u>35</u>
Actual/Expected Ratio	35%	32%	34%

Recommendation

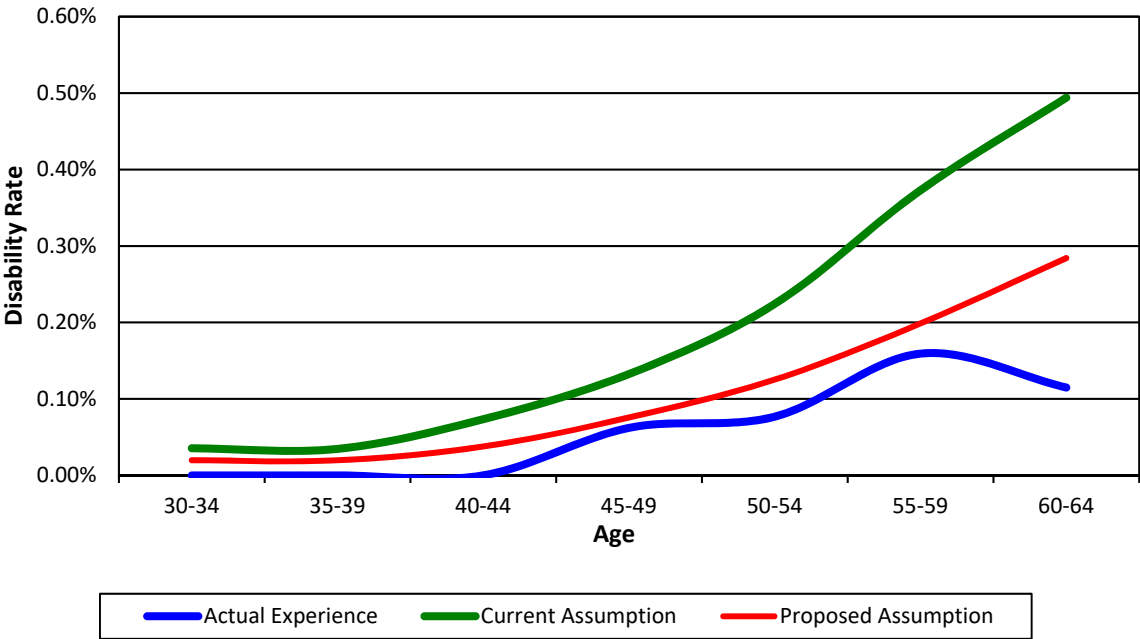
As shown above, the actual incidence of disability for male and female members has been substantially lower than the incidence of disability predicted by the current assumption. We recommend lowering the assumed disability rates and using a custom table based upon actual experience. A comparison of actual experience with the incidence of disability expected under the proposed assumption is shown below.

Proposed Assumption 2015 - 2020	Disability Incidence from Active		
	Male	Female	Total
Actual Disabilities	8	4	12
Expected Disabilities	<u>13</u>	<u>8</u>	<u>21</u>
Actual/Expected Ratio	63%	49%	58%

The current and proposed disability rate tables are provided in Appendix A – Table 5.

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SECTION III. DEMOGRAPHIC ASSUMPTIONS



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SECTION III. DEMOGRAPHIC ASSUMPTIONS

EXHIBIT 9. ACTIVE WITHDRAWAL AND MORTALITY

Current Assumption:	Withdrawal rates that vary by service (effective 2009) RP-2000 Combined Healthy mortality table set forward (Males +3, Females +2) projected generationally from 2016 using 30% of Scale BB
2011-2015 Study:	No change to withdrawal assumption. Adopted mortality assumption.
Proposed Assumption:	Lower withdrawal rates that vary by service (see Appendix A- Table 4) PUB-2010 General Employee Amount-Weighted mortality table set forward (Males +4, Females +2), using 130% of the rates before age 80 and projected generationally from 2010 using 50% of mortality improvement scale MP-2020

In reviewing the withdrawal assumption, we have subtracted expected deaths from actual withdrawals and deaths, since the records reviewed for this study do not distinguish between active members who withdrew and received a return of contributions and those who died. Withdrawal occurs primarily for relatively young members, so the proportion of mortality in the combined totals is small.

The following table summarizes the withdrawal experience for active members during the study period and compares it with expected withdrawals based on the current and proposed assumptions.

2015 – 2020	Active Withdrawals		
	Old Plan	DB 175	Total
Actual Withdrawals and Deaths	196	228	424
Expected Deaths	<u>50</u>	<u>20</u>	<u>70</u>
Estimated Withdrawals	146	208	354
Current Assumption			
Expected Withdrawals	148	389	537
Actual/Expected Ratio	99%	53%	66%
Proposed Assumption			
Expected Withdrawals	135	257	392
Actual/Expected Ratio	108%	81%	90%

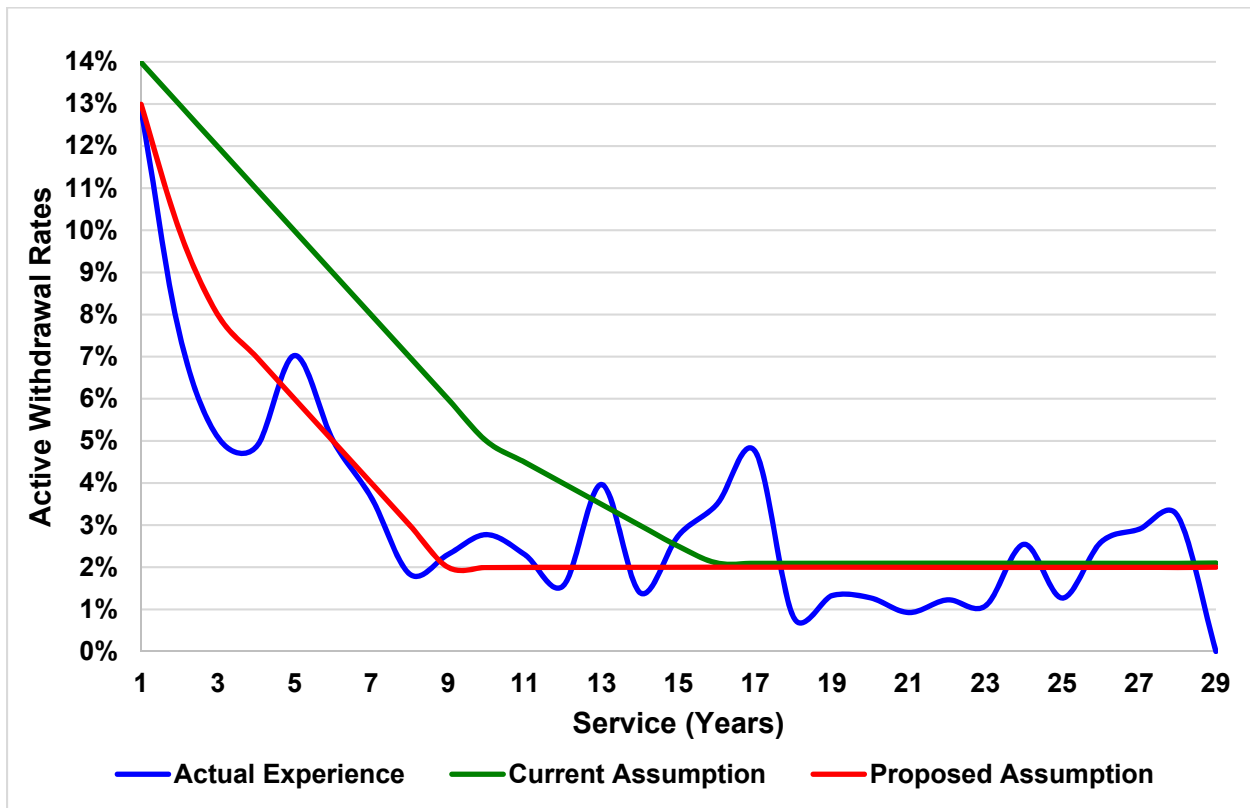
Recommendation

Active Withdrawal

The actual withdrawal experience has been lower than expected by the current assumption. As such, we propose to decrease the current withdrawal assumption, which is shown in Appendix A – Table 6.

