

State of Alaska

Public Employees' Retirement System, Teachers'
Retirement System, National Guard and Naval Militia
Retirement System, and Judicial Retirement System

Actuarial Experience Study for the Period
July 1, 2013 to June 30, 2017

February 2019





February 14, 2019

Board of Trustees
Alaska Retirement Management Board
Department of Administration
Division of Retirement and Benefits
P.O. Box 110203
Juneau, AK 99811-0203

Dear Members of the Board:

We were engaged by the Alaska Retirement Management Board (ARMB) to study the economic and demographic experience of active and retired members of the State of Alaska Public Employees' Retirement System (PERS), Teachers' Retirement System (TRS), National Guard and Naval Militia Retirement System (NGNMRS), and Judicial Retirement System (JRS) for the 4-year period July 1, 2013 to June 30, 2017¹.

The experience study was prepared in accordance with generally accepted actuarial practices and best practices, which suggest that the actuary periodically undertake an experience study of the economic and demographic experience of active and retired members of the Systems, and that these studies take place at least every 4 to 5 years. The results of the experience study provide information to assist the ARMB in assessing whether to adopt new assumptions for measuring the Systems' pension and postretirement healthcare benefit obligations.

This report provides details of the Systems' experience for the period July 1, 2013 to June 30, 2017, and the new assumptions and funding methods we propose the ARMB consider adopting beginning with the June 30, 2018 valuations.

¹ Due to a lack of credible data, the experience of JRS was not studied.

We met several times with the ARMB in 2017 and 2018 regarding proposed changes to the economic and demographic assumptions and funding methods. During those meetings, we presented estimated cost effects of the proposed changes. Those cost effects have not been shown in this report.

The ARMB and staff of the State of Alaska may use this report for the review of the experience of the Systems. Use of this report for any other purposes or by anyone other than the ARMB and State of Alaska staff may not be appropriate and may result in mistaken conclusions because of failure to understand applicable assumptions, methods or inapplicability of the report for that purpose. Because of the risk of misinterpretation of results, you should ask us to review any statement you wish to make on the results contained in this report. We will not accept any liability for any such statement made without review by us.

Where presented, references to “funded ratio” and “unfunded actuarial accrued liability” typically are measured on an actuarial value of assets basis. It should be noted that the same measurements using market value of assets would result in different funded ratios and unfunded actuarial accrued liabilities. Moreover, the funded ratio presented is appropriate for evaluating the need and level of future contributions but makes no assessment regarding the funded status of the Systems if the Systems were to settle (i.e., purchase annuities) for all or a portion of their liabilities.

The experience study was performed under the overall direction of David Kershner, who meets the Qualifications of the American Academy of Actuaries to render the actuarial opinions herein. He is a Fellow of the Society of Actuaries, an Enrolled Actuary, a Member of the American Academy of Actuaries, and a Fellow of the Conference of Consulting Actuaries.

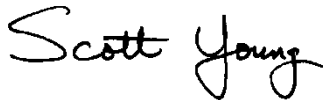
We would be pleased to discuss the results shown in this report at your convenience. We can be reached at (602) 803-6174 (David), (216) 315-1929 (Scott), and (917) 891-1286 (Stuart) to answer any questions about the report.

Sincerely,



David J. Kershner, FSA, EA, MAAA, FCA
Principal, Wealth
Buck

The undersigned actuary is a Fellow of the Society of Actuaries, an Enrolled Actuary, and a Member of the American Academy of Actuaries. He is responsible for all healthcare-related assumptions, and hereby affirms his qualification to render opinions in such matters in accordance with the Qualification Standards of the American Academy of Actuaries.



Scott Young, FSA, EA, MAAA
Director, Health

The undersigned actuary is a Fellow of the Society of Actuaries, an Enrolled Actuary, a Member of the American Academy of Actuaries, and a Fellow of the Conference of Consulting Actuaries. He is responsible for all investment-related assumptions, and hereby affirms his qualification to render opinions in such matters in accordance with the Qualification Standards of the American Academy of Actuaries.



Stuart M. Schulman, FSA, EA, CFA, FCA, MAAA
Principal, Financial Risk Management

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Introduction

Assumptions are a key element in an actuarial valuation. In order to perform an actuarial valuation of the assets and liabilities of the Systems, the actuary must adopt assumptions with respect to each of the following:

1. Investment return on the Systems' funds over the period benefits to current members will be paid, including inflation during the same period.
2. The relative increases in the salary of a member from the date of the valuation to the date of separation from active service.
3. The expected mortality rates among retired persons (healthy and disabled).
4. The probabilities of members separating from active service on account of withdrawal, death and disability.
5. The ages at which members will retire.
6. The rate at which separating members will elect to receive a refund of their contributions.
7. The number of dependents, marriage at retirement, age of spouse at retirement, etc.
8. Assumptions specific to post-retirement healthcare benefits.

The actuarial valuation is the method by which the annual funding requirement is determined. Actuarial assumptions do not directly impact the total cost of a retirement program, but they are a key variable in determining the timing of that cost and the allocation of the cost between current and future contributions. The proposed changes in actuarial assumptions reflect the most recent experience as well as future expected experience. Each assumption should reflect the actuary's best estimate of anticipated long-term experience of the System.

Based on Alaska Statutes 37.10.220(a)(9), the Alaska Retirement Management Board (ARMB) requests an actuarial experience study at least every four years. The purpose of this study is to measure actual experience under the Systems since June 30, 2013, compare this experience to current assumptions, and propose changes to the assumptions. The last experience study was performed in 2013 for PERS and TRS, and assumptions were adopted by the ARMB in September 2014 for use beginning with the June 30, 2014 valuations.

The objectives of this study are to:

- Determine appropriate rates to anticipate the following events among active members:
 - termination from employment

- mortality during active service
- disability retirement
- normal retirement
- early retirement
- salary increases
- Determine appropriate rates to anticipate mortality among healthy and disabled retirees and their dependents.
- Evaluate whether changes to the funding method should be considered.
- Propose changes regarding the post-retirement healthcare assumptions.

Methodology

Data is supplied annually to the actuary by the State of Alaska Department of Administration, Retirement and Benefits Division, for purposes of the annual actuarial valuations. This data includes demographic characteristics of current and past members, including any changes in the members' status or relationship with the Systems. The data also includes a salary history for active members. These demographic changes and salary history are the basis for the experience study.

Tabulations were compiled that show the distribution by age and/or service of the liability (Actuarial Accrued Liability) of members who were exposed during the 4-year period to the events of termination from employment, retirement, death and disability. A member is considered exposed to an event if he or she meets the age and/or service requirements for that event. All tabulations have been weighted by the liability for each member². The assumed rates of occurrence for each event, which are currently used in the annual actuarial valuations, were then applied to the members exposed to determine the liability of members expected to separate from service for each category.

The liability of members who actually separated from service due to termination from employment, retirement, death or disability were then compared to the expected liability. Data may be grouped by age and/or service increments to provide statistically significant results.

The expected and actual salaries as of the end of each year were also compared to actual salaries as of the end of each previous year. The comparisons show an average annual increase in both expected and actual salaries for the 4-year period.

The results of the experience study are the basis for the actuary's proposed assumption changes. The actuary must also take into account benefit changes that occurred during the experience period. If a change in benefit levels or benefit eligibility was made during the experience period, the actuary should consider the impact the change may have on

² Except for DCR plan withdrawal rates, which were weighted by headcounts.

the data used in the analysis. There have been no significant changes in Alaska plan benefits during the 4-year period ending June 30, 2017.

In addition to comparing actual to expected experience and adjusting the results for special plan benefits and economic conditions, the actuary must consider future expectations of experience due to future plan changes or expected changes in the economy.

To summarize, the actuary's proposed assumptions are based on the following:

- comparison of actual to expected experience
- adjustment for special plan benefits and past economic conditions
- adjustment for future plan changes and economic conditions

Each assumption should be the actuary's best estimate of reasonable long-term expectations.

Actuarial Standards of Practice

The Actuarial Standards Board issues Actuarial Standards of Practice that all actuaries must follow. The Actuarial Standards of Practice that are applicable to this experience study include No. 4 (Measuring Pension Obligations and Determining Pension Plan Costs or Contributions), No. 6 (Measuring Retiree Group Benefit Obligations), No. 27 (Selection of Economic Assumptions for Measuring Pension Obligations), and No. 35 (Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations).

Section 1: Demographic Assumptions³

This section compares the actual demographic experience during the 4-year period ending June 30, 2017 with the expected experience (which is based on the current demographic assumptions that have been used since the June 30, 2014 actuarial valuations).

A. Healthy Mortality During Active Service and After Termination

The tables below show the Actuarial Accrued Liability (AAL) for actual and expected deaths of healthy PERS and TRS active members during the 4-year period ending June 30, 2017. “Current expected” means the expected AAL due to deaths during the 4-year period based on the current assumptions. “New expected” means the AAL that would have been expected due to deaths during the 4-year period using the new proposed assumptions. “Actual” means the AAL due to actual deaths that occurred during the 4-year period. We have also shown the expected and actual number of deaths (headcounts) during the 4-year period.

1. Pre-Termination Mortality (Healthy)

Pre-Termination Mortality (Healthy)							
	Current Expected (CE)	Actual (A)	A/CE	New Expected (NE)	A/NE	Headcounts (CE)	Headcounts (A)
PERS Peace/Fire and Others							
Females	\$15,925,019	\$15,743,892	99%	\$15,868,886	99%	67	69
Males	\$22,189,461	\$23,911,937	108%	\$30,658,953	78%	70	88
TRS							
Females	\$5,455,716	\$5,220,561	96%	\$7,554,288	69%	14	11
Males	\$4,907,903	\$6,527,897	133%	\$6,274,947	104%	11	14

The Society of Actuaries published the results of a major mortality study in October 2014⁴. The standard base table and generational mortality improvement scale from that study are called “RP-2014” and “MP-2017”, respectively.

³ The current and proposed demographic assumptions are shown in Section 5.

⁴ That study excluded experience from public-sector plans. In August 2018, the Society of Actuaries published an exposure draft of their mortality study that focused exclusively on public-sector plan experience. The base mortality tables from that study were not very different than RP-2014. Since the public-sector mortality study was released as an exposure draft, the ARMB elected to make their decision on the mortality assumption based on the October 2014 study. (In January 2019, the Society of Actuaries published a final version of the public-sector mortality study that did not include changes to the base tables that were included in the exposure draft).

Because the experience during the 4-year period was not fully credible for each group, we applied the procedure published by the Society of Actuaries⁵ for situations with less than full credibility. We propose the following pre-termination healthy mortality assumption⁶:

- PERS Peace/Fire and Others: 100% (male) and 100% (female) of RP-2014 employee table with MP-2017 generational improvement
- TRS: 100% (male) and 100% (female) of RP-2014 white-collar employee table with MP-2017 generational improvement

2. Post-Termination Mortality (Healthy)

Post-Termination Mortality (Healthy)							
	Current Expected (CE)	Actual (A)	A/CE	New Expected (NE)	A/NE	Headcounts (CE)	Headcounts (A)
PERS Peace /Fire and Others							
Females	\$158,044,937	\$166,106,372	105%	\$168,077,974	99%	1,269	1,437
Males	\$272,620,195	\$270,887,500	99%	\$276,758,853	98%	1,289	1,472
TRS							
Females	\$103,349,977	\$118,248,422	114%	\$131,933,132	90%	359	452
Males	\$116,315,167	\$121,662,912	105%	\$131,536,002	92%	322	375

Because the experience during the 4-year period was only partially credible for each group, we followed the same credibility procedure described above. We propose the following post-termination healthy mortality assumption:

- PERS Peace/Fire and Others: 91% (male) and 96% (female) of RP-2014 healthy annuitant table with MP-2017 generational improvement
- TRS: 93% (male) and 90% (female) of RP-2014 white-collar healthy annuitant table with MP-2017 generational improvement

B. Disabled Mortality

The table below shows the AAL for actual and expected deaths of System disabled retirees during the 4-year period ending June 30, 2017. “Current expected” means the expected AAL due to deaths of disabled retirees during the 4-year period based on the current assumptions. “New expected” means the AAL that would have been expected due to deaths of disabled retirees during the 4-year period using the new proposed assumptions. “Actual” means the AAL due to actual deaths of disabled retirees that

⁵ Society of Actuaries August 2017 publication titled *Credibility Educational Resources for Pension Actuaries: Application of Credibility Theory to Mortality Assumption*.

⁶ All proposed mortality assumptions in this report are based on the benefit-weighted version of RP-2014, rolled back to 2006 using MP-2014 and projected forward using MP-2017.

occurred during the 4-year period. We have also shown the expected and actual number of deaths during the 4-year period.

Post- Retirement Disability Mortality							
		Actual (A)	A/CE	New Expected (NE)	A/NE	Headcounts (CE)	Headcounts (A)
PERS Peace/Fire and Others							
Females	\$1,243,661	\$2,729,511	219%	\$1,291,560	211%	6	16
Males	\$3,887,374	\$3,660,203	94%	\$2,813,386	130%	14	16
TRS							
Females	\$414,373	\$1,672,483	404%	\$437,885	382%	1	5
Males	\$348,054	\$0	0%	\$261,377	0%	1	0

Because the experience during the 4-year period was not fully credible for each group, we followed the same credibility procedure described above. We propose the following post-retirement disabled mortality assumption:

- PERS Peace/Fire and Others: 100% (male) and 100% (female) of RP-2014 disabled table with MP-2017 generational improvement
- TRS: 100% (male) and 100% (female) of RP-2014 disabled table with MP-2017 generational improvement

C. Withdrawal from Service Before Retirement

The current assumption for withdrawal uses a “select and ultimate” table. During the select period (the first five years of an employee’s career (eight years for TRS)), the withdrawal assumption is based on years of service and gender. After the select period (the “ultimate period”), the withdrawal assumption is based on age and gender.

Withdrawal rates for participants with less than five (PERS) or eight (TRS) years of service were not studied since these Systems were closed to new entrants as of July 1, 2006. Therefore, we propose no changes to the select withdrawal rates for PERS or TRS. We are proposing new select withdrawal rates for PERS DCR and TRS DCR based on the experience for the 4-year period ending June 30, 2017.

The table below shows the AAL for actual and expected terminations of PERS and TRS active members during the 4-year period ending June 30, 2017. “Current expected” means the expected AAL due to terminations during the 4-year period based on the current assumptions. “New expected” means the AAL that would have been expected due to terminations during the 4-year period using the new proposed assumptions. “Actual” means the AAL due to actual terminations that occurred during the 4-year period. We have also shown the expected and actual number of terminations during the 4-year period.

	Females					Males				
	Current Expected (CE)	Actual (A)	A/CE	New Expected (NE)	A/NE	Current Expected (CE)	Actual (A)	A/CE	New Expected (NE)	A/NE
PERS Others – with at least 5 years of service										
- Under age 40	\$24,549,020	\$23,681,799	96%	\$23,316,538	102%	\$16,993,008	\$21,219,008	125%	\$20,393,303	104%
- Age 40 – 49	\$72,497,927	\$75,896,245	105%	\$76,129,990	100%	\$55,162,395	\$61,124,153	111%	\$60,673,061	101%
- Age 50 – 54	\$67,360,729	\$72,976,458	108%	\$72,099,488	101%	\$53,432,380	\$50,527,984	95%	\$50,804,332	99%
Overall	\$165,042,993	\$174,581,120	106%	\$172,094,422	101%	\$125,885,622	\$133,452,333	106%	\$132,074,420	101%
Headcounts	1,081	1,456				661	850			
PERS Peace/Fire – with at least 5 years of service										
- Under age 40	\$2,047,048	\$1,739,316	85%	\$1,739,385	100%	\$6,591,872	\$7,846,356	119%	\$7,571,887	104%
- Age 40 – 49	\$4,105,640	\$3,990,056	97%	\$3,983,462	100%	\$16,677,808	\$15,751,700	94%	\$15,843,949	99%
- Age 50 – 54	\$1,548,431	\$3,514,629	227%	\$2,516,873	140%	\$8,516,873	\$9,233,303	108%	\$9,027,885	102%
Overall	\$7,701,119	\$9,244,042	120%	\$8,239,719	112%	\$31,789,250	\$32,831,359	103%	\$32,445,744	101%
Headcounts	28	39				100	134			
TRS – with at least 8 years of service										
- Under age 40	\$11,802,191	\$12,249,606	104%	\$12,161,299	101%	\$4,120,317	\$3,529,095	86%	\$3,502,357	101%
- Age 40 – 49	\$40,531,515	\$29,962,361	74%	\$30,808,144	97%	\$17,512,472	\$11,433,863	65%	\$13,141,218	87%
- Age 50 – 54	\$16,924,894	\$21,660,622	128%	\$21,330,390	102%	\$6,862,785	\$8,487,184	124%	\$7,269,403	117%
Overall	\$69,876,332	\$65,558,266	94%	\$64,857,649	101%	\$28,606,912	\$24,088,432	84%	\$23,965,433	101%
Headcounts	330	361				118	121			

The table below shows the actual and expected number of PERS DCR and TRS DCR terminations of active members during the 4-year period ending June 30, 2017. “Current expected” means the expected number of terminations during the 4-year period based on the current assumptions. “New expected” means the number of terminations that would have been expected during the 4-year period using the new proposed assumptions. “Actual” means the actual number of terminations during the 4-year period.

	Females					Males				
	Current Expected (CE)	Actual (A)	A/CE	New Expected (NE)	A/NE	Current Expected (CE)	Actual (A)	A/CE	New Expected (NE)	A/NE
PERS DCR - Others										
- Years < 5	4,671	4,932	106%	4,904	101%	3,068	3,243	106%	3,204	101%
- Years 5+	823	949	115%	906	105%	556	727	131%	696	104%
PERS DCR– Peace/Fire										
- Years < 5	78	102	131%	96	106%	332	351	106%	348	101%
- Years 5+	21	32	150%	30	107%	92	109	119%	105	104%
TRS DCR										
- Years < 5	975	952	98%	952	98%	389	406	104%	389	104%
- Years 5+	312	406	130%	367	111%	118	181	154%	167	108%

We propose keeping the select period the same for all plans. We propose changing the PERS and TRS sex-distinct withdrawal rates for the ultimate period as follows:

- PERS Others
 - Males – For ages less than 40, increase the rates by 20%. For ages 40 – 49, increase the rates by 10%. For ages 50 – 54, decrease the rates by 5%. For ages over 54 (not yet eligible to retire), change to 3%.
 - Females – For ages less than 40, decrease the rates by 5%. For ages 40 – 49, increase the rates by 5%. For ages 50 – 54, increase the rates by 7%. For ages over 54 (not yet eligible to retire), change to 5%.
- PERS Peace/Fire
 - Males – For ages less than 40, increase the rates by 15%. For ages 40 – 49, decrease the rates by 5%. For ages 50 – 54, increase the rates by 6%. For ages over 54 (not yet eligible to retire), change to 3%.
 - Females – For ages less than 40, decrease the rates by 15%. For ages 40 – 49, decrease the rates by 3%. For ages 50 – 53, increase the rates by 100%. For age 54, change to 3%. For ages over 54 (not yet eligible to retire), change to 2%.
- TRS
 - Males – For ages less than 40, decrease the rates by 15%. For ages 40 – 49, decrease the rates by 25%. For ages 50 – 53, increase the rates by 20%. For age 54, change to 3%. For ages over 54 (not yet eligible to retire), change to 2%.
 - Females – For ages less than 40, increase the rates by 3%. For ages 40 – 49, decrease the rates by 24%. For ages 50 – 54, increase the rates by 26%. For ages over 54 (not yet eligible to retire), change to 5%.

We propose changing the DCR sex-distinct withdrawal rates for the select and ultimate periods as follows:

- PERS DCR Others
 - Males – Increase all rates in the select period by 5%. Increase all rates in the ultimate period by 25%.
 - Females – Increase all rates in the select period by 5%. Increase all rates in the ultimate period by 10%.
- PERS DCR Peace /Fire
 - Males – Increase all rates in the select period by 5%. Increase all rates in the ultimate period by 15%.
 - Females – Increase all rates in the select period by 25%. Increase all rates in the ultimate period by 40%.

- TRS DCR
 - Males – No changes in the select period. Increase all rates in the ultimate period by 50%.
 - Females – No changes in the select period. Increase all rates in the ultimate period by 25%.

For NGNMRS, there was not enough credible experience to study terminations during the first five years of a member’s career. Therefore, we propose no changes to the select withdrawal rates for NGNMRS.

The table below shows the AAL for actual and expected terminations of NGNMRS active members with at least five years of service during the 4-year period ending June 30, 2017. “Current expected” means the expected AAL due to terminations during the 4-year period based on the current assumptions. “New expected” means the AAL that would have been expected due to terminations during the 4-year period using the new proposed assumptions. “Actual” means the AAL due to actual terminations that occurred during the 4-year period. We have also shown the expected and actual number of terminations during the 4-year period.

	Females					Males				
	Current Expected (CE)	Actual (A)	A/CE	New Expected (NE)	A/NE	Current Expected (CE)	Actual (A)	A/CE	New Expected (NE)	A/NE
NGNMRS – with at least 5 years of service										
- Age 20 - 29	\$22,000	\$43,948	200%	\$41,796	105%	\$98,885	\$168,124	170%	\$148,333	113%
- Age 30 - 39	\$107,042	\$202,573	189%	\$203,368	100%	\$468,392	\$678,881	145%	\$702,568	97%
- Age 40 - 49	\$41,566	\$75,948	183%	\$78,990	96%	\$157,325	\$247,665	157%	\$235,976	105%
- Age 50 -59	\$7,597	\$22,191	292%	\$14,437	154%	\$17,035	\$36,087	212%	\$25,544	141%
Overall	\$178,205	\$344,660	193%	\$338,592	102%	\$742,436	\$1,141,269	154%	\$1,113,476	102%
Headcounts	95	202				381	692			

We propose changing the NGNMRS sex-distinct withdrawal rates for the ultimate period as follows:

- Males – Increase all rates by 50%
- Females – Increase all rates by 90%

D. Retirement

The tables below show the AAL for actual and expected retirements of PERS, TRS and NGNMRS members during the 4-year period ending June 30, 2017. "Current expected" means the expected AAL due to retirements during the 4-year period based on the current assumptions. "New expected" means the AAL that would have been expected due to retirements during the 4-year period using the new proposed assumptions. "Actual" means the AAL due to actual retirements that occurred during the 4-year period. We have also shown the expected and actual number of retirements during the 4-year period.

Reduced Retirement (PERS/TRS)										
Females						Males				
	Current Expected (CE)	Actual (A)	A/CE	New Expected (NE)	A/NE	Current Expected (CE)	Actual (A)	A/CE	New Expected (NE)	A/NE
PERS Others	\$165,231,211	\$185,225,372	112%	\$180,994,487	102%	\$120,944,464	\$145,755,648	121%	\$146,100,817	100%
PERS Peace/Fire	\$2,526,146	\$3,243,017	128%	\$2,998,620	108%	\$12,149,119	\$11,233,483	92%	\$11,341,114	99%
TRS	\$43,777,541	\$38,362,724	88%	\$37,654,229	102%	\$15,735,766	\$18,247,984	116%	\$18,683,029	98%
Headcounts										
PERS Others	647	671				370	430			
PERS Peace/Fire	8	9				36	36			
TRS	149	133				48	54			
All Retirements (NGNMRS) - Unisex										
NGNMRS	\$4,574,127	\$6,095,310	133%	5,863,375	104%					
Headcounts	488	715								

Unreduced Retirement (PERS/TRS)										
Female						Male				
	Current Expected (CE)	Actual (A)	A/CE	New Expected (NE)	A/NE	Current Expected (CE)	Actual (A)	A/CE	New Expected (NE)	A/NE
PERS Others	\$572,319,327	\$676,720,497	118%	\$630,371,200	107%	\$559,567,836	\$658,892,264	118%	\$616,491,286	107%
PERS Peace/Fire	\$32,427,533	\$32,845,860	101%	\$32,427,533	101%	\$167,172,283	\$191,443,328	115%	\$183,579,095	104%
TRS	\$447,249,657	\$483,982,086	108%	\$470,916,000	103%	\$245,443,639	\$240,559,239	98%	\$244,321,956	98%
Headcounts										
PERS Others	1,953	2,083				1,510	1,592			
PERS Peace/Fire	61	51				259	279			
TRS	917	955				440	414			

We propose the following new retirement rates:

- Reduced Retirement (PERS/TRS)
 - PERS Others
 - Males: 6% at all ages except 52-53 (9%), 54 (20%), 59 (15%)
 - Females: 8% at ages 50-53, 15% at 54, 6% at 55-58, 20% at 59
 - PERS Peace/Fire
 - Males: 7% at all ages except 50-51 (5%), 59 (20%)
 - Females: 5% at age 50, 7% at 51-53, 35% at 54, 8% at 55-58, 20% at 59
 - TRS
 - Males: 10% at all ages except 55 (15%)
 - Females: 10% at ages 50-52, 12% at 53-54, 8% at 55-59
 - PERS DCR – No changes because not enough credible experience
 - TRS DCR – No changes because not enough credible experience
- Unreduced Retirement (PERS/TRS)
 - PERS Others
 - Males: Increase all rates by 10%, 100% at age 80
 - Females: Increase all rates by 10%, 100% at age 80
 - PERS Peace/Fire
 - Males: Increase all rates by 10%, 100% at age 70
 - Females: No change to rates except 100% at age 70
 - TRS
 - Males: No change to rates except 100% at age 80
 - Females: Increase all rates (except ages over 74) by 5%, 100% at age 80
- NGNMRS – Increase rates at all ages

For deferred vested members in PERS and TRS, the current retirement assumption is 100% at the earliest age that the member is eligible for an unreduced retirement benefit. We propose no change to this assumption.

E. Disability

The table below shows the AAL for actual and expected disabilities of PERS and TRS members during the 4-year period ending June 30, 2017. “Current expected” means the expected AAL due to disability during the 4-year period based on the current assumptions. “New expected” means the AAL that would have been expected due to disability during the 4-year period using the new proposed assumptions. “Actual” means the AAL due to actual disabilities that occurred during the 4-year period. We have also shown the expected and actual number of disabilities during the 4-year period.