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SECTION III. DEMOGRAPHIC ASSUMPTIONS



Active Mortality

To be consistent with the healthy retiree mortality rates, we propose to revise the assumption from the current RP-2000 mortality table (Males +3, Females +2) projected generationally from 2016 using 30% of mortality improvement scale BB to 130% for ages 79 and younger and 100% for ages 80 and older of the PUB-2010 General Employee Amount-Weighted mortality table with age set forward (Males +4, Females +2) projected generationally from 2010 using 50% of mortality improvement scale MP-2020. The proposed active mortality assumption is the same as the retiree mortality assumption, except uses the General Employee Amount-Weighted Table rather than General Healthy Retiree Amount-Weighted Table.

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SECTION III. DEMOGRAPHIC ASSUMPTIONS

EXHIBIT 10. RETIREMENT

Current Assumption:	50% retire at first eligibility for unreduced retirement, 20% of the remaining members retire in each year until age 75, and 100% of the remaining members at age 75 retire immediately (effective 2016)
2011-2015 Study:	Adopted the current rates.
Proposed Assumption:	40% retire at first eligibility for unreduced retirement, 20% of the remaining members retire in each year until age 75, and 100% of the remaining members at age 75 retire immediately

For employees who became members prior to October 1, 1981, the Fund provides unreduced retirement benefits at age 60, or upon completion of 25 years of service if earlier. For employees who became members on or after October 1, 1981, the service requirement for unreduced retirement was increased to 30 years. For employees who became members on or after August 22, 1984, the unreduced retirement age was increased to age 65.

Uniformed personnel who became members prior to October 1, 1981 are eligible for unreduced benefits at age 55 if they have completed 10 years of service. Uniformed personnel who became members on or after October 1, 1981 are eligible for unreduced benefits at age 55 if they have completed 15 years of service. Uniformed personnel who became members on or after August 22, 1984 are eligible for unreduced benefits at age 60 if they have completed 15 years of service.

The following summarizes total retirement experience for active members who are eligible to receive unreduced retirement benefits from the Fund.

Current Assumption 2015 - 2020	Retirements		
	Old Plan	DB 175	Total
Actual Retirements	957	105	1,062
Expected Retirements	<u>1,156</u>	<u>146</u>	<u>1,302</u>
Actual/Expected Ratio	83%	72%	82%

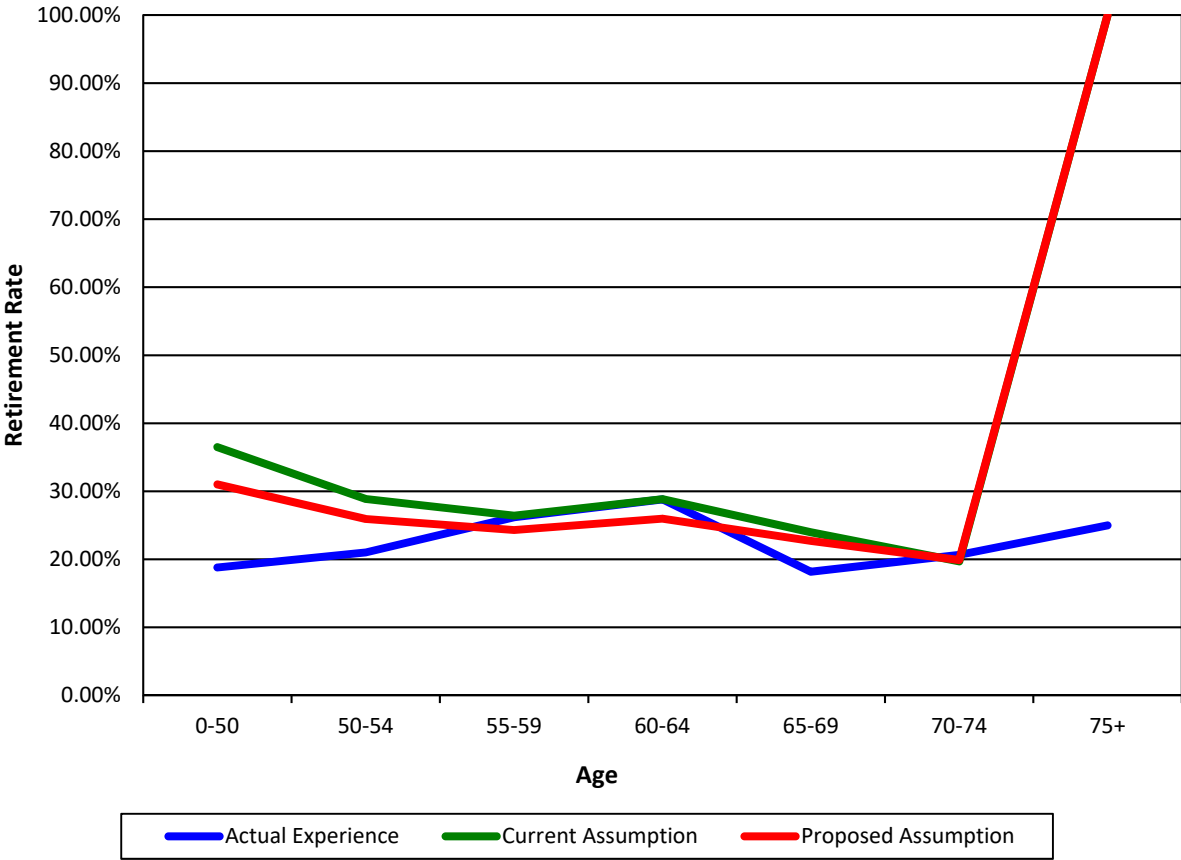
Recommendation

Actual retirement experience has been lower than the current assumption. We recommend decreasing the assumed retirement rate at first eligibility for unreduced retirement by 20%, resulting in a proposed assumption of 40%. We recommend no change to the assumption that 20% of remaining members retire each year until age 75, and no change to the assumption that those eligible at age 75 will retire immediately.

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SECTION III. DEMOGRAPHIC ASSUMPTIONS

Proposed Assumption 2015 - 2020	Retirements		
	Old Plan	DB 175	Total
Actual Retirements	957	105	1,062
Expected Retirements	<u>1,056</u>	<u>137</u>	<u>1,194</u>
Actual/Expected Ratio	91%	76%	89%



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SECTION III. DEMOGRAPHIC ASSUMPTIONS

EXHIBIT 11. REFUND OF CONTRIBUTIONS

Current Assumption:	Employees who separate from service before retirement age with less than 20 years of service will elect a refund of contributions Current inactive employees who have 5 years of service and at least \$10,000 in contributions are assumed not to elect a refund and will retire when first eligible for unreduced benefits.
2011-2015 Study:	No change
Proposed Assumption:	No change

The Fund requires active members to contribute 9½% of base pay. Members who separate from service may elect to receive a refund of contributions, provided that they have not completed more than 25 years of service with the Fund. Members who receive a refund of contributions are not entitled to further benefits from the Fund unless they are later rehired and repay the contributions that were refunded.