Disability										
	Female					Male				
	Current Expected (CE)	Actual (A)	A/CE	New Expected (NE)	A/NE	Current Expected (CE)	Actual (A)	A/CE	New Expected (NE)	A/NE
PERS Others	1,292,459	3,180,366	246%	2,584,917	123%	1,557,055	2,526,140	162%	2,335,582	108%
PERS Peace/Fire	311,367	119,043	38%	155,684	76%	1,982,768	1,593,973	80%	1,586,214	100%
TRS	1,653,378	1,657,382	100%	1,653,378	100%	822,238	463,367	56%	452,231	102%
Headcounts										
PERS Others	10	19				9	14			
PERS Peace/Fire	1	1				6	6			
TRS	8	8				3	3			

We propose the following changes to the disability rates (in all cases, the disability rate is 0% upon becoming eligible to retire):

- PERS Others
 - Males: Increase all rates by 50%
 - Females: Increase all rates by 100%
- PERS Peace/Fire
 - Males: Decrease all rates by 20%
 - Females: Decrease all rates by 50%

- TRS
 - Males: Decrease all rates by 45% (except change to 0.0337% at all ages less than 33)
 - Females: No changes (except change to 0.0612% at all ages less than 31)

F. Withdrawal of Contributions at Termination

Vested members who terminate prior to being eligible for retirement have the option of withdrawing their contributions with interest or leaving their money in the System and receiving a deferred retirement annuity benefit.

We reviewed the data for vested members who left employment during the 4-year period ending June 30, 2017. The table below summarizes the current assumption (% of vested members who will withdraw their contributions at termination), actual experience, and the proposed assumption.

	Current Assumption	Actual Experience	Proposed Assumption ⁷
PERS Others	10%	7%	5%
PERS Peace/Fire	15%	12%	10%
TRS	5%	0%	0%

G. Other Demographic Assumptions

Percent Covering Dependent Spouse at Retirement Without Dual Coverage

This assumption (referred to as the “marriage assumption” for the pension valuation) is used (i) to estimate the death benefits payable to a spouse upon the death of an active or deferred vested member in the pension valuation, and (ii) to determine the expected number of spouses who are eligible to elect participation in the post-retirement healthcare valuation.

The table below summarizes the experience for the 4-year period ending June 30, 2017, and the current and proposed assumptions:

	PERS Others		PERS Peace/Fire		TRS	
	Male	Female	Male	Female	Male	Female
Experience - Percent married	62%	51%	73%	45%	59%	50%
Current assumption	75%	70%	85%	60%	85%	75%
Proposed assumption ⁸	65%	60%	75%	50%	65%	60%

⁷ In all cases, the assumption is 100% of members will withdraw their contributions if they are not vested at termination.

⁸ The proposed changes apply to post-retirement healthcare benefits only (and include an allowance for future covered children). No changes to this assumption are proposed for pension benefits.

Age Difference between Husbands and Wives

The age difference between husbands and wives is used in conjunction with the dependent spouse assumption to value death benefits, expected optional form of payment elections and post-retirement healthcare benefits. The table below summarizes the current and proposed assumptions:

	PERS Others	PERS Peace/Fire	TRS
Male Member/Female Spouse			
Experience - Average age older	3.7 years older	3.0 years older	4.2 years older
Current age difference assumption	3 years older	3 years older	3 years older
Proposed age difference assumption	3 years older	3 years older	3 years older
Female Member/Male Spouse			
Experience - Average age younger	1.5 years younger	0.2 years younger	1.0 years younger
Current age difference assumption	3 years younger	3 years younger	3 years younger
Proposed age difference assumption	2 years younger	2 years younger	2 years younger

Number of Dependent Children

Benefits are valued only for members currently covering dependent children. Coverage for dependent children is currently assumed through age 23 (unless disabled, in which case coverage is assumed throughout the disabled child's life). The proposed dependent spouse assumption for post-retirement healthcare benefits shown above has been set to include an allowance for future covered children.

Alaska Residency

Eligible benefit recipients who reside in Alaska receive an Alaska cost-of-living allowance. An assumption is made regarding how many members will remain in Alaska after retirement.

The table below summarizes the experience for the 4-year period ending June 30, 2017, and the current and proposed assumptions:

	PERS Others	PERS Peace/Fire	TRS
Total benefit amount of all benefit recipients potentially eligible for the Alaska COLA (in thousands)	\$146,955	\$23,244	\$99,785
Total benefit amount of benefit recipients actually receiving an Alaska COLA (in thousands)	\$100,146	\$14,412	\$61,011
Percentage of benefit recipients receiving Alaska COLA	68%	62%	61%
Current assumption	70%	65%	60%
Proposed assumption	70%	65%	60%

Number of Unused Sick Days (TRS only)

TRS members receive service credit for unused sick leave when they retire. An assumption is made to determine the expected amount of credit members will receive when they retire.

The current assumption is that a TRS member will receive 4.5 days for each year of service. We did not have sufficient data to study this assumption, so we propose no change.

Part-time Service Earned During the Year

Some PERS and TRS members are employed part-time. Members earn a portion of a year of service for their part-time employment. An assumption is made regarding the amount of service these members will earn during a year.

We reviewed members who were part-time to analyze this assumption. The table below summarizes the experience for the 4-year period ending June 30, 2017, and the current and proposed assumptions.

	PERS Others	PERS Peace/Fire	TRS
Total part-time member exposures	4,160	N/A ⁹	696
Average increase in service	0.81	N/A	0.72
Current assumption	0.65	N/A	0.75
Proposed assumption	0.75	N/A	0.75

Occupational vs. Non-occupational Death and Disability

PERS provides different benefits for members who become disabled or die due to occupational causes. TRS provides different benefits for members who die due to occupational causes.

The table below summarizes the experience for the 4-year period ending June 30, 2017, and the current and proposed assumptions:

	PERS Others	PERS Peace/Fire	TRS
Disability			
Number of members receiving a non-occupational disability benefit	441	27	N/A
Number of members receiving an occupational disability benefit	281	94	N/A
Total number of members receiving disability benefit	722	121	N/A
Portion occupational	39%	78%	N/A
Current assumption	50%	70%	N/A
Proposed assumption	40%	75%	N/A
Death			
Current assumption	50%	70%	15%
Proposed assumption	40%	75%	15%

We do not have data that identifies members for whom an occupational vs. non-occupational death benefit is paid. Therefore, we propose occupational/non-occupational death assumptions equal to the disability assumptions. For TRS, we propose no change to the death assumption.

Rehires

Beginning with the June 30, 2016 valuations, a load was added to the Normal Cost to account for rehires. The loads were based on a weighted average of the 5-year history

⁹ There are no PERS Peace/Fire members who are classified as part-time.

of rehire losses as measured in the valuations for the 5-year period ending June 30, 2015. We revisited these rehire loads by looking at the 5-year history of rehire losses as measured in the valuations for the 5-year period ending June 30, 2017.

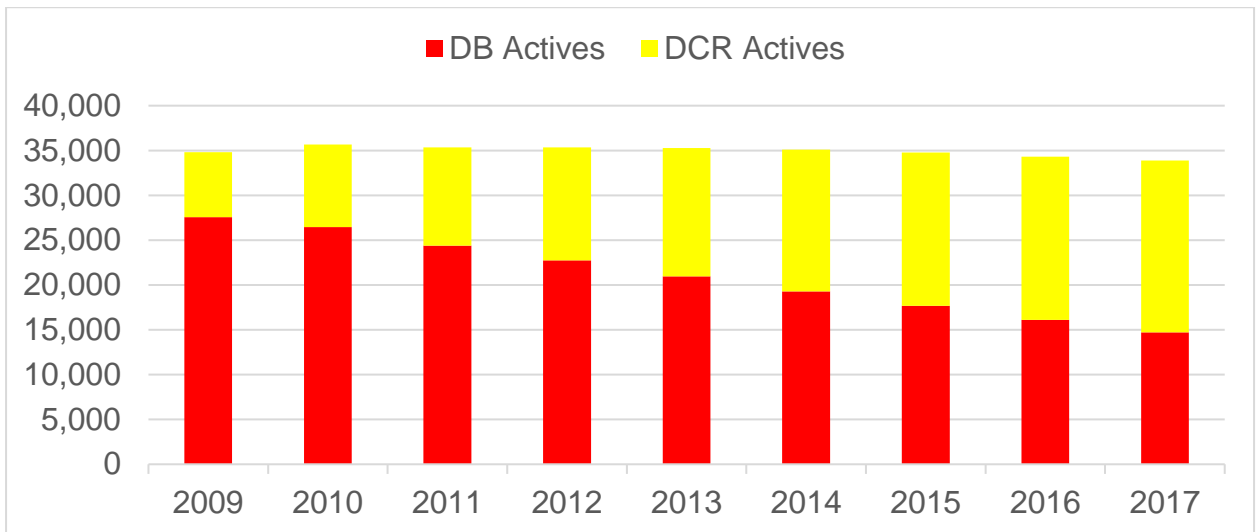
The current and proposed rehire Normal Cost loads are shown in the following table:

	Current		Proposed	
	PERS	TRS	PERS	TRS
Pension	14.23%	18.49%	18.77%	15.57%
Healthcare	17.24%	10.39%	17.09%	12.03%

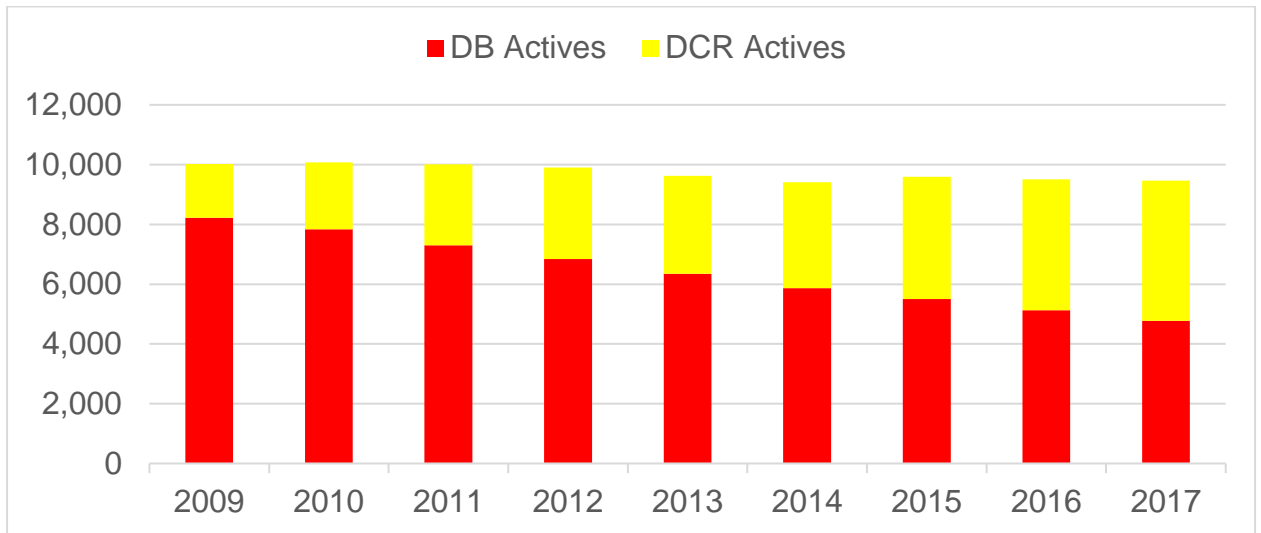
Active Population Growth

The graphs below show the number of DB and DCR active members for each of the last nine years:

PERS



TRS



The percentage increases/(decreases) in the total number of active members (DB/DCR combined) are:

	PERS	TRS
2010	2.45%	0.60%
2011	(0.89)%	(0.66)%
2012	(0.09)%	(1.09)%
2013	(0.16)%	(2.81)%
2014	(0.49)%	(2.24)%
2015	(0.97)%	(2.01)%
2016	(1.26)%	(0.95)%
2017	(1.25)%	(0.42)%
8-year geometric average (2010-2017)	(0.34)%	(0.71)%
4-year geometric average (2014-2017)	(0.99)%	(0.41)%

The current overall active population growth assumption used for PERS/TRS projections is 0%. We propose no change to this assumption.

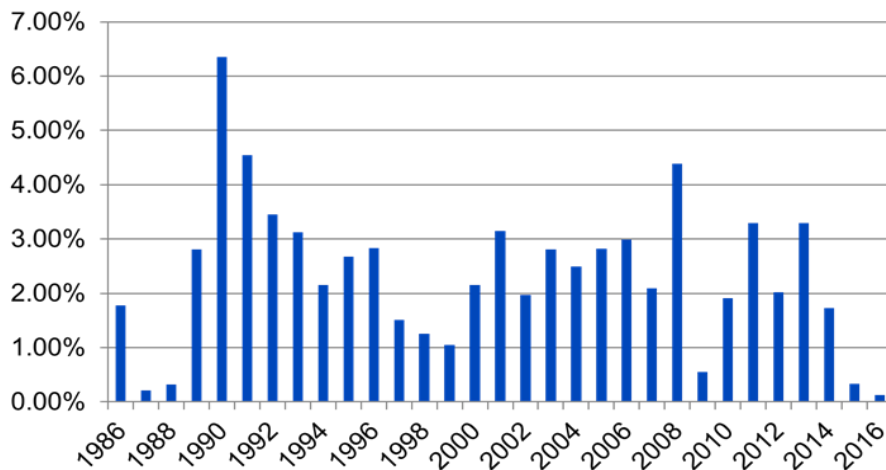
Section 2: Economic Assumptions

A. Inflation

Inflation is a core component of several of the economic assumptions, including the investment return assumption, salary increases, payroll growth rate, and healthcare trend rates. The current inflation assumption is 3.12% per year. The table below summarizes historical inflation rates for 10-year periods, including national inflation rates and inflation rates specific to Alaska.

Ten-Year Period Ending	Average Inflation Rate (CPI)	
	National	Anchorage
1996	3.58%	2.83%
2006	2.57%	2.22%
2016	1.71%	1.96%
20-Year Arithmetic Average	2.14%	2.09%
Current Assumption	3.12%	3.12%

Below is a graph showing historical inflation rates under the Consumer Price Index specific for Anchorage:



The arithmetic average of the Anchorage CPI for the 4-year period ending in 2016 is 1.4%.

We performed a projection of expected inflation rates using the GEMS economic scenario generator, developed by Conning and Company. GEMS is an econometric

model that incorporates historical data and forecasts future values for inflation and all relevant asset classes.

Our projections were done under two approaches:

- Approach #1 – The propensity for asset returns and inflation to revert (eventually) to historical norms occurs, recognizing the inherent difficulty in forecasting current conditions to persist for 30+ years. Under this approach, the expectation is that asset returns and inflation rates will center around historical averages.
- Approach #2 – Emerging demographic trends (such as aging workforce, increasing longevity, globalization of economy, and technological innovation transforming the workforce) that contribute to the “new normal” of low GDP, low inflation, and a low asset return environment will persist well beyond the current business cycle. Under this approach, expectations around returns for “return generating” assets such as equities and real estate are approximately 150 to 200 basis points below that expected under Approach #1.

We also considered expert opinions (such as the Philadelphia Fed) and market forecasts of inflation (such as the rate of inflation implied in the TIPS spread), as well as the long-term forecast of the Social Security administration.

The projected inflation rates for the next 10, 20 and 30 years are as follows:

- Approach #1
 - 10 years: 2.49%
 - 20 years: 2.86%
 - 30 years: 3.12%
- Approach #2
 - 10 years: 2.22%
 - 20 years: 2.56%
 - 30 years: 2.83%

Based on our analysis, we propose lowering the inflation rate to a rate between 2.5% and 3.0%¹⁰.

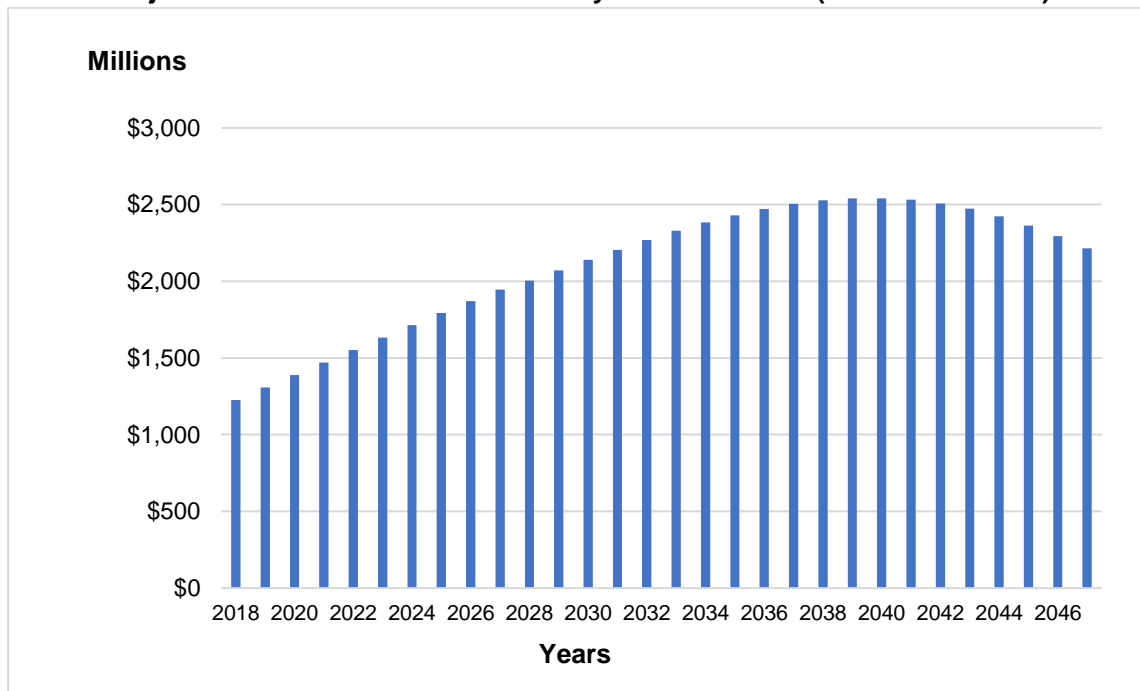
¹⁰ At the January 2019 meeting, the ARMB selected a new inflation rate of 2.5%. The proposed economic assumptions shown later in this report reflect this new inflation rate.

B. Investment Return

The investment return assumption is used to discount the projected benefits expected to be paid from the System. It is the assumption that has the largest impact on the Actuarial Accrued Liability and contribution rates.

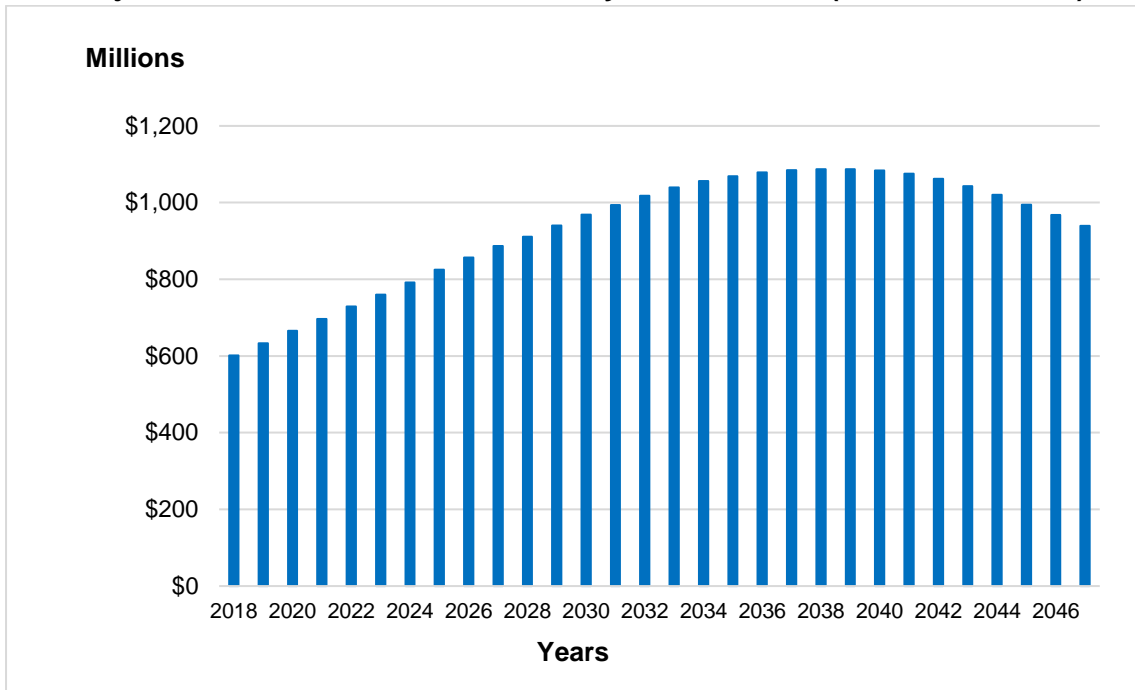
This assumption should be a best estimate of long-term expectations. In setting this assumption, we consider recent history, but recognize that the last few years of very low returns may not be the best predictor of long-term expectations. Although PERS and TRS were closed to new entrants in 2006, the projected pension and healthcare benefits expected to be paid beyond 20 years from now are significant. This can be seen from the following graphs that show the projected benefits expected to be paid from PERS and TRS from FY2018 through FY2047¹¹:

Projection of Future Annual Benefit Payments for PERS (FY2018 – FY2047)

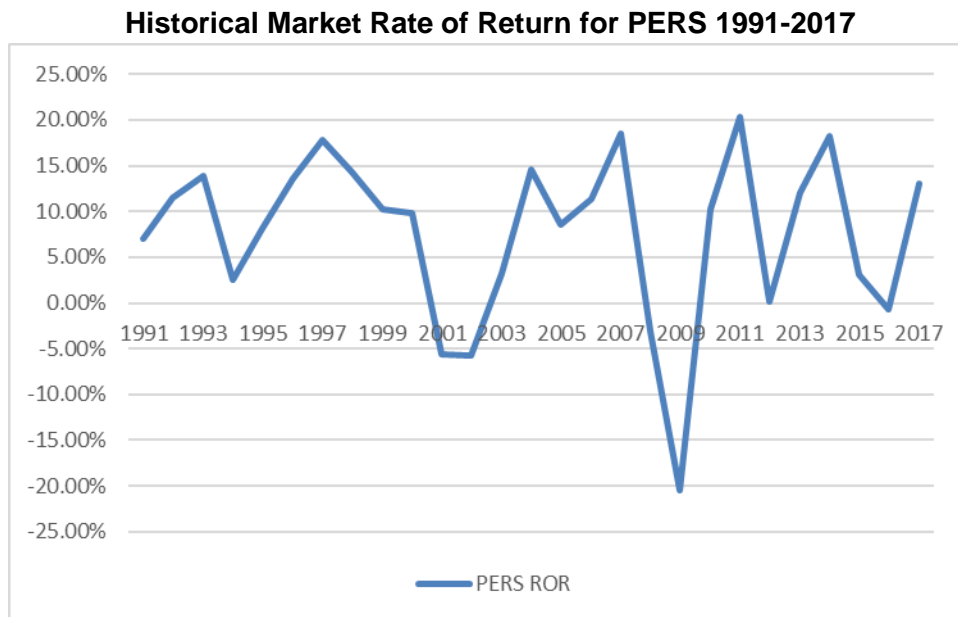


¹¹ Based on the June 30, 2017 valuation projections.

Projection of Future Annual Benefit Payments for TRS (FY2018 – FY2047)



The following graph shows the actual market value return history for PERS from 1991 to 2017¹²:



Arithmetic Average: 7.66%
 Geometric Average: 7.25%
 Assumed Return: 8.00%

¹² Asset returns during these years for TRS were very similar.

The following asset allocation policy for PERS and TRS (which was adopted by the ARMB effective June 30, 2017) was used in our analysis of expected rates of return:

Asset Class	Allocation
Broad Domestic Equity	24%
Global ex-US Equity	22%
Intermediate Treasury's	10%
Opportunistic	10%
Real Assets	17%
Absolute Return	7%
Private Equity	9%
Cash Equivalents	1%
Total	100%

We used two methods to project expected future investment returns:

- GEMS – Geometric nominal and real rates of return were projected for the next 30 years (returns beyond 30 years are assumed to be the same as the average return for year 30).
- Building Block - Geometric real returns by asset class are deconstructed into relevant components. The values for each component (e.g., inflation, risk-free return and various equity and other risk premiums) are determined based on various factors, including GDP growth rates, historical values, risk premiums implied by current market conditions and current consensus estimates, taking into account the investment horizon. Expected inflation is added to real returns to develop nominal returns. The Building Block results shown below are based on capital market assumptions that are independent of those used to develop the GEMS results.

The table below shows the results of our analysis under the two approaches described above in Section 2(A)¹³:

	Approach #1			Approach #2		
	10-year	20-year	30-year	10-year	20-year	30-year
GEMS						
Nominal Rate of Return	8.04%	8.96%	9.36%	6.30%	7.10%	7.43%
Inflation Rate	2.49%	2.86%	3.12%	2.22%	2.56%	2.83%
Real Rate of Return	5.52%	6.06%	6.20%	4.06%	4.51%	4.57%
Nominal Return Net of Investment Expenses	7.59%	8.51%	8.91%	5.85%	6.65%	6.98%

¹³ The nominal return net of investment expenses shown in this table reflects the subtraction of 45 basis points based on recent history of investment expenses.

	Approach #1			Approach #2		
Building Block						
Nominal Rate of Return	7.73%	8.30%	8.77%	6.16%	6.88%	7.35%
Inflation Rate	2.30%	2.50%	2.60%	2.20%	2.40%	2.50%
Real Rate of Return	5.43%	5.80%	6.17%	3.96%	4.48%	4.85%
Nominal Return Net of Investment Expenses	7.28%	7.85%	8.32%	5.71%	6.43%	6.90%

Based on our analysis, we believe the current investment return assumption of 8.0% could be maintained¹⁴. However, the ARMB may decide to adopt something less than 8.0% to reflect a margin for adverse deviation. The ARMB has elected to maintain the real rate of return at 4.88%. Combined with the 2.5% inflation rate the ARMB selected, the new investment return is 7.38%.

C. Individual Salary Increases

We reviewed the salary increases that active members of PERS and TRS received during the 4-year period ending June 30, 2017. The average annual increases during the last four years are less than the expected annual increases for almost every year of service and age¹⁵. The overall expected and actual average increases over the 4-year period for active members of PERS and TRS are shown below:

- PERS Others
 - Expected: 5.77%
 - Actual: 4.42%
- PERS Peace/Fire
 - Expected: 5.70%
 - Actual: 4.21%
- TRS
 - Expected: 5.32%
 - Actual: 3.52%

¹⁴ The current investment return assumption of 8.0% for PERS, TRS and JRS is net of all expenses. We are proposing this assumption be changed to be net of investment expenses only, with an amount added to the Normal Cost component of the contribution rate for administrative expenses.