The current assumption is that active members who separate from service in the future and who have less than 20 years of service will elect a refund of contributions. Inactive members who have at least 5 years of service and a contribution balance that exceeds \$10,000, are assumed not to elect a refund and will retire when first eligible for unreduced benefits.

Recommendation

We recommend no change to the current assumption for refunds to actives separating from service.

We recommend no change to the current assumption that current inactive employees who have 5 years of service and at least \$10,000 in contributions are assumed not to elect a refund and will retire when first eligible for unreduced benefits.

SECTION III. DEMOGRAPHIC ASSUMPTIONS

EXHIBIT 12. MARITAL STATUS

Current Assumption:	75% of active members are married (effective 2009)
2011-2015 Study:	No change
Proposed Assumption:	No change

Actual marital status is provided in the data received for retired members. The member’s marital status determines eligibility for the surviving spouse annuity. The following table summarizes marital status for active members who retired or became disabled during the study period and compares the results with the prior experience study. Marital status for all retiree records included in valuation data during the study period is also summarized.

	2011-2015	2015-2020	2011-2020
Retirements – Married	542	757	1,299
Retirements – Unmarried	<u>174</u>	<u>320</u>	<u>494</u>
Total Retirements (Including Disability)	716	1,077	1,793
Percentage of Retirees Married at Retirement	76%	70%	72%
Total Retiree Exposures – Married	16,984	20,826	37,810
Total Retiree Exposures – Unmarried	<u>4,481</u>	<u>5,819</u>	<u>10,300</u>
Total Retiree Exposures (Including Disability)	21,465	26,645	48,110
Current Percentage of Married Retirees	79%	78%	79%

Recommendation

During the current study period (2015-2020), the percentage of members who retired and were married (70%) was lower than the current assumption (75%), and the total percentage of married retirees, including those who retired prior to 2015 (78%), is slightly higher than the current assumption. During the current and prior study periods (2011-2020), the total percentage of married retirees, including those who retired prior to 2011 (79%), is slightly higher than the current assumption. We propose no change to the current assumption.

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EXHIBIT 13. SURVIVOR BENEFIT – MINOR CHILDREN

Current Assumption:	0.2 eligible child survivors at the time of the active or retiree death, with payments to the minor child continuing for 6 years (effective 2016)
2011-2015 Study:	Adopted current assumption
Proposed Assumption:	No change

A survivor benefit is payable to children under age 18 of a member whose death occurs while in service after at least three years of service, or if an annuitant or inactive member with at least 25 years of service. The benefit is payable until age 25 if the child is a full-time student in high school or an accredited undergraduate educational institution, or payable regardless of age if disabled and disability occurred before age 18, and terminates upon a child’s death or marriage. The annuity amount for each eligible child is \$2,880 per year, subject to a maximum payment to five or more minor children of \$14,400 per year.

The current assumption for the value of this survivor benefit is assuming 0.2 eligible child survivors at the time of the member death, with payments to the minor child continuing for 6 years.

The following summarizes child survivor experience and retiree deaths during the current and prior study periods.

	2007-2011	2011-2015	2015-2020	Total 2007-2020
Child Survivors Added	154	94	98	346
Retiree Deaths	574	609	808	1991
Child Survivors Per Retiree Death	0.27	0.15	0.12	0.17
Child Pensioners at End of Study Period	263	198	117	117

Recommendation

The overall experience from 2007 to 2020 shows the approximately 0.17 eligible child survivors at the time of the retiree death, and so we recommend no change to the current assumption.

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EXHIBIT 14. LEAVE ADJUSTMENTS TO SERVICE/EARNINGS

Current Assumption:	Service increased by 1.5 years upon retirement Average earnings increased by 5% upon retirement (effective 2016)
2011-2015 Study:	Average earnings increase reduced from 10% to 5%
Proposed Assumption:	Service increased 1.5 years upon retirement. Average earnings increased by 3% upon retirement

A member may receive service credits for accumulated unused sick and annual leave at the time of retirement (1 month of service is credited for 12 days of leave). In addition, members who have elected to include non-base pay in their pension earnings may receive earnings credit for unused annual leave.

For members who retired during the study period, we have compared the service stored in the member’s retiree record with the expected service based on the member’s active record for the prior valuation. We have also compared the average of members’ highest 3 years of earnings as active members for the period 2015-2020 with their final average earnings. We excluded any service/earnings decreases from these comparisons. The following table shows the average increase to retiree service and earnings during the current and prior study periods, and compares it to the current and proposed assumptions

	2011-2015 Experience	2015-2020 Experience	Current Assumption	Proposed Assumption
Service Increase at Retirement (years)	1.8	1.6	1.5	1.5
Earnings Increase at Retirement	3.9%	2.3%	5.0%	3.0%

Recommendation

Based on the observed earnings increases, we recommend reducing the assumed increase upon retirement from 5% of average earnings to 3% of average earnings. We propose no change to the assumed service increase upon retirement.

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EXHIBIT 15. ACTUARIAL COST METHOD AND AMORTIZATION PERIOD

Current Method:	Entry Age Normal
Amortization Period:	100% funding by May 1, 2033 (11.58 years from September 30, 2021)
2011-2015 Study:	No change to Method
Proposed Method:	Entry Age Normal
Proposed Amortization Period:	Initial Unfunded Actuarial Accrued Liability (UAAL) is split into either 5, 7 or 10 equally-sized bases.

The amortization period of the Initial UAAL is set to result in a phase down of the employer contribution rate starting:
 October 1, 2030 for the 5 year phase down
 October 1, 2029 for the 7 year phase down
 October 1, 2028 for the 10 year phase down

Future changes in the Unfunded Accrued Actuarial Liability amortized as a level percent of payroll over 15 years, using layered bases

Actuarial Cost Method - Background

An actuarial cost method is used to calculate the plan's accrued liability and normal cost for active members. The most common actuarial cost methods are:

- **Entry Age Normal** – This method projects a member's retirement benefit to the expected retirement age and then assigns a cost to each year of service such that the resulting normal costs are level throughout the member's working career, either as a level dollar amount or as a level percentage of pay.
- **Unit Credit** – This method defines the accrued liability to be the present value of benefits accrued to date. The normal cost is the cost of benefits earned in the current year. This method is not appropriate for plans that base retirement benefits on salary, because this method does not consider the impact of future salary increases. Salary increases and aging can lead to rapidly accelerating normal costs.
- **Projected Unit Credit** – This method is similar to the Unit Credit method, but future salary increases are factored into the calculation of accrued liability and normal cost.

By far, the most common method for public plans is the Entry Age Method. This is generally the most conservative of the methods because it assigns a higher proportion of projected benefits to the accrued liability. The use of this method is required in order to determine the Total Pension Liability reported for accounting purposes under GASB 67.