¹⁵ The current salary increase assumption is service-based for PERS Peace/Fire and TRS. For PERS Others, the current salary increase assumption is service-based during the member's first five years of service, and age-based thereafter.

Based on recent experience, we propose lowering the salary increase rates and changing the assumption for PERS Others to be service-based for all years. The current and proposed salary increase rates are shown in Section 5.

D. Payroll Growth Rate

To calculate the total contribution rate for PERS and TRS, the Unfunded Actuarial Accrued Liability is amortized on a level percent of pay basis over a closed 25-year period beginning June 30, 2014¹⁶. Because pay is expected to increase, an assumption is made for the rate at which total payroll is expected to increase.

Currently, a payroll growth rate of 3.62% (inflation plus 50 basis points) is used to amortize the PERS and TRS Unfunded Actuarial Accrued Liability. The tables below show the increases in average annual earnings for PERS and TRS active members in each of the last four years (considering both DB and DCR active members).

PERS DB/DCR

	Number of Actives	Annual Earnings (000's)	Annual Average Earnings	Increase in Average Earnings in Prior Year
June 30, 2017	33,890	\$2,256,300	\$66,577	1.1%
June 30, 2016	34,320	\$2,260,857	\$65,876	2.3%
June 30, 2015	34,758	\$2,239,064	\$64,419	0.9%
June 30, 2014	35,097	\$2,239,805	\$63,817	2.4%
June 30, 2013	35,271	\$2,198,978	\$62,345	N/A

The average increase for the 4-year period ending June 30, 2017 was 1.7%.

TRS DB/DCR

	Number of Actives	Annual Earnings (000's)	Annual Average Earnings	Increase in Average Earnings in Prior Year
June 30, 2017	9,466	\$724,298	\$76,516	0.9%
June 30, 2016	9,506	\$721,076	\$75,855	1.5%
June 30, 2015	9,597	\$717,220	\$74,734	1.2%
June 30, 2014	9,408	\$694,574	\$73,828	1.2%
June 30, 2013	9,624	\$702,204	\$72,964	N/A

The average increase for the 4-year period ending June 30, 2017 was 2.1%.

¹⁶ Using pay of DB and DCR active members.

Based on recent experience, we propose changing the payroll growth assumption from inflation + 50 basis points to inflation + 25 basis points.

E. Administrative Expenses

Currently, the 8.0% investment return is assumed to be net of all expenses¹⁷. We propose changing the investment return assumption for PERS and TRS to be net of investment expenses only and add an administrative expense load to the Normal Cost component of the contribution rate based on the average of administrative expenses paid from the trust during the prior two years¹⁸.

¹⁷ For NGNMRS, the current 7.0% investment return is assumed to be net of investment expenses only, and an administrative expense load is added to the Normal Cost component of the contribution rate based on the average of administrative expenses paid from the trust during the prior two years.

¹⁸ We also propose making this change for JRS.

Section 3: Post-retirement Healthcare Assumptions¹⁹

A. Healthcare Cost Trend Rates

Healthcare cost trend rates (HCCTR) are used to project the baseline per capita costs into the future. Separate trend rates are used for each major healthcare benefit category.

The HCCTR are reviewed annually as part of the actuarial valuation process. We have also reviewed them as part of the experience study since the inflation rate and other related assumptions are being evaluated.

The current ultimate trend rate of 4.0% reflects the current 3.12% inflation rate plus real GDP growth of 0.88%.

The Getzen model, developed by the Society of Actuaries, has been used for Alaska's Systems valuations since 2012. Using the updated version of the Getzen model, and considering recent trend rate surveys and Alaska claims experience, we propose changing the HCCTR as follows:

- Reflect a real GDP growth rate of 2.0% based on the following considerations:
 - A PWC report titled *The World in 2050* projects real GDP growth of 1.8% between now and 2050.
 - The Federal Reserve's Open Market Committee June 2018 Forecast projects longer term real GDP growth between 1.7% and 2.1%.
 - The Congressional Budget Office's April 2018 10-Year Projection of real GDP growth is 1.9%.
 - Callan's presentation to the ARMB in June 2018 projected real GDP growth between 2.0% and 2.5% over the next 10 years, and 3.0% over the long-term.
- Change the ultimate trend rate to 4.5% based on the ARMB's selection of a 2.5% inflation rate at the June 2018 meeting, and a real GDP growth rate of 2.0%.
- Change the RDS trend rates based on updated projections in the 2018 Medicare Trustees report.
- Align EGWP trend rates with prescription drug trend rates rather than RDS trend rates, because EGWP subsidies are likely to be a level percentage of prescription drug costs over time.
- Modify the HCCTR beginning in FY2041 to reflect the ultimate trend rate of 4.5%.

¹⁹ The healthcare per capita costs are developed annually as part of the actuarial valuation process. The factors considered in updating these costs are explained in detail in the actuarial valuation report.

The current and proposed HCCTR by year and healthcare benefit category are shown in Section 5.

B. Morbidity

Morbidity rates (also called aging factors) are used to estimate utilization of healthcare benefits at each age to reflect the fact that healthcare utilization typically increases with age. Separate morbidity rates are used for medical and prescription drug benefits.

We propose slight changes to the morbidity factors as shown in Section 5 based on actual claims provided by Aetna for the 2014 through 2016 calendar years.

C. Participation Rates

The participation assumption is used to estimate the percentage of future retirees who will elect to participate in the Alaska post-retirement healthcare program. There are different reasons why members may choose not to participate in the program. Members may have coverage under another employer or through their spouse's employer, or they may simply elect to waive coverage for a period of time.

- DB participation rates
 - PERS and TRS pay the entire cost of healthcare coverage for the member and spouse depending on the member's age, service and tier.
 - For members where the System pays the full cost:
 - The current assumption is that 100% of members and spouses will elect coverage when first eligible. We propose no change to this assumption.
 - For members where the System pays less than the full cost:
 - The current assumption for PERS and TRS is that 10% of members and spouses will elect coverage when first eligible.
 - Based on actual experience during the 2-year period ending June 30, 2017 (the only years for which we had detailed experience), the average percentage of retirees who elected coverage was 16% for PERS and 20% for TRS.
 - Based on recent experience, we propose changing the assumption from 10% to 20% for both PERS and TRS.
- DCR participation rates
 - Because there are so few retirees in the DCR plans, we did not have credible experience to evaluate this assumption.
 - We are proposing modest changes to the DCR participation rates as shown in Section 5.

Section 4: Actuarial Methods

A. Funding Method

Liabilities and contributions are currently determined using the Entry Age Normal Actuarial Cost Method, level percent of pay basis for pension benefits and level dollar basis for post-retirement healthcare benefits. We propose changing the post-retirement healthcare Actuarial Accrued Liability and Normal Cost to be calculated on a level percent of pay basis rather than a level dollar basis. This will align the post-retirement healthcare funding liabilities and costs with those used for accounting purposes (which are prescribed by Governmental Accounting Standards Board Statements No. 74 and 75).

B. Asset Valuation Method

The current asset valuation method recognizes market gains and losses 20% per year. The Actuarial Value of Assets was re-initialized to Market Value of Assets as of June 30, 2014, and 5-year smoothing was phased in starting in FY2015. We do not propose any changes to the asset valuation method.

C. Amortization Method

Based on Alaska Statutes, the Unfunded Actuarial Accrued Liability (UAAL) under PERS and TRS is being amortized on a level percent of pay basis over a closed 25-year period that began June 30, 2014.

Large changes in the UAAL (e.g., due to a large actuarial gain or loss) in a given year could result in significant volatility in contribution rates, especially as the remainder of the closed 25-year period becomes shorter and shorter. Accordingly, we recommend consideration be given to changing the amortization method to a “layered approach”²⁰. Under this approach, the UAAL that exists at the time of the change would be amortized on a level percent of pay basis over the remaining years of the closed 25-year period, and each future year’s change in UAAL would be separately amortized on a level percent of pay basis over a fixed number of years (e.g., 25 years). A variation of this approach would be to establish different periods of time depending on the reason for the change in the UAAL, or to use a period other than 25 years for each “layer”.

It may be necessary to modify the language in the Alaska Statutes to incorporate a change in the amortization method.

²⁰ The DCR plans currently use the layered approach, where each year’s change in the UAAL is amortized separately over a 25-year period.

Section 5: Current & Proposed Assumptions

Mortality Rates

		Current			Proposed		
	Pre-Termination Healthy	Post-Termination Healthy	Post-Retirement Disabled	Pre-Termination Healthy	Post-Termination Healthy	Post-Retirement Disabled	
PERS ²¹							
Male	60% of post-termination healthy rates	96% of RP-2000, 2000 Base Year projected to 2018 with Scale BB	RP-2000 Disabled Retiree Table, 2000 Base Year projected to 2018 with Scale BB	100% of RP-2014 employee with MP-2017 generational improvement	91% of RP-2014 healthy annuitant with MP-2017 generational improvement	100% of RP-2014 disabled with MP-2017 generational improvement	
Female	65% of post-termination healthy rates	96% of RP-2000, 2000 Base Year projected to 2018 with Scale BB	RP-2000 Disabled Retiree Table, 2000 Base Year projected to 2018 with Scale BB	100% of RP-2014 employee with MP-2017 generational improvement	96% of RP-2014 healthy annuitant with MP-2017 generational improvement	100% of RP-2014 disabled with MP-2017 generational improvement	
TRS ²²							
Male	68% of post-termination healthy rates	94% of RP-2000, 2000 Base Year projected to 2018 with Scale BB, setback 3 years	RP-2000 Disabled Retiree Table, 2000 Base Year projected to 2018 with Scale BB	100% of RP-2014 white collar employee with MP-2017 generational improvement	93% of RP-2014 white collar healthy annuitant with MP-2017 generational improvement	100% of RP-2014 disabled with MP-2017 generational improvement	
Female	60% of post-termination healthy rates	97% of RP-2000, 2000 Base Year projected to 2018 with Scale BB, setback 4 years	RP-2000 Disabled Retiree Table, 2000 Base Year projected to 2018 with Scale BB	100% of RP-2014 white collar employee with MP-2017 generational improvement	90% of RP-2014 white collar healthy annuitant with MP-2017 generational improvement	100% of RP-2014 disabled with MP-2017 generational improvement	

²¹ Apply to DB and DCR. Proposed changes for NGNMRS are the same as the proposed changes for PERS.

²² Apply to DB and DCR. Proposed changes for JRS are the same as the proposed changes for TRS.

PERS Peace/Fire

Withdrawal Rates

Members with less than 5 years of service

Years of Service	Female		Male	
	Current	Proposed	Current	Proposed
0	0.15	0.15	0.15	0.15
1	0.08	0.08	0.12	0.12
2	0.06	0.06	0.07	0.07
3	0.06	0.06	0.06	0.06
4	0.07	0.07	0.06	0.06

Members with 5 or more years of service

Age	Female		Male		Age	Female		Male	
	Current	Proposed	Current	Proposed		Current	Proposed	Current	Proposed
20	0.080000	0.068000	0.040894	0.047000	45	0.033802	0.032800	0.019012	0.018100
21	0.080000	0.068000	0.040894	0.047000	46	0.033527	0.032500	0.019506	0.018500
22	0.080000	0.068000	0.040894	0.047000	47	0.033251	0.032300	0.020000	0.019000
23	0.080000	0.068000	0.038801	0.044600	48	0.032862	0.031900	0.023333	0.022200
24	0.080000	0.068000	0.036708	0.042200	49	0.032474	0.031500	0.026667	0.025300
25	0.080000	0.068000	0.034616	0.039800	50	0.032085	0.064200	0.030000	0.031800
26	0.080000	0.068000	0.032523	0.037400	51	0.031581	0.063200	0.040000	0.042400
27	0.080000	0.068000	0.030430	0.035000	52	0.030941	0.061900	0.040000	0.042400
28	0.078000	0.066300	0.028877	0.033200	53	0.030201	0.060400	0.040000	0.042400
29	0.076000	0.064600	0.027324	0.031400	54	0.060402	0.030000	0.040000	0.042400
30	0.074000	0.062900	0.025771	0.029600	55	0.060402	0.020000	0.040000	0.030000
31	0.072000	0.061200	0.024218	0.027900	56	0.060402	0.020000	0.040000	0.030000
32	0.070000	0.059500	0.022665	0.026100	57	0.060402	0.020000	0.040000	0.030000
33	0.063077	0.053600	0.021722	0.025000	58	0.060402	0.020000	0.040000	0.030000
34	0.056154	0.047700	0.020779	0.023900	59	0.060402	0.020000	0.040000	0.030000
35	0.049231	0.041800	0.019836	0.022800	60	0.060402	0.020000	0.040000	0.030000
36	0.042308	0.036000	0.018893	0.021700	61	0.060402	0.020000	0.040000	0.030000
37	0.035385	0.030100	0.017950	0.020600	62	0.060402	0.020000	0.040000	0.030000
38	0.035234	0.029900	0.017866	0.020500	63	0.060402	0.020000	0.040000	0.030000
39	0.035082	0.029800	0.017782	0.020400	64	0.060402	0.020000	0.040000	0.030000
40	0.034930	0.033900	0.017699	0.016800	65	0.060402	0.020000	0.040000	0.030000
41	0.034779	0.033700	0.017615	0.016700	65+	0.060402	0.020000	0.040000	0.030000
42	0.034627	0.033600	0.017531	0.016700					
43	0.034352	0.033300	0.018025	0.017100					
44	0.034077	0.033100	0.018519	0.017600					

PERS Peace/Fire

Reduced Retirement Rates

Age	Female		Male	
	Current	Proposed	Current	Proposed
<50	N/A		N/A	
50	0.087041	0.050000	0.087041	0.050000
51	0.085580	0.070000	0.085580	0.050000
52	0.072383	0.070000	0.072383	0.070000
53	0.076688	0.070000	0.076688	0.070000
54	0.075561	0.350000	0.075561	0.070000
55	0.077429	0.080000	0.077429	0.070000
56	0.077106	0.080000	0.077106	0.070000
57	0.076730	0.080000	0.076730	0.070000
58	0.076820	0.080000	0.076820	0.070000
59	0.200000	0.200000	0.200000	0.200000
60+	N/A	N/A	N/A	N/A

PERS Peace/Fire

Unreduced Retirement Rates

Age	Female		Male	
	Current	Proposed	Current	Proposed
<47	0.060000	0.060000	0.080000	0.088000
47	0.150000	0.150000	0.080000	0.088000
48	0.150000	0.150000	0.130000	0.143000
49	0.150000	0.150000	0.130000	0.143000
50	0.150000	0.150000	0.150000	0.165000
51	0.150000	0.150000	0.150000	0.165000
52	0.150000	0.150000	0.185000	0.203500
53	0.150000	0.150000	0.185000	0.203500
54	0.250000	0.250000	0.185000	0.203500
55	0.200000	0.200000	0.250000	0.275000
56	0.150000	0.150000	0.250000	0.275000
57	0.150000	0.150000	0.250000	0.275000
58	0.150000	0.150000	0.250000	0.275000
59	0.150000	0.150000	0.250000	0.275000
60	0.250000	0.250000	0.300000	0.330000
61	0.200000	0.200000	0.250000	0.275000
62	0.300000	0.300000	0.250000	0.275000
63	0.500000	0.500000	0.250000	0.275000
64	0.500000	0.500000	0.200000	0.220000
65	0.500000	0.500000	0.200000	0.220000
66	0.500000	0.500000	0.250000	0.275000
67	0.500000	0.500000	0.500000	0.550000
68	0.500000	0.500000	0.500000	0.550000
69	0.500000	0.500000	0.500000	0.550000
70+	1.000000	1.000000	1.000000	1.000000

PERS Peace/Fire

Disability Rates

Age	Unisex Current	Male Proposed	Female Proposed	Age	Unisex Current	Male Proposed	Female Proposed
20	0.000224	0.000179	0.000112	40	0.001027	0.000822	0.000514
21	0.000224	0.000179	0.000112	41	0.001068	0.000854	0.000534
22	0.000224	0.000179	0.000112	42	0.001108	0.000887	0.000554
23	0.000305	0.000244	0.000153	43	0.001221	0.000977	0.000611
24	0.000387	0.000310	0.000194	44	0.001333	0.001066	0.000666
25	0.000468	0.000374	0.000234	45	0.001446	0.001157	0.000723
26	0.000550	0.000440	0.000275	46	0.001559	0.001247	0.000780
27	0.000631	0.000505	0.000316	47	0.001671	0.001337	0.000836
28	0.000658	0.000526	0.000329	48	0.001828	0.001462	0.000914
29	0.000685	0.000548	0.000342	49	0.001985	0.001588	0.000992
30	0.000712	0.000570	0.000356	50	0.002142	0.001714	0.001071
31	0.000739	0.000591	0.000369	51	0.002299	0.001839	0.001150
32	0.000765	0.000612	0.000383	52	0.002456	0.001965	0.001228
33	0.000793	0.000634	0.000396	53	0.002868	0.002294	0.001434
34	0.000821	0.000657	0.000410	54	0.003280	0.002624	0.001640
35	0.000849	0.000679	0.000425				
36	0.000877	0.000702	0.000439				
37	0.000905	0.000724	0.000452				
38	0.000946	0.000757	0.000473				
39	0.000986	0.000789	0.000493				

PERS Peace/Fire

Salary Scale

Years of Service	Current	Proposed
0	9.66%	7.75%
1	8.66%	7.25%
2	7.16%	6.75%
3	7.03%	6.25%
4	6.91%	5.75%
5	6.41%	5.25%
6	5.66%	4.75%
7	4.92%	4.25%
8	4.92%	3.75%
9	4.92%	3.65%
10	4.92%	3.55%
11	4.92%	3.45%
12	4.92%	3.35%
13	4.92%	3.25%
14	4.92%	3.15%
15	4.92%	3.05%
16	4.92%	2.95%
17	4.92%	2.85%
18	4.92%	2.75%
19	4.92%	2.75%
20+	4.92%	2.75%

PERS DCR Peace/Fire

Withdrawal Rates

Members with less than 5 years of service

Years of Service	Female		Male	
	Current	Proposed (rounded)	Current	Proposed (rounded)
0	0.17	0.21	0.18	0.19
1	0.13	0.16	0.14	0.15
2	0.11	0.14	0.10	0.11
3	0.10	0.13	0.09	0.09
4	0.09	0.11	0.08	0.08

Members with 5 or more years of service

Age	Female		Male		Age	Female		Male	
	Current	Proposed	Current	Proposed		Current	Proposed	Current	Proposed
20	0.085500	0.119700	0.048000	0.055200	45	0.078800	0.110300	0.049678	0.057100
21	0.085500	0.119700	0.048000	0.055200	46	0.078400	0.109800	0.049061	0.056400
22	0.085500	0.119700	0.048000	0.055200	47	0.078000	0.109200	0.048444	0.055700
23	0.085500	0.119700	0.049120	0.056500	48	0.077400	0.108400	0.052256	0.060100
24	0.085500	0.119700	0.050240	0.057800	49	0.076800	0.107500	0.056067	0.064500
25	0.085500	0.119700	0.051360	0.059100	50	0.076200	0.106700	0.059878	0.068900
26	0.085500	0.119700	0.052480	0.060400	51	0.075600	0.105800	0.063689	0.073200
27	0.085500	0.119700	0.053600	0.061600	52	0.075000	0.105000	0.067500	0.077600
28	0.085275	0.119400	0.053528	0.061600	53	0.076154	0.106600	0.069300	0.079700
29	0.085050	0.119100	0.053456	0.061500	54	0.077308	0.108200	0.071100	0.081800
30	0.084825	0.118800	0.053384	0.061400	55	0.078462	0.109800	0.072900	0.083800
31	0.084600	0.118400	0.053312	0.061300	56	0.079615	0.111500	0.074700	0.085900
32	0.084375	0.118100	0.053239	0.061200	57	0.080769	0.113100	0.076500	0.088000
33	0.084214	0.117900	0.053119	0.061100	58	0.081923	0.114700	0.078480	0.090300
34	0.084054	0.117700	0.052998	0.060900	59	0.083077	0.116300	0.080460	0.092500
35	0.083893	0.117500	0.052878	0.060800	60	0.084231	0.117900	0.082440	0.094800
36	0.083732	0.117200	0.052757	0.060700	61	0.085385	0.119500	0.084420	0.097100
37	0.083571	0.117000	0.052636	0.060500	62	0.086538	0.121200	0.086400	0.099400
38	0.082857	0.116000	0.052415	0.060300	63	0.087692	0.122800	0.107600	0.123700
39	0.082143	0.115000	0.052194	0.060000	64	0.088846	0.124400	0.128800	0.148100
40	0.081429	0.114000	0.051972	0.059800	65+	0.090000	0.126000	0.150000	0.172500
41	0.080714	0.113000	0.051751	0.059500					
42	0.080000	0.112000	0.051529	0.059030					
43	0.079600	0.111400	0.050912	0.058500					
44	0.079200	0.110900	0.050295	0.057800					

PERS Others

Withdrawal Rates

Members with less than 5 years of service

Service	Hire Age < 35				Hire Age > 35			
	Current		Proposed		Current		Proposed	
	Male	Female	Male	Female	Male	Female	Male	Female
0	0.29	0.29	0.29	0.29	0.20	0.20	0.20	0.20
1	0.16	0.20	0.16	0.20	0.12	0.15	0.12	0.15
2	0.13	0.16	0.13	0.16	0.10	0.13	0.10	0.13
3	0.10	0.13	0.10	0.13	0.09	0.10	0.09	0.10
4	0.08	0.10	0.08	0.10	0.09	0.09	0.09	0.09

Members with 5 or more years of service

Age	Female		Male		Age	Female		Male	
	Current	Proposed	Current	Proposed		Current	Proposed	Current	Proposed
20	0.136735	0.129900	0.095000	0.114000	45	0.045685	0.048000	0.039880	0.043900
21	0.136735	0.129900	0.095000	0.114000	46	0.043828	0.046000	0.039357	0.043300
22	0.136735	0.129900	0.095000	0.114000	47	0.041972	0.044100	0.038834	0.042700
23	0.128522	0.122100	0.090250	0.108500	48	0.041891	0.044000	0.038701	0.042600
24	0.120309	0.114300	0.085500	0.102600	49	0.041809	0.043900	0.038568	0.042400
25	0.112096	0.106500	0.080750	0.096900	50	0.041566	0.044500	0.038170	0.036300
26	0.103883	0.098700	0.076000	0.091200	51	0.041365	0.044300	0.037844	0.036000
27	0.095670	0.090900	0.071250	0.085500	52	0.041121	0.044000	0.037460	0.035600
28	0.091756	0.087200	0.069160	0.083000	53	0.040844	0.043700	0.037023	0.035200
29	0.087842	0.083400	0.067060	0.080500	54	0.057924	0.062000	0.043859	0.041700
30	0.083927	0.079700	0.064960	0.078000	55	0.057924	0.050000	0.043859	0.030000
31	0.080013	0.076000	0.062870	0.075400	56	0.057924	0.050000	0.043859	0.030000
32	0.076099	0.072300	0.060770	0.072900	57	0.057924	0.050000	0.043859	0.030000
33	0.072399	0.068800	0.058280	0.069900	58	0.057924	0.050000	0.043859	0.030000
34	0.068699	0.065300	0.055780	0.066900	59	0.057924	0.050000	0.043859	0.030000
35	0.064999	0.061700	0.053290	0.063900	60	0.057924	0.050000	0.043859	0.030000
36	0.061299	0.058200	0.050790	0.061000	61	0.057924	0.050000	0.043859	0.030000
37	0.057599	0.054700	0.048300	0.058000	62	0.057924	0.050000	0.043859	0.030000
38	0.056330	0.053500	0.046930	0.056300	63	0.057924	0.050000	0.043859	0.030000
39	0.055061	0.052300	0.045560	0.054700	64	0.057924	0.050000	0.043859	0.030000
40	0.053792	0.056500	0.044190	0.048600	65+	0.057924	0.050000	0.043859	0.030000
41	0.052523	0.055100	0.042820	0.047100					
42	0.051254	0.053800	0.041450	0.045600					
43	0.049398	0.051900	0.040930	0.045000					
44	0.047541	0.049900	0.040400	0.044400					

PERS Others

Reduced Retirement Rates

Age	Female		Male	
	Current	Proposed	Current	Proposed
<50	N/A	N/A	N/A	N/A
50	0.06	0.08	0.04	0.06
51	0.06	0.08	0.04	0.06
52	0.08	0.08	0.06	0.09
53	0.08	0.08	0.06	0.09
54	0.14	0.15	0.14	0.20
55	0.06	0.06	0.05	0.06
56	0.06	0.06	0.05	0.06
57	0.06	0.06	0.05	0.06
58	0.06	0.06	0.05	0.06
59	0.16	0.20	0.14	0.15
60+	N/A	N/A	N/A	N/A

PERS Others

Unreduced Retirement Rates

Age	Female		Male	
	Current (rounded)	Proposed (rounded)	Current (rounded)	Proposed (rounded)
<50	0.10	0.11	0.10	0.11
50	0.35	0.39	0.30	0.33
51	0.35	0.39	0.33	0.36
52	0.35	0.39	0.33	0.36
53	0.35	0.39	0.33	0.36
54	0.35	0.39	0.35	0.38
55	0.30	0.33	0.30	0.33
56	0.20	0.22	0.20	0.22
57	0.18	0.20	0.20	0.22
58	0.18	0.20	0.20	0.22
59	0.18	0.20	0.20	0.22
60	0.21	0.23	0.20	0.22
61	0.20	0.22	0.20	0.22
62	0.20	0.22	0.20	0.22
63	0.20	0.22	0.20	0.22
64	0.20	0.22	0.20	0.22
65	0.26	0.29	0.23	0.25
66	0.26	0.29	0.25	0.28
67	0.22	0.24	0.20	0.22
68	0.22	0.24	0.23	0.25
69	0.22	0.24	0.25	0.28
70	0.22	0.24	0.25	0.28
71	0.22	0.24	0.25	0.28
72	0.25	0.28	0.25	0.28
73	0.25	0.28	0.25	0.28
74	0.35	0.39	0.25	0.28
75-79	0.50	0.55	0.50	0.55
80-89	0.50	1.00	0.50	1.00
90+	1.00	1.00	1.00	1.00