Recommendation – Actuarial Cost Method

We recommend that the Fund continue to use the Entry Age Actuarial Cost Method with costs allocated as a level percentage of pay.

Amortization Period - Background

The amortization period is the number of years in which any Unfunded Actuarial Accrued Liability (UAAL) is amortized. It sets the period over which the UAAL and any changes to the UAAL is reflected in the employer contribution rate.

The current amortization period that requires 100% funding by May 1, 2033 is not sustainable. As the date of May 1, 2033, gets closer and closer, the remaining funding period will become shorter and shorter. The UAAL, and any changes to the UAAL, will be spread over shorter and shorter periods. This will cause large swings in the required employer contribution rate from one year to the next.

For example, if the investments of the fund did poorly during the fiscal years ending prior to September 30, 2032, that could potentially result in experience losses of \$100 to \$200 million, which based upon the current requirement to be fully funded by May 1, 2033, would require employer contributions equal to that amount to be paid within 1 year.

If the investments of the fund earn the targeted return each year, the current amortization period is projected to result in a very large drop in employer contributions in 2033. For government budgeting purposes, it may be better to phase-in that drop in contributions over a longer period of time.

Recommendation – Amortization Period

We recommend that the Fund propose legislation to change the amortization period. This change would require that GCA 8137 be updated. The recommendation is to divide the initial UAAL as of either 5, 7 or 10 separate and equal sized bases, with those bases amortized over a period time intended to result in a phase down of the employer contribution rate over the following fiscal years:

5 year phase down – October 1, 2031 to September 30, 2036

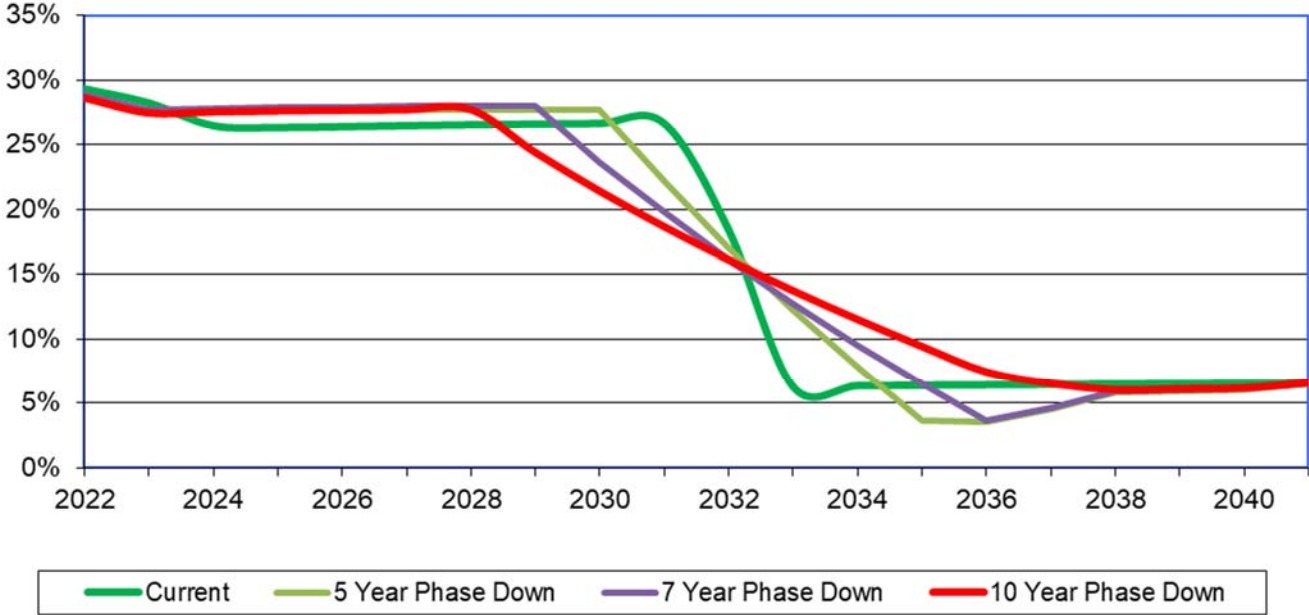
7 year phase down – October 1, 2030 to September 30, 2037

10 year phase down – October 1, 2029 to September 30, 2039

In addition, any future changes in the UAAL would be amortized as a level percent of pay over 15 years from the date the base is created, using layered bases. See Table 7 in Appendix A for further details. The projected employer contribution rates before and after the proposed change are shown below.

SECTION IV. ACTUARIAL METHODS

Projected Employer Contribution Rates for Fiscal Years Starting 10/1



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EXHIBIT 16. ASSET VALUATION METHOD

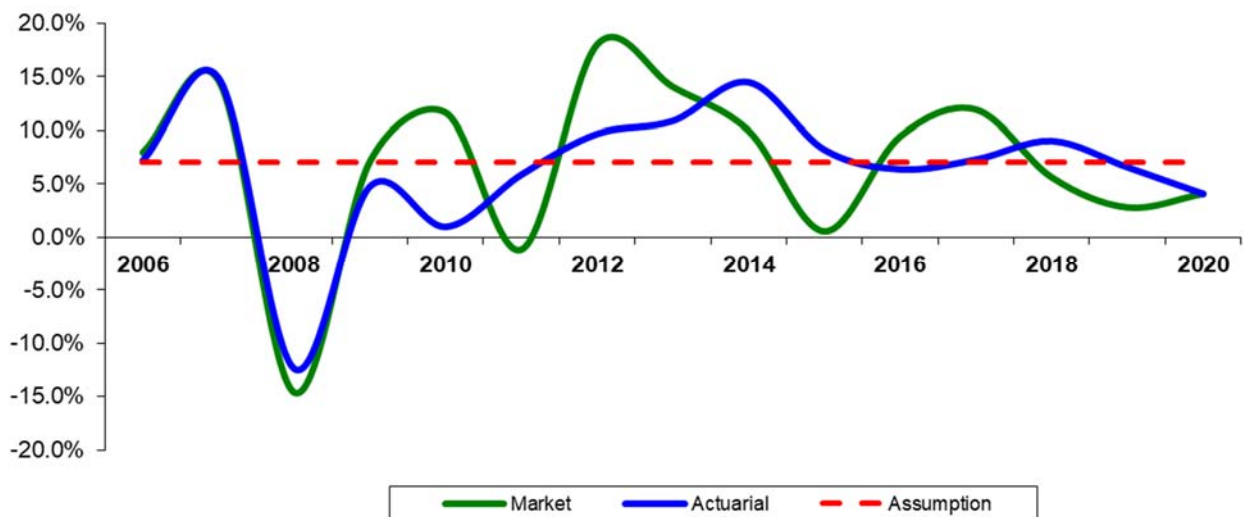
Current Method:	3-year phase-in of investment gains/losses that differ from assumed rate of return (effective 2009)
2011-2015 Study:	No change
Proposed Method:	No change

An asset valuation method determines the value of the fund assets to be reflected in the actuarial valuation. The most common asset valuation methods are:

- Market Value – The asset value is the market value of the fund’s assets. This provides the most up to date funding status, but the unfunded actuarial accrued liability and employer contribution rates may be volatile from year to year.
- Amortized Cost – This is useful for funds that hold fixed income securities to maturity. By using the amortized cost of bonds, rather than the market value, the value of the fund’s assets will be more stable over time. However, most funds no longer hold fixed income securities to maturity. This method may still be useful for funds with dedicated bond portfolios.
- “X” year Smoothing Method – This method recognizes investment returns that differ from the actuarial assumption over a period of years that usually range from 3 to 10 years. Investment gains and losses are averaged over typical economic cycles so that favorable investment returns during good years can be deferred to help offset investment losses during poor years.

Recommendation

We recommend no change to the current asset valuation method. The investment returns based upon the smoothing method adopted in 2009 (Actuarial) are less volatile than the market value returns.



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APPENDIX A. SUMMARY OF CURRENT AND PROPOSED ASSUMPTIONS

	Current Assumption		Proposed Assumption	
ECONOMIC ASSUMPTIONS				
Interest Rate	7.00%		6.70%	
Salary Increases	<u>Service</u>	<u>% Increase</u>	<u>Service</u>	<u>% Increase</u>
	0 – 5	7.50%	0 – 5	6.00%
	6 – 10	6.00%	6 – 10	4.50%
	11 – 15	5.00%	11 – 15	3.00%
	16 – 20	4.00%	16 – 20	3.00%
	Over 20	4.00%	Over 20	3.00%
Total Payroll Growth (DB and DC)	2.75%		2.50%	
Administrative Expenses	Budgeted expenses plus 5% of DB 1.75 Normal Cost		Budgeted Expenses	
DEMOGRAPHIC ASSUMPTIONS				
Mortality	RP-2000 Combined Healthy table +3 for males +2 for females Mortality is projected generationally using 30% of projection scale BB		PUB-2010 Amounted Weighted Healthy Employee or Healthy Retiree tables (130% of rates prior to age 80) +4 for males +2 for females PUB-2010 Amounted Weighted Healthy Survivors tables (130% of rates prior to age 80) +3 for males +4 for females Mortality is projected generationally from 2010 using 50% of MP-2020	
Disability	1974-78 SOA LTD Non-Jumbo, with male rates reduced by 50% and female rates reduced by 75%		<u>Age</u>	<u>Male</u> <u>Female</u>
Incidence			20-39	0.025% 0.015%
			40-44	0.050% 0.025%
			45-49	0.100% 0.050%
			50-54	0.150% 0.100%
			55-59	0.250% 0.150%
			60 and up	0.400% 0.200%

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	Current Assumption	Proposed Assumption
Post-disability mortality	<p>RP-2000 Disability table +6 for males +4 for females</p> <p>Mortality is projected generationally using 30% of projection scale BB</p>	<p>PUB-2010 Amounted Weighted Disabled tables (130% of rates prior to age 80) +4 for males +2 for females</p> <p>Mortality is projected generationally from 2010 using 50% of MP-2020</p>
Withdrawal Rates	Service-based rates (see attached)	Service-based rates (see attached)
Retirement Age	<p>50% assumed to retire at earliest eligibility for unreduced benefits.</p> <p>20% per year thereafter until age 75</p> <p>100% at age 75</p>	<p>40% assumed to retire at earliest eligibility for unreduced benefits.</p> <p>20% per year thereafter until age 75</p> <p>100% at age 75</p>
Return of Contributions	<p>100% of any current employees who withdraw before retirement and who have less than 20 years of service are assumed to elect a return of contributions</p> <p>Inactive members with at least 5 years of service and \$10,000 in contributions who have not withdrawn their contributions are assumed to retire upon eligibility for unreduced benefits. All other employees who have previously withdrawn are assumed to elect a return of contributions.</p>	Same
Marital Status	For active and inactive employees, 75% are assumed to have spouses. The assumed age difference is 3 years (+3 for a male spouse; -3 for a female spouse).	Same
Survivor Benefit – Minor Children	An average of 0.2 eligible child survivors for each retiree with payments paid for 6 years. Payments to current child survivor are assumed to be payable through age 21	Same

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SECTION V. APPENDICES

	Current Assumption	Proposed Assumption
Leave Adjustments	Benefit Service increased 1.5 years upon retirement. Increase average earnings by 5% at retirement	Benefit Service increased 1.5 years upon retirement. Increase average earnings by 3% at retirement
ACTUARIAL METHODS		
Actuarial Cost Method	Entry Age Normal (level percentage of pay)	Same
Amortization Period	Fully funded by May 1, 2033 (11.58 years from September 30, 2021)	UAAL as of September 30, 2021 divided into 10 bases, with each amortized over periods between 7 to 16 years starting October 1, 2022 Future changes in UAAL amortized over a fixed 15 year period, using layered bases
Asset Valuation Method	3-year phase-in of gains/losses relative to interest rate assumption	Same

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TABLE 1. HEALTHY MORTALITY ACTIVE EMPLOYEE RATES

Probabilities of Death for Healthy Active Employee Members (per 100 at each age)					
Current Assumption			Proposed Assumption		
Age	Male	Female	Age	Male	Female
20	0.04	0.02	20	0.04	0.01
21	0.04	0.02	21	0.04	0.01
22	0.04	0.02	22	0.04	0.01
23	0.04	0.02	23	0.04	0.01
24	0.04	0.02	24	0.04	0.01
25	0.04	0.02	25	0.04	0.01
26	0.04	0.02	26	0.05	0.02
27	0.04	0.02	27	0.05	0.02
28	0.05	0.03	28	0.05	0.02
29	0.06	0.03	29	0.05	0.02
30	0.06	0.04	30	0.06	0.02
31	0.07	0.04	31	0.06	0.02
32	0.08	0.04	32	0.07	0.03
33	0.08	0.05	33	0.07	0.03
34	0.09	0.05	34	0.07	0.03
35	0.10	0.06	35	0.08	0.04
36	0.10	0.06	36	0.09	0.04
37	0.11	0.06	37	0.09	0.04
38	0.11	0.07	38	0.10	0.05
39	0.12	0.08	39	0.11	0.05
40	0.13	0.09	40	0.12	0.06
41	0.14	0.09	41	0.13	0.06
42	0.15	0.10	42	0.14	0.07
43	0.16	0.11	43	0.15	0.07
44	0.17	0.12	44	0.17	0.08
45	0.19	0.13	45	0.18	0.09
46	0.20	0.14	46	0.19	0.09
47	0.21	0.16	47	0.21	0.10
48	0.24	0.17	48	0.23	0.11
49	0.27	0.19	49	0.25	0.12
50	0.29	0.20	50	0.26	0.13
51	0.32	0.22	51	0.28	0.14
52	0.36	0.24	52	0.31	0.15
53	0.42	0.27	53	0.33	0.16
54	0.47	0.31	54	0.36	0.17
55	0.53	0.35	55	0.38	0.19
56	0.59	0.39	56	0.41	0.20
57	0.67	0.44	57	0.45	0.22
58	0.77	0.51	58	0.48	0.24
59	0.88	0.58	59	0.52	0.26
60	1.00	0.67	60	0.56	0.29