PERS Others
Disability Rates

Age	Female		Male		Age	Female		Male	
	Current	Proposed	Current	Proposed		Current	Proposed	Current	Proposed
20	0.000188	0.000376	0.000218	0.000327	40	0.000381	0.000762	0.000489	0.000734
21	0.000188	0.000376	0.000218	0.000327	41	0.000397	0.000794	0.000510	0.000765
22	0.000188	0.000376	0.000218	0.000327	42	0.000413	0.000826	0.000531	0.000797
23	0.000200	0.000400	0.000240	0.000360	43	0.000454	0.000908	0.000586	0.000879
24	0.000212	0.000424	0.000261	0.000392	44	0.000495	0.000990	0.000641	0.000962
25	0.000224	0.000448	0.000283	0.000425	45	0.000536	0.001072	0.000695	0.001043
26	0.000236	0.000472	0.000304	0.000456	46	0.000577	0.001154	0.000750	0.001125
27	0.000248	0.000496	0.000326	0.000489	47	0.000618	0.001236	0.000805	0.001208
28	0.000255	0.000510	0.000334	0.000501	48	0.000680	0.001360	0.000886	0.001329
29	0.000262	0.000524	0.000342	0.000513	49	0.000742	0.001484	0.000967	0.001451
30	0.000269	0.000538	0.000349	0.000524	50	0.000804	0.001608	0.001048	0.001572
31	0.000277	0.000554	0.000357	0.000536	51	0.000867	0.001734	0.001129	0.001694
32	0.000284	0.000568	0.000365	0.000548	52	0.000929	0.001858	0.001210	0.001815
33	0.000293	0.000586	0.000377	0.000566	53	0.001084	0.002168	0.001421	0.002132
34	0.000303	0.000606	0.000389	0.000584	54	0.001239	0.002478	0.001633	0.002450
35	0.000312	0.000629	0.000401	0.000602					
36	0.000322	0.000644	0.000413	0.000620					
37	0.000331	0.000662	0.000425	0.000638					
38	0.000348	0.000696	0.000446	0.000669					
39	0.000364	0.000728	0.000467	0.000701					

PERS Others

Salary scale

Years of service	Current	Proposed
0	8.55%	6.75%
1	7.36%	6.25%
2	6.35%	5.75%
3	6.11%	5.25%
4	5.71%	4.75%
5	Age Based	4.25%
6	Age Based	3.75%
7	Age Based	3.65%
8	Age Based	3.55%
9	Age Based	3.45%
10	Age Based	3.35%
11	Age Based	3.25%
12	Age Based	3.15%
13	Age Based	3.05%
14	Age Based	2.95%
15	Age Based	2.85%
16	Age Based	2.75%
17	Age Based	2.75%
18	Age Based	2.75%
19	Age Based	2.75%
20+	Age Based	2.75%

PERS DCR Others

Withdrawal Rates

Members with less than 5 years of service

Years of Service	Female		Male	
	Current	Proposed (rounded)	Current	Proposed (rounded)
0	0.27	0.28	0.23	0.24
1	0.21	0.22	0.20	0.21
2	0.17	0.18	0.16	0.17
3	0.14	0.14	0.13	0.13
4	0.18	0.12	0.09	0.09

Members with 5 or more years of service

Age	Female		Male		Age	Female		Male	
	Current	Proposed	Current	Proposed		Current	Proposed	Current	Proposed
20	0.150000	0.165000	0.109667	0.137100	45	0.071847	0.079000	0.061728	0.077200
21	0.150000	0.165000	0.109667	0.137100	46	0.068938	0.075800	0.060789	0.076000
22	0.150000	0.165000	0.109667	0.137100	47	0.066029	0.072600	0.059850	0.074800
23	0.150067	0.165100	0.109674	0.137100	48	0.065749	0.072300	0.061414	0.076800
24	0.150133	0.165100	0.109681	0.137100	49	0.065469	0.072000	0.062977	0.078700
25	0.150200	0.165200	0.109689	0.137100	50	0.065189	0.071700	0.064541	0.080700
26	0.150267	0.165300	0.109696	0.137100	51	0.064908	0.071400	0.066104	0.082600
27	0.150333	0.165400	0.109703	0.137100	52	0.064628	0.071100	0.067668	0.084600
28	0.144910	0.159400	0.107312	0.134100	53	0.066022	0.072600	0.067714	0.084600
29	0.139486	0.153400	0.104921	0.131200	54	0.067416	0.074200	0.067760	0.084700
30	0.134062	0.147500	0.102529	0.128200	55	0.068809	0.075700	0.067806	0.084800
31	0.128638	0.141500	0.100138	0.125200	56	0.070203	0.077200	0.067853	0.084800
32	0.123214	0.135500	0.097747	0.122200	57	0.071597	0.078800	0.067899	0.084900
33	0.117230	0.129000	0.093219	0.116500	58	0.074069	0.081500	0.070131	0.087700
34	0.111246	0.122400	0.088692	0.110900	59	0.076541	0.084200	0.072363	0.090500
35	0.105261	0.115800	0.084164	0.105200	60	0.079014	0.086900	0.074595	0.093200
36	0.099277	0.109200	0.079637	0.099500	61	0.081486	0.089600	0.076827	0.096000
37	0.093293	0.102600	0.075110	0.093900	62	0.083958	0.092400	0.079059	0.098800
38	0.090749	0.099800	0.072996	0.091200	63	0.095528	0.105100	0.082239	0.102800
39	0.088205	0.097000	0.070883	0.088600	64	0.107097	0.117800	0.085420	0.106800
40	0.085661	0.094200	0.068770	0.086000	65+	0.118667	0.130500	0.088600	0.110800
41	0.083117	0.091400	0.066657	0.083200					
42	0.080573	0.094300	0.064544	0.080700					
43	0.077664	0.085400	0.063605	0.079500					
44	0.074756	0.082200	0.062667	0.078300					

TRS

Withdrawal Rates

Members with less than 8 years of service

Service	Female		Male	
	Current	Proposed	Current	Proposed
0	0.170	0.170	0.204	0.204
1	0.170	0.170	0.204	0.204
2	0.140	0.140	0.168	0.168
3	0.120	0.120	0.144	0.144
4	0.100	0.100	0.120	0.120
5	0.090	0.090	0.108	0.108
6	0.075	0.075	0.090	0.090
7	0.060	0.060	0.072	0.072

Members with 8 or more years of service

Age	Female		Male		Age	Female		Male	
	Current	Proposed	Current	Proposed		Current	Proposed	Current	Proposed
15	0.037185	0.038300	0.031209	0.026500	40	0.036224	0.027500	0.030159	0.022600
16	0.037157	0.038300	0.031170	0.026500	41	0.036155	0.027500	0.030085	0.022600
17	0.037138	0.038300	0.031138	0.026500	42	0.036086	0.027400	0.030010	0.022500
18	0.037129	0.038200	0.031107	0.026400	43	0.035976	0.027300	0.029866	0.022400
19	0.037120	0.038200	0.031091	0.026400	44	0.035867	0.027300	0.029721	0.022300
20	0.036848	0.038000	0.030847	0.026200	45	0.035757	0.027200	0.029577	0.022200
21	0.036848	0.038000	0.030831	0.026200	46	0.035648	0.027100	0.029432	0.022100
22	0.036839	0.037900	0.030799	0.026200	47	0.035538	0.027000	0.029288	0.022000
23	0.036839	0.037900	0.030776	0.026200	48	0.035380	0.026900	0.029046	0.021800
24	0.036830	0.037900	0.030736	0.026100	49	0.035221	0.026800	0.028805	0.021600
25	0.036830	0.037900	0.030705	0.026100	50	0.035063	0.044200	0.028563	0.034300
26	0.036820	0.037900	0.030673	0.026100	51	0.034847	0.043900	0.028248	0.033900
27	0.036762	0.037900	0.030642	0.026000	52	0.034595	0.043600	0.027878	0.033500
28	0.041480	0.042700	0.030610	0.026000	53	0.034296	0.043200	0.027468	0.033000
29	0.046198	0.047600	0.030579	0.026000	54	0.059961	0.075600	0.046305	0.030000
30	0.050917	0.052400	0.030555	0.026000	55	0.059285	0.050000	0.045414	0.020000
31	0.055635	0.057300	0.030540	0.026000	56	0.058410	0.050000	0.044334	0.020000
32	0.060353	0.062200	0.030516	0.025900	57	0.057288	0.050000	0.043012	0.020000
33	0.055569	0.057200	0.030500	0.025900	58	0.056018	0.050000	0.041567	0.020000
34	0.050784	0.052300	0.030455	0.025900	59	0.054401	0.050000	0.039826	0.020000
35	0.046000	0.047400	0.030431	0.025900	60	0.052569	0.050000	0.037868	0.020000
36	0.041215	0.042500	0.030407	0.025800	61	0.050523	0.050000	0.035694	0.020000
37	0.036431	0.037500	0.030383	0.025800	62	0.048197	0.050000	0.033170	0.020000
38	0.036362	0.037500	0.030308	0.025800	63	0.045540	0.050000	0.030294	0.020000
39	0.036293	0.037400	0.030234	0.025700	64	0.042653	0.050000	0.027176	0.020000
					65+	0.066000	0.050000	0.054000	0.020000

TRS

Reduced Retirement Rates

Age	Female		Male	
	Current	Proposed	Current	Proposed
<50	N/A	N/A	N/A	N/A
50	0.08	0.10	0.08	0.10
51	0.08	0.10	0.08	0.10
52	0.08	0.10	0.08	0.10
53	0.08	0.12	0.08	0.10
54	0.16	0.12	0.16	0.10
55	0.08	0.08	0.08	0.15
56	0.08	0.08	0.08	0.10
57	0.08	0.08	0.08	0.10
58	0.08	0.08	0.08	0.10
59	0.16	0.08	0.16	0.10
60+	N/A	N/A	N/A	N/A

TRS

Unreduced Retirement Rates

Age	Female		Male	
	Current	Proposed	Current	Proposed
<45	0.03	0.03	0.03	0.03
45	0.05	0.05	0.05	0.05
46	0.08	0.08	0.05	0.05
47	0.08	0.08	0.05	0.05
48	0.08	0.08	0.05	0.05
49	0.08	0.08	0.05	0.05
50	0.13	0.14	0.05	0.05
51	0.12	0.13	0.08	0.08
52	0.12	0.13	0.15	0.15
53	0.13	0.14	0.15	0.15
54	0.14	0.15	0.15	0.15
55	0.16	0.17	0.20	0.20
56	0.16	0.17	0.17	0.17
57	0.16	0.17	0.15	0.15
58	0.16	0.17	0.20	0.20
59	0.22	0.23	0.20	0.20
60	0.22	0.23	0.25	0.25
61	0.22	0.23	0.18	0.18
62	0.20	0.21	0.18	0.18
63	0.20	0.21	0.18	0.18
64	0.25	0.26	0.18	0.18
65	0.20	0.21	0.30	0.30
66	0.20	0.21	0.25	0.25
67	0.20	0.21	0.25	0.25
68	0.25	0.26	0.25	0.25
69	0.25	0.26	0.35	0.35
70	0.25	0.26	0.30	0.30
71	0.35	0.37	0.30	0.30
72	0.35	0.37	0.30	0.30
73	0.35	0.37	0.30	0.30
74	0.35	0.37	0.30	0.30
75-79	0.50	0.50	0.50	0.50
80-84	0.50	1.00	0.50	1.00
85+	1.00	1.00	1.00	1.00

TRS
Disability Rates

Age	Female		Male		Age	Female		Male	
	Current	Proposed	Current	Proposed		Current	Proposed	Current	Proposed
20	0.000560	0.000612	0.000560	0.000337	40	0.000703	0.000703	0.000703	0.000387
21	0.000563	0.000612	0.000563	0.000337	41	0.000718	0.000718	0.000718	0.000395
22	0.000565	0.000612	0.000565	0.000337	42	0.000733	0.000733	0.000733	0.000403
23	0.000574	0.000612	0.000574	0.000337	43	0.000770	0.000770	0.000770	0.000423
24	0.000583	0.000612	0.000583	0.000337	44	0.000806	0.000806	0.000806	0.000443
25	0.000593	0.000612	0.000593	0.000337	45	0.000843	0.000843	0.000843	0.000464
26	0.000602	0.000612	0.000602	0.000337	46	0.000879	0.000879	0.000879	0.000483
27	0.000611	0.000612	0.000611	0.000337	47	0.000916	0.000916	0.000916	0.000504
28	0.000611	0.000612	0.000611	0.000337	48	0.000975	0.000975	0.000975	0.000536
29	0.000612	0.000612	0.000612	0.000337	49	0.001034	0.001034	0.001034	0.000569
30	0.000612	0.000612	0.000612	0.000337	50	0.001093	0.001093	0.001093	0.000601
31	0.000613	0.000613	0.000613	0.000337	51	0.001152	0.001152	0.001152	0.000634
32	0.000613	0.000613	0.000613	0.000337	52	0.001211	0.001211	0.001211	0.000666
33	0.000622	0.000622	0.000622	0.000342	53	0.001356	0.001356	0.001356	0.000746
34	0.000631	0.000631	0.000631	0.000347	54	0.001501	0.001501	0.001501	0.000826
35	0.000641	0.000641	0.000641	0.000353					
36	0.000650	0.000650	0.000650	0.000357					
37	0.000659	0.000659	0.000659	0.000362					
38	0.000674	0.000674	0.000674	0.000371					
39	0.000689	0.000689	0.000689	0.000379					

TRS
Salary Scale

Years of service	Current	Proposed
0	8.11%	6.75%
1	7.51%	6.25%
2	6.91%	5.75%
3	6.41%	5.25%
4	6.11%	4.75%
5	6.11%	4.25%
6	5.90%	3.75%
7	5.69%	3.65%
8	5.55%	3.55%
9	5.40%	3.45%
10	5.26%	3.35%
11	5.11%	3.25%
12	4.96%	3.15%
13	4.84%	3.05%
14	4.72%	2.95%
15	4.60%	2.85%
16	4.49%	2.75%
17	4.37%	2.75%
18	4.27%	2.75%
19	4.17%	2.75%
20	4.07%	2.75%
21	3.97%	2.75%
22+	3.87%	2.75%