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Probabilities of Death for Healthy Active Employee Members <i>(per 100 at each age)</i>					
Current Assumption			Proposed Assumption		
Age	Male	Female	Age	Male	Female
61	1.13	0.76	61	0.61	0.32
62	1.27	0.86	62	0.66	0.35
63	1.44	0.97	63	0.71	0.38
64	1.61	1.10	64	0.77	0.43
65	1.79	1.22	65	0.84	0.47
66	1.98	1.34	66	0.91	0.52
67	2.22	1.49	67	1.00	0.57
68	2.46	1.67	68	1.09	0.64
69	2.73	1.86	69	1.19	0.70
70	3.04	2.07	70	1.30	0.78
71	3.39	2.30	71	1.42	0.86
72	3.78	2.55	72	1.56	0.95
73	4.22	2.81	73	1.71	1.05
74	4.69	3.10	74	1.87	1.16
75	5.21	3.41	75	2.05	1.28
76	5.79	3.76	76	2.25	1.42
77	6.44	4.15	77	6.99	1.57
78	7.20	4.59	78	7.87	1.73
79	8.05	5.08	79	8.85	4.92
80	8.97	5.63	80	9.11	5.11
81	9.98	6.25	81	9.36	5.29
82	11.08	6.95	82	9.62	5.47
83	12.28	7.74	83	10.73	6.21
84	13.60	8.64	84	11.95	7.04
85	15.06	9.63	85	13.26	7.99
86	16.64	10.73	86	14.67	9.05
87	18.34	11.92	87	16.17	10.22
88	19.98	13.17	88	17.75	11.49
89	21.66	14.46	89	19.39	12.83
90	23.37	15.76	90	21.11	14.24
91	25.07	17.04	91	22.89	15.70
92	26.75	18.28	92	24.73	17.23
93	28.39	19.45	93	26.63	18.83
94	29.99	20.54	94	28.59	20.51
95	31.53	21.52	95	30.59	22.28
96	33.02	22.39	96	32.61	24.15
97	34.46	23.14	97	34.64	26.11
98	35.86	23.75	98	36.64	28.16
99	37.17	24.48	99	38.60	30.27

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TABLE 2. HEALTHY RETIREE MORTALITY RATES

Probabilities of Death for Healthy Retirees (per 100 at each age)					
Current Assumption			Proposed Assumption		
Age	Male	Female	Age	Male	Female
20	0.04	0.02	20	0.04	0.01
21	0.04	0.02	21	0.04	0.01
22	0.04	0.02	22	0.04	0.01
23	0.04	0.02	23	0.04	0.01
24	0.04	0.02	24	0.04	0.01
25	0.04	0.02	25	0.04	0.01
26	0.04	0.02	26	0.05	0.02
27	0.04	0.02	27	0.05	0.02
28	0.05	0.03	28	0.05	0.02
29	0.06	0.03	29	0.05	0.02
30	0.06	0.04	30	0.06	0.02
31	0.07	0.04	31	0.06	0.02
32	0.08	0.04	32	0.07	0.03
33	0.08	0.05	33	0.07	0.03
34	0.09	0.05	34	0.07	0.03
35	0.10	0.06	35	0.08	0.04
36	0.10	0.06	36	0.09	0.04
37	0.11	0.06	37	0.09	0.04
38	0.11	0.07	38	0.10	0.05
39	0.12	0.08	39	0.11	0.05
40	0.13	0.09	40	0.12	0.06
41	0.14	0.09	41	0.13	0.06
42	0.15	0.10	42	0.14	0.07
43	0.16	0.11	43	0.15	0.07
44	0.17	0.12	44	0.17	0.08
45	0.19	0.13	45	0.18	0.09
46	0.20	0.14	46	0.39	0.09
47	0.21	0.16	47	0.42	0.10
48	0.24	0.17	48	0.45	0.29
49	0.27	0.19	49	0.48	0.30
50	0.29	0.20	50	0.52	0.32
51	0.32	0.22	51	0.56	0.34
52	0.36	0.24	52	0.60	0.35
53	0.42	0.27	53	0.65	0.37
54	0.47	0.31	54	0.69	0.39
55	0.53	0.35	55	0.74	0.41
56	0.59	0.39	56	0.80	0.44
57	0.67	0.44	57	0.86	0.47
58	0.77	0.51	58	0.93	0.50
59	0.88	0.58	59	1.00	0.54
60	1.00	0.67	60	1.09	0.59

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Probabilities of Death for Healthy Retirees <i>(per 100 at each age)</i>					
Current Assumption			Proposed Assumption		
Age	Male	Female	Age	Male	Female
61	1.13	0.76	61	1.19	0.65
62	1.27	0.86	62	1.30	0.72
63	1.44	0.97	63	1.44	0.80
64	1.61	1.10	64	1.60	0.89
65	1.79	1.22	65	1.78	0.99
66	1.98	1.34	66	1.98	1.10
67	2.22	1.49	67	2.21	1.24
68	2.46	1.67	68	2.48	1.38
69	2.73	1.86	69	2.77	1.55
70	3.04	2.07	70	3.10	1.74
71	3.39	2.30	71	3.47	1.95
72	3.78	2.55	72	3.89	2.18
73	4.22	2.81	73	4.37	2.45
74	4.69	3.10	74	4.91	2.74
75	5.21	3.41	75	5.52	3.08
76	5.79	3.76	76	6.21	3.46
77	6.44	4.15	77	6.99	3.88
78	7.20	4.59	78	7.87	4.37
79	8.05	5.08	79	8.85	4.92
80	8.97	5.63	80	9.11	5.11
81	9.98	6.25	81	9.36	5.29
82	11.08	6.95	82	9.62	5.47
83	12.28	7.74	83	10.73	6.21
84	13.60	8.64	84	11.95	7.04
85	15.06	9.63	85	13.26	7.99
86	16.64	10.73	86	14.67	9.05
87	18.34	11.92	87	16.17	10.22
88	19.98	13.17	88	17.75	11.49
89	21.66	14.46	89	19.39	12.83
90	23.37	15.76	90	21.11	14.24
91	25.07	17.04	91	22.89	15.70
92	26.75	18.28	92	24.73	17.23
93	28.39	19.45	93	26.63	18.83
94	29.99	20.54	94	28.59	20.51
95	31.53	21.52	95	30.59	22.28
96	33.02	22.39	96	32.61	24.15
97	34.46	23.14	97	34.64	26.11
98	35.86	23.75	98	36.64	28.16
99	37.17	24.48	99	38.60	30.27

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TABLE 3. HEALTHY SURVIVOR MORTALITY RATES

Probabilities of Death for Healthy Survivors (per 100 at each age)					
Current Assumption			Proposed Assumption		
Age	Male	Female	Age	Male	Female
20	0.04	0.02	20	0.04	0.01
21	0.04	0.02	21	0.04	0.01
22	0.04	0.02	22	0.04	0.01
23	0.04	0.02	23	0.04	0.01
24	0.04	0.02	24	0.04	0.02
25	0.04	0.02	25	0.04	0.02
26	0.04	0.02	26	0.04	0.02
27	0.04	0.02	27	0.05	0.02
28	0.05	0.03	28	0.05	0.02
29	0.06	0.03	29	0.05	0.02
30	0.06	0.04	30	0.05	0.03
31	0.07	0.04	31	0.06	0.03
32	0.08	0.04	32	0.06	0.03
33	0.08	0.05	33	0.07	0.04
34	0.09	0.05	34	0.07	0.04
35	0.10	0.06	35	0.07	0.04
36	0.10	0.06	36	0.08	0.05
37	0.11	0.06	37	0.09	0.05
38	0.11	0.07	38	0.09	0.06
39	0.12	0.08	39	0.10	0.06
40	0.13	0.09	40	0.11	0.07
41	0.14	0.09	41	0.12	0.34
42	0.15	0.10	42	0.71	0.35
43	0.16	0.11	43	0.74	0.37
44	0.17	0.12	44	0.77	0.38
45	0.19	0.13	45	0.81	0.40
46	0.20	0.14	46	0.84	0.42
47	0.21	0.16	47	0.91	0.44
48	0.24	0.17	48	0.94	0.48
49	0.27	0.19	49	0.97	0.51
50	0.29	0.20	50	1.00	0.54
51	0.32	0.22	51	1.04	0.58
52	0.36	0.24	52	1.07	0.62
53	0.42	0.27	53	1.11	0.66
54	0.47	0.31	54	1.15	0.71
55	0.53	0.35	55	1.20	0.76
56	0.59	0.39	56	1.25	0.81
57	0.67	0.44	57	1.32	0.87
58	0.77	0.51	58	1.39	0.93
59	0.88	0.58	59	1.47	1.00
60	1.00	0.67	60	1.56	1.08

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Probabilities of Death for Healthy Survivors <i>(per 100 at each age)</i>					
Current Assumption			Proposed Assumption		
Age	Male	Female	Age	Male	Female
61	1.13	0.76	61	1.67	1.17
62	1.27	0.86	62	1.80	1.26
63	1.44	0.97	63	1.95	1.37
64	1.61	1.10	64	2.12	1.49
65	1.79	1.22	65	2.31	1.61
66	1.98	1.34	66	2.53	1.76
67	2.22	1.49	67	2.77	1.92
68	2.46	1.67	68	3.04	2.10
69	2.73	1.86	69	3.33	2.31
70	3.04	2.07	70	3.65	2.54
71	3.39	2.30	71	4.01	2.80
72	3.78	2.55	72	4.40	3.08
73	4.22	2.81	73	4.82	3.40
74	4.69	3.10	74	5.28	3.77
75	5.21	3.41	75	5.79	4.18
76	5.79	3.76	76	6.34	4.64
77	6.44	4.15	77	6.97	5.18
78	7.20	4.59	78	7.67	5.79
79	8.05	5.08	79	8.45	6.49
80	8.97	5.63	80	8.55	6.70
81	9.98	6.25	81	8.64	6.91
82	11.08	6.95	82	8.74	7.12
83	12.28	7.74	83	9.66	8.03
84	13.60	8.64	84	10.67	9.04
85	15.06	9.63	85	11.77	10.15
86	16.64	10.73	86	12.98	11.33
87	18.34	11.92	87	14.42	12.60
88	19.98	13.17	88	15.95	13.95
89	21.66	14.46	89	17.56	15.40
90	23.37	15.76	90	19.24	16.95
91	25.07	17.04	91	20.99	18.59
92	26.75	18.28	92	22.80	20.33
93	28.39	19.45	93	24.67	22.17
94	29.99	20.54	94	26.60	24.09
95	31.53	21.52	95	28.57	26.10
96	33.02	22.39	96	30.58	28.16
97	34.46	23.14	97	32.61	30.27
98	35.86	23.75	98	34.64	32.38
99	37.17	24.48	99	36.64	34.49

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TABLE 4. DISABLED MORTALITY RATES

Probabilities of Death for Disabled Retired Members (per 100 at each age)					
Current Assumption			Proposed Assumption		
Age	Male	Female	Age	Male	Female
20	2.26	0.75	20	0.38	0.25
21	2.26	0.75	21	0.36	0.23
22	2.26	0.75	22	0.38	0.21
23	2.26	0.75	23	0.40	0.21
24	2.26	0.75	24	0.42	0.23
25	2.26	0.75	25	0.44	0.25
26	2.26	0.75	26	0.46	0.28
27	2.26	0.75	27	0.48	0.31
28	2.26	0.75	28	0.51	0.33
29	2.26	0.75	29	0.53	0.37
30	2.26	0.75	30	0.56	0.40
31	2.26	0.75	31	0.60	0.44
32	2.26	0.75	32	0.63	0.48
33	2.26	0.75	33	0.67	0.52
34	2.26	0.75	34	0.72	0.57
35	2.26	0.75	35	0.78	0.62
36	2.26	0.75	36	0.84	0.68
37	2.26	0.75	37	0.91	0.75
38	2.26	0.75	38	0.99	0.82
39	2.26	0.75	39	1.08	0.90
40	2.38	0.75	40	1.19	0.98
41	2.51	0.75	41	1.31	1.07
42	2.64	0.82	42	1.44	1.17
43	2.77	0.90	43	1.59	1.28
44	2.90	0.98	44	1.74	1.39
45	3.03	1.06	45	1.91	1.52
46	3.16	1.15	46	2.09	1.65
47	3.29	1.25	47	2.23	1.78
48	3.42	1.35	48	2.36	1.93
49	3.54	1.45	49	2.50	2.00
50	3.67	1.55	50	2.63	2.06
51	3.80	1.65	51	2.75	2.13
52	3.93	1.76	52	2.86	2.20
53	4.07	1.87	53	2.96	2.26
54	4.20	1.97	54	3.06	2.33
55	4.35	2.08	55	3.16	2.38
56	4.50	2.18	56	3.25	2.44
57	4.66	2.29	57	3.36	2.49
58	4.83	2.41	58	3.48	2.54
59	5.02	2.53	59	3.62	2.60
60	5.22	2.66	60	3.78	2.67

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Probabilities of Death for Disabled Retired Members <i>(per 100 at each age)</i>					
Current Assumption			Proposed Assumption		
Age	Male	Female	Age	Male	Female
61	5.44	2.80	61	3.96	2.74
62	5.69	2.96	62	4.15	2.83
63	5.96	3.13	63	4.36	2.93
64	6.26	3.32	64	4.58	3.05
65	6.58	3.53	65	4.82	3.19
66	6.94	3.76	66	5.07	3.34
67	7.33	4.01	67	5.35	3.52
68	7.75	4.29	68	5.65	3.72
69	8.21	4.58	69	5.98	3.95
70	8.70	4.89	70	6.34	4.21
71	9.21	5.22	71	6.75	4.50
72	9.76	5.58	72	7.20	4.83
73	10.34	5.95	73	7.70	5.20
74	10.94	6.35	74	8.25	5.62
75	11.55	6.78	75	8.87	6.08
76	12.19	7.23	76	9.55	6.60
77	12.83	7.71	77	10.31	7.17
78	13.49	8.23	78	11.13	7.81
79	14.16	8.78	79	12.04	8.52
80	14.84	9.38	80	12.18	8.52
81	15.52	10.02	81	12.32	8.53
82	16.22	10.71	82	12.46	8.54
83	16.92	11.45	83	12.61	9.33
84	18.34	12.25	84	13.60	10.16
85	19.98	13.10	85	14.86	11.01
86	21.66	14.00	86	16.25	11.88
87	23.37	14.97	87	17.68	12.76
88	25.07	15.99	88	19.13	13.67
89	26.75	17.04	89	20.59	14.62
90	28.39	18.28	90	22.08	15.64
91	29.99	19.45	91	23.62	16.74
92	31.53	20.54	92	25.23	17.96
93	33.02	21.52	93	26.92	19.30
94	34.46	22.39	94	28.72	20.78
95	35.86	23.14	95	30.62	22.44
96	37.17	23.75	96	32.61	24.23
97	38.30	24.48	97	34.64	26.14
98	39.20	25.45	98	36.64	28.16
99	39.79	26.60	99	38.60	30.27