TRS DCR

Withdrawal Rates

Members with less than 5 years of service

Years of Service	Female		Male	
	Current (rounded)	Proposed (rounded)	Current (rounded)	Proposed (rounded)
0	0.22	0.22	0.21	0.21
1	0.19	0.19	0.20	0.20
2	0.15	0.15	0.16	0.16
3	0.13	0.13	0.14	0.14
4	0.11	0.11	0.07	0.12

Members with 5 or more years of service

Age	Female		Male		Age	Female		Male	
	Current	Proposed	Current	Proposed		Current	Proposed	Current	Proposed
20	0.066811	0.083100	0.062959	0.094100	45	0.064754	0.080900	0.060332	0.090500
21	0.066811	0.083100	0.062959	0.094100	46	0.064544	0.080700	0.059957	0.089900
22	0.066811	0.083100	0.062959	0.094100	47	0.064333	0.080400	0.059583	0.089400
23	0.066773	0.083100	0.062903	0.094100	48	0.063975	0.080000	0.059053	0.088600
24	0.066735	0.083100	0.062847	0.094100	49	0.063617	0.079500	0.058522	0.087800
25	0.066697	0.083100	0.062791	0.094100	50	0.063259	0.079100	0.057992	0.087000
26	0.066659	0.083200	0.062735	0.094100	51	0.062901	0.078600	0.057461	0.086200
27	0.066621	0.083300	0.062679	0.094000	52	0.062543	0.078200	0.056931	0.085400
28	0.066583	0.083200	0.062623	0.093900	53	0.061818	0.077300	0.055800	0.083700
29	0.066544	0.083200	0.062567	0.093900	54	0.061093	0.076400	0.054670	0.082000
30	0.066506	0.083100	0.062512	0.093800	55	0.060367	0.075500	0.053539	0.080300
31	0.066467	0.083100	0.062456	0.093700	56	0.059642	0.074600	0.052409	0.078600
32	0.066429	0.083000	0.062400	0.093600	57	0.058917	0.073600	0.051278	0.076900
33	0.066351	0.082900	0.062360	0.093500	58	0.060021	0.075000	0.051711	0.077600
34	0.066273	0.082800	0.062320	0.093500	59	0.061125	0.076400	0.052144	0.078200
35	0.066194	0.082700	0.062280	0.093400	60	0.062230	0.077800	0.052578	0.078900
36	0.066116	0.082600	0.062240	0.093400	61	0.063334	0.079200	0.053011	0.079500
37	0.066038	0.082500	0.062200	0.093300	62	0.064438	0.080500	0.053444	0.080200
38	0.065908	0.082400	0.062051	0.093100	63	0.066292	0.082900	0.057296	0.085900
39	0.065777	0.082200	0.061902	0.092900	64	0.068146	0.085200	0.061148	0.091700
40	0.065647	0.082100	0.061753	0.092600	65+	0.070000	0.087500	0.065000	0.097500
41	0.065516	0.081900	0.061604	0.092400					
42	0.065386	0.081700	0.061455	0.092200					
43	0.065175	0.081500	0.061081	0.091600					
44	0.064965	0.081200	0.060706	0.091100					

Healthcare Cost Trend Rates

Applicable to all plans

Current:

Fiscal Year	Medical Pre-65	Medical Post-65	Prescription Drugs	RDS/EGWP	Retiree Contributions
2018	8.0%	5.5%	9.0%	6.5%	8.0%
2019	7.5%	5.5%	8.5%	6.2%	7.6%
2020	7.0%	5.4%	8.0%	6.0%	7.2%
2021	6.5%	5.4%	7.5%	5.7%	6.8%
2022	6.3%	5.4%	7.1%	5.5%	6.5%
2023	6.1%	5.4%	6.8%	5.4%	6.3%
2024	5.9%	5.4%	6.4%	5.2%	6.0%
2025	5.8%	5.4%	6.1%	5.0%	5.9%
2026	5.6%	5.4%	5.7%	4.8%	5.6%
2027	5.4%	5.4%	5.4%	4.7%	5.4%
2028	5.4%	5.4%	5.4%	4.7%	5.4%
2029	5.4%	5.4%	5.4%	4.7%	5.4%
2030	5.4%	5.4%	5.4%	4.7%	5.4%
2031	5.4%	5.4%	5.4%	4.7%	5.4%
2032	5.4%	5.4%	5.4%	4.7%	5.4%
2033	5.4%	5.4%	5.4%	4.7%	5.4%
2034	5.4%	5.4%	5.4%	4.7%	5.4%
2035	5.4%	5.4%	5.4%	4.7%	5.4%
2036	5.4%	5.4%	5.4%	4.7%	5.4%
2037	5.4%	5.4%	5.4%	4.7%	5.4%
2038	5.4%	5.4%	5.4%	4.7%	5.4%
2039	5.4%	5.4%	5.4%	4.7%	5.4%
2040	5.4%	5.4%	5.4%	4.7%	5.4%
2041	5.2%	5.2%	5.2%	4.6%	5.2%
2042	5.1%	5.1%	5.1%	4.5%	5.1%
2043	5.0%	5.0%	5.0%	4.5%	5.0%
2044	4.8%	4.8%	4.8%	4.4%	4.8%
2045	4.7%	4.7%	4.7%	4.3%	4.7%
2046	4.5%	4.5%	4.5%	4.2%	4.5%
2047	4.4%	4.4%	4.4%	4.2%	4.4%
2048	4.3%	4.3%	4.3%	4.1%	4.3%
2049	4.1%	4.1%	4.1%	4.0%	4.1%
2050+	4.0%	4.0%	4.0%	4.0%	4.0%

Proposed:

Fiscal Year	Medical Pre-65	Medical Post-65	Prescription Drugs/EGWP	RDS	Retiree Contributions	
2018	8.0%	5.5%	9.0%	4.7%	8.0%	
2019	7.5%	5.5%	8.5%	4.7%	7.6%	
2020	7.0%	5.4%	8.0%	4.7%	7.2%	
2021	6.5%	5.4%	7.5%	4.6%	6.8%	
2022	6.3%	5.4%	7.1%	4.6%	6.5%	
2023	6.1%	5.4%	6.8%	4.6%	6.3%	
2024	5.9%	5.4%	6.4%	4.6%	6.0%	
2025	5.8%	5.4%	6.1%	4.6%	5.9%	
2026	5.6%	5.4%	5.7%	4.6%	5.6%	
2027	5.4%	5.4%	5.4%	4.5%	5.4%	
2028	5.4%	5.4%	5.4%	4.5%	5.4%	
2029	5.4%	5.4%	5.4%	4.5%	5.4%	
2030	5.4%	5.4%	5.4%	4.5%	5.4%	
2031	5.4%	5.4%	5.4%	4.5%	5.4%	
2032	5.4%	5.4%	5.4%	4.5%	5.4%	
2033	5.4%	5.4%	5.4%	4.5%	5.4%	
2034	5.4%	5.4%	5.4%	4.5%	5.4%	
2035	5.4%	5.4%	5.4%	4.5%	5.4%	
2036	5.4%	5.4%	5.4%	4.5%	5.4%	
2037	5.4%	5.4%	5.4%	4.5%	5.4%	
2038	5.4%	5.4%	5.4%	4.5%	5.4%	
2039	5.4%	5.4%	5.4%	4.5%	5.4%	
2040	5.4%	5.4%	5.4%	4.5%	5.4%	
2041	5.3%	5.3%	5.3%	4.5%	5.3%	
2042	5.2%	5.2%	5.2%	4.5%	5.2%	
2043	5.1%	5.1%	5.1%	4.5%	5.1%	
2044	5.1%	5.1%	5.1%	4.5%	5.1%	
2045	5.0%	5.0%	5.0%	4.5%	5.0%	
2046	4.9%	4.9%	4.9%	4.5%	4.9%	
2047	4.8%	4.8%	4.8%	4.5%	4.8%	
2048	4.7%	4.7%	4.7%	4.5%	4.7%	
2049	4.6%	4.6%	4.6%	4.5%	4.6%	
2050+	4.5%	4.5%	4.5%	4.5%	4.5%	
Getzen Model Components of Ultimate Trend Rates					Current	Proposed
Inflation					3.12%	2.50%
Real GDP					0.88% ²³	2.00%
Ultimate Trend Rate					4.00%	4.50%

²³ The real GDP growth rate of 0.88% has been used to set the ultimate trend rates since the 6/30/14 valuations.

Healthcare Participation Rates

PERS DCR and TRS DCR

If retire directly from disability:

Age	Current	Proposed
<55	73.00%	75.0%
55	73.00%	75.0%
56	77.50%	77.5%
57	79.75%	80.0%
58	82.00%	82.5%
59	84.25%	85.0%
60	86.50%	87.5%
61	88.75%	90.0%
62	91.00%	92.5%
63	93.25%	95.0%
64	95.50%	97.5%
65+	94.40%	100.0%

If retire directly from employment – before age 65:

Age	Current	Proposed ²⁴
55	40%	50%
56	50%	55%
57	55%	60%
58	60%	65%
59	65%	70%
60	70%	75%
61	75%	80%
62	80%	85%
63	85%	90%
64	90%	95%
65	N/A	100%

If retire directly from employment – age 65+:

Years of Service	Current	Proposed
< 15	70.5%	75%
15-19	75.2%	80%
20-24	79.9%	85%
25-29	89.3%	90%
30+	94.0%	95%

²⁴ Proposed assumption is a combination of (i) the proposed service-based rates for retirement from employment at age 65+, and (ii) the proposed age-based rates for retirement from employment before age 65.

Healthcare Morbidity Rates

Applicable to all plans

Age	Current		Proposed	
	Medical	Prescription Drugs	Medical	Prescription Drugs
< 45	2.0%	4.5%	2.0%	4.5%
45-54	2.5%	3.5%	2.5%	3.5%
55-64	3.5%	3.0%	2.5%	1.5%
65-74	4.0%	1.5%	3.0%	2.0%
75-84	1.5%	0.5%	2.0%	(0.5)%
85-94	0.5%	0.0%	0.3%	(2.5)%
95	0.5%	0.0%	0.0%	0.0%
96+	0.0%	0.0%	0.0%	0.0%

NGNMRS

Retirement Rates

Age	Current		Proposed	
	Male	Female	Male	Female
<51	10%	10%	13%	13%
51-52	10%	10%	13%	13%
53	12%	12%	15%	15%
54	15%	15%	20%	20%
55	20%	20%	25%	25%
56	25%	25%	35%	35%
57	30%	30%	40%	40%
58	35%	35%	45%	45%
59	40%	40%	50%	50%
60	45%	45%	55%	55%
61-64	50%	50%	60%	60%
65+	100%	100%	100%	100%

Withdrawal Rates

Members with less than 5 years of service

Service	Female		Male	
	Current	Proposed	Current	Proposed
<1	20%	20%	20%	20%
1-4	10%	10%	10%	10%

Members with 5 or more years of service

Age	Female		Male		Age	Female		Male	
	Current	Proposed	Current	Proposed		Current	Proposed	Current	Proposed
22	0.089621	0.170300	0.089621	0.134400	45	0.053593	0.101800	0.053593	0.080400
23	0.085762	0.162900	0.085762	0.128600	46	0.051041	0.097000	0.051041	0.076600
24	0.082654	0.157000	0.082654	0.124000	47	0.047548	0.090300	0.047548	0.071300
25	0.080193	0.152400	0.080193	0.120300	48	0.043086	0.081900	0.043086	0.064600
26	0.078275	0.148700	0.078275	0.117400	49	0.037790	0.071800	0.037790	0.056700
27	0.076794	0.145900	0.076794	0.115200	50	0.032580	0.061900	0.032580	0.048900
28	0.075648	0.143700	0.075648	0.113500	51	0.028500	0.054200	0.028500	0.042700
29	0.074735	0.142000	0.074735	0.112100	52	0.025530	0.048500	0.025530	0.038300
30	0.073955	0.140500	0.073955	0.110900	53	0.023415	0.044500	0.023415	0.035100
31	0.073215	0.139100	0.073215	0.109800	54	0.021825	0.041500	0.021825	0.032700
32	0.072431	0.137600	0.072431	0.108600	55	0.020670	0.039300	0.020670	0.031000
33	0.071529	0.135900	0.071529	0.107300	56	0.020130	0.038200	0.020130	0.030200
34	0.070452	0.133900	0.070452	0.105700	57	0.020205	0.038400	0.020205	0.030300
35	0.069165	0.131400	0.069165	0.103700	58	0.020760	0.039400	0.020760	0.031100
36	0.067656	0.128500	0.067656	0.101500	59	0.021810	0.041400	0.021810	0.032700
37	0.065945	0.125300	0.065945	0.098900	60	0.021810	0.045000	0.021810	0.035000
38	0.064121	0.121800	0.064121	0.096200					
39	0.062309	0.118400	0.062309	0.093500					
40	0.060618	0.115200	0.060618	0.090900					
41	0.059132	0.112400	0.059132	0.088700					
42	0.057884	0.110000	0.057884	0.086800					
43	0.056726	0.107800	0.056726	0.085100					
44	0.055397	0.105300	0.055397	0.083100					