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TABLE 5. DISABILITY INCIDENCE RATES

Probabilities of Disability for Active Members (per 100 working at each age)					
Current Assumption			Proposed Assumption		
Age	Male	Female	Age	Male	Female
20	0.0500	0.0250	20	0.0250	0.0150
21	0.0500	0.0250	21	0.0250	0.0150
22	0.0500	0.0250	22	0.0250	0.0150
23	0.0500	0.0250	23	0.0250	0.0150
24	0.0500	0.0250	24	0.0250	0.0150
25	0.0500	0.0250	25	0.0250	0.0150
26	0.0500	0.0250	26	0.0250	0.0150
27	0.0500	0.0250	27	0.0250	0.0150
28	0.0500	0.0250	28	0.0250	0.0150
29	0.0500	0.0250	29	0.0250	0.0150
30	0.0500	0.0250	30	0.0250	0.0150
31	0.0500	0.0250	31	0.0250	0.0150
32	0.0500	0.0250	32	0.0250	0.0150
33	0.0500	0.0250	33	0.0250	0.0150
34	0.0500	0.0250	34	0.0250	0.0150
35	0.0500	0.0250	35	0.0250	0.0150
36	0.0500	0.0250	36	0.0250	0.0150
37	0.0500	0.0250	37	0.0250	0.0150
38	0.0500	0.0250	38	0.0250	0.0150
39	0.0500	0.0250	39	0.0250	0.0150
40	0.1000	0.0500	40	0.0500	0.0250
41	0.1000	0.0500	41	0.0500	0.0250
42	0.1000	0.0500	42	0.0500	0.0250
43	0.1000	0.0500	43	0.0500	0.0250
44	0.1000	0.0500	44	0.0500	0.0250
45	0.1800	0.0900	45	0.1000	0.0500
46	0.1800	0.0900	46	0.1000	0.0500
47	0.1800	0.0900	47	0.1000	0.0500
48	0.1800	0.0900	48	0.1000	0.0500
49	0.1800	0.0900	49	0.1000	0.0500
50	0.3150	0.1575	50	0.1500	0.1000
51	0.3150	0.1575	51	0.1500	0.1000
52	0.3150	0.1575	52	0.1500	0.1000
53	0.3150	0.1575	53	0.1500	0.1000
54	0.3150	0.1575	54	0.1500	0.1000
55	0.5300	0.2650	55	0.2500	0.1500
56	0.5300	0.2650	56	0.2500	0.1500
57	0.5300	0.2650	57	0.2500	0.1500
58	0.5300	0.2650	58	0.2500	0.1500
59	0.5300	0.2650	59	0.2650	0.1350
60	0.7550	0.3775	60	0.3800	0.1900
61	0.7550	0.3775	61	0.3800	0.1900
62	0.7550	0.3775	62	0.3800	0.1900
63	0.7550	0.3775	63	0.3800	0.1900
64	0.7550	0.3775	64	0.3800	0.1900

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TABLE 6. WITHDRAWAL RATES

Probability of Withdrawal from Active Service (per 100 working at each service duration)					
Current Assumption			Proposed Assumption		
Service	Male	Female	Service	Male	Female
0	15.0	15.0	0	15.0	15.0
1	14.0	14.0	1	13.0	13.0
2	13.0	13.0	2	10.0	10.0
3	12.0	12.0	3	8.0	8.0
4	11.0	11.0	4	7.0	7.0
5	10.0	10.0	5	6.0	6.0
6	9.0	9.0	6	5.0	5.0
7	8.0	8.0	7	4.0	4.0
8	7.0	7.0	8	3.0	3.0
9	6.0	6.0	9	2.0	2.0
10	5.0	5.0	10	2.0	2.0
11	4.5	4.5	11	2.0	2.0
12	4.0	4.0	12	2.0	2.0
13	3.5	3.5	13	2.0	2.0
14	3.0	3.0	14	2.0	2.0
15	2.5	2.5	15	2.0	2.0
16	2.0	2.0	16	2.0	2.0
17	2.0	2.0	17	2.0	2.0
18	2.0	2.0	18	2.0	2.0
19	2.0	2.0	19	2.0	2.0
20 & over	2.0	2.0	20 & over	2.0	2.0

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TABLE 7. AMORTIZATION PERIODS FOR UNFUNDED ACTUARIAL ACCRUED LIABILITY

Base	Amortization Period	Ending Date*
Current UAAL Period Entire Unfunded Actuarial Accrued Liability (UAAL)	11.58 years remaining as of September 30, 2021	April 30, 2033
5-Year Phase Down 5 Bases each equal to 1/5 th of Initial UAAL	Varies from 10 to 14 years	Phase Down Period October 1, 2031 to September 30, 2036
7-Year Phase Down 7 Bases each equal to 1/7 th of Initial UAAL	Varies from 9 to 15 years	Phase Down Period October 1, 2030 to September 30, 2037
10-Year Phase Down 10 Bases each equal to 1/10 th of Initial UAAL	Varies from 8 to 17 years	Phase Down Period October 1, 2029 to September 30, 2039
Future Changes to UAAL	15 years	15 years after base is established

* Assumes legislation to change the amortization period is first adopted for contribution rates beginning October 1, 2022.

APPENDIX B. GLOSSARY OF KEY TERMS

Actuarial Accrued Liability or Total Pension Liability. The Present Value of Future Benefits allocated to past service in accordance with the actuarial cost method. GASB 67 uses the term Total Pension Liability.

Actuarial Cost Method. A method of allocating the present value of benefits to past and future periods. The entry age normal cost method with costs allocated as a level percentage of pay takes into consideration the effect of wage inflation.

Actuarial Gains and Losses. Changes to the Actuarial Accrued Liability due to deviations from the actuarial assumptions. These can include gains and losses from investments, employee turnover, disability, retirement, mortality, and administrative expenses.

Actuarial Value of Assets. A method of valuing Fund assets that may smooth gains and losses that occur in the market value over a period of time.

GASB. Government Accounting Standards Board. GASB Statements No. 67, and 68 are accounting standards issued by GASB that require certain items be disclosed in the Fund's financial statements.

Fiduciary Net Position. The market value of Fund assets.

Net Pension Liability. The dollar value of the Total Pension Liability that exceeds the market value of Fund assets. A fully funded plan will have no Net Pension Liability.

Normal Cost or Service Cost. The value of benefits earned for one year of service. The normal cost is calculated in accordance with the actuarial cost method. The accumulation of all normal costs assigned to past service equals the Actuarial Accrued Liability. GASB 68 uses the term Service Cost.

Present Value of Benefits. The sum of all benefits expected to be paid in the future by the retirement system, with the payments discounted to the present using the valuation interest rate. This includes benefits to be earned in the future for current employees.

Present Value of Future Normal Cost. The sum of all future normal costs expected for current employees, with the costs discounted back to the present using the valuation interest rate.

Security Ratio. The percentage of the Actuarial Accrued Liability that is funded by the Fund assets. A fully funded plan will have a security ratio of 100%.

Unfunded Actuarial Accrued Liability. The dollar value of the Actuarial Accrued Liability that exceeds the Actuarial Value of Assets. A fully funded plan will have no unfunded actuarial accrued liability.