Cavanaugh Macdonald
CONSULTING, LLC
The experience and dedication you deserve

August 17, 2016

Ms. Brenda Halpin, Director
State of Connecticut
Office of the State Comptroller
Retirement Services Division
55 Elm Street
Hartford, CT 06106

Dear Ms. Halpin:

Enclosed is the "Connecticut State Employees Retirement System Experience Investigation for the Four-Year Period Ending June 30, 2015". The investigation includes the demographic experience for the Connecticut State Employees Retirement System (SERS).

Please let us know if there are any questions concerning this report.

Sincerely,

John J. Garrett, ASA, FCA, MAAA
Principal and Consulting Actuary

Edward J. Koebel, EA, FCA, MAAA
Principal and Consulting Actuary

S:\Connecticut SERS\Experience Study\2011-2015 Exp Study\CT SERS Experience Investigation Report 2015.docx

3550 Busbee Pkwy, Suite 250, Kennesaw, GA 30144
Phone (678) 388-1700 • Fax (678) 388-1730
www.CavMacConsulting.com
Offices in Englewood, CO • Kennesaw, GA • Bellevue, NE

Cavanaugh Macdonald
CONSULTING, LLC
The experience and dedication you deserve

CONNECTICUT STATE EMPLOYEES RETIREMENT SYSTEM

EXPERIENCE INVESTIGATION FOR THE FOUR-YEAR PERIOD ENDING JUNE 30, 2015

www.CavMacConsulting.com

Cavanaugh Macdonald
CONSULTING, LLC
The experience and dedication you deserve

August 17, 2016

State of Connecticut
State Employees Retirement Commission
55 Elm Street
Hartford, CT 06106

Members of the Commission:

We are pleased to submit the results of an investigation of the demographic experience for the Connecticut State Employees Retirement System (SERS). The purpose of the investigation was to assess the reasonability of the demographic actuarial assumptions for the System. The actuarial assumptions are utilized by the actuary to provide a best estimate of the value of all benefits expected to be paid by the System over future years. The valuation also uses various actuarial methods in determining the required funding necessary to accumulate a sufficient amount of assets to fully fund the expected benefit payments.

This experience study covers the four-year period from July 1, 2011 to June 30, 2015. As a result of the investigation, it is recommended that revised tables be adopted by the SERS Retirement Commission for future use. Changing the assumptions will not change the actual cost of future benefits but will impact the measurement of the expected value of future benefits and the required contributions to maintain actuarial soundness.

The investigation of the experience of members of the System includes all active and retired members as well as beneficiaries of deceased members. In some instances, the experience was investigated separately for males and females where difference in gender was correlated to material differences in experience.

The results of the investigation indicate that the current assumed rates of separation from active service due to withdrawal, disability, retirement and mortality do not accurately reflect the actual and anticipated experience of the System. As a result of the investigation, new withdrawal, disability, retirement and mortality tables have been developed which reflect more closely the actual experience of the membership.

This report shows a comparison of the actual and expected cases of separation from active service, actual and expected number of deaths, and actual and expected salary increases. These tables are shown based on current assumed expected rates and based on new proposed expected rates. A comparison between the rates of separation and mortality presently in use and the recommended revised rates are also shown in this report.

All rates of separation, mortality and salary increase at each age for each system are shown in the attached tables in Appendix A of this report. In the actuary's judgment, the rates recommended are suitable for use until further experience indicates that modifications are desirable.

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

Respectfully submitted,

John J. Garrett, ASA, FCA, MAAA
Principal and Consulting Actuary

Edward J. Koebel, EA, FCA, MAAA
Principal and Consulting Actuary

TABLE OF CONTENTS

Section		Page
I	Executive Summary	1
II	Demographic Assumptions	3
	Rates of Withdrawal	4
	Rates of Disability Retirement	15
	Rates of Service Retirement	18
	Rates of Mortality	27
	Rates of Salary Increase	33
III	Other Assumptions and Methods	34
Appendix		
A	Recommended Rates	35

Section I
Executive Summary

The following summarizes the findings and recommendations with regard to the assumptions utilized for the State of Connecticut Retirement Systems. Detailed explanations for the recommendations are found in the sections that follow.

Economic Assumption Changes

The economic assumptions include price inflation, investment rate of return and wage inflation. The economic assumptions were reviewed and discussed by a group including the Comptroller's Office, the Office of Policy and Management, and the State Treasurer's Office. Management and the State Employees Bargaining Agent Coalition (SEBAC) are currently discussing the recommendations and analysis done by this group. In order not to interfere with the progress of that review, we are not including the economic assumptions as part of this study.

Demographic Assumption Changes

The table below lists the demographic assumptions that should be changed based on the experience of the last four years.

Assumption	Recommendations
Withdrawal	Recommend changes for Non-Hazardous and Hazardous Employees
Disability Retirement	Recommend lowering rates at most ages
Service Retirement	Recommend changes for Early, First Eligible and Ultimate Retirement and Split by Tier
Mortality	Recommend Update to Projected White Collar version of RPH-2014 Mortality Table
Salary Scale	Recommend no change in Merit Scale

Other Assumption and Method Changes

The table below lists the other assumptions and methods used in the valuations and our recommendations. As with the Economic Assumptions, several other actuarial methods, including the actuarial cost method and the amortization payment method, are being reviewed by a collective group in the State of Connecticut. Therefore, we are not including a review of those methods as part of this study.

Assumption	Recommendations
Actuarial Cost Method	Not studied
Asset Smoothing	Recommend no change from 5 year Smoothing
Amortization Method	Recommend a layered UAAL amortization approach beginning with the 2016 valuation. New UAAL layers composed experience gains and losses will be amortized over a closed 25-year period from valuation date they were initially measured. Changes to assumptions and methods would also be captured in the any UAAL layers.

Financial Impact

The following table highlights the impact of the recommended changes on the principal valuation results.

Impact on Principal Valuation Results ($ in thousands)			
	Valuation Results June 30, 2014	**Demographic Changes Only**	**Demographic Changes and Layered UAAL**
Unfunded Accrued Liability	$14,920,815	$15,630,208	$15,630,208
Funding Ratio	41.5%	40.4%	40.4%
Actuarially Determined Employer Contribution Rate (ADEC)			
Normal	7.99%	8.38%	8.38%
Accrued Liability	35.43%	37.11%	36.75%
Total	43.42%	45.49%	45.13%
Amortization Period (years)	17.0 years	17.0 years	17.2 years

Section II
Demographic Assumptions

There are several demographic assumptions used in the actuarial valuations performed for the Connecticut Retirement Systems. They are:

- Rates of Withdrawal
- Rates of Disability Retirement
- Rates of Service Retirement
- Rates of Post-retirement and Pre-Retirement Mortality
- Rates of Salary Increase

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

The purpose of a study of demographic experience is to compare what actually happened to the membership during the study period with what was expected to happen based on the assumptions used in the most recent Actuarial Valuations.

Detailed tabulations by age, service and/or gender are performed over the entire study period. These tabulations look at all active and retired members during the period as well as separately annotating those who experience a demographic event, also referred to as a decrement. In addition the tabulation of all members together with the current assumptions permits the calculation of the number of expected decrements during the study period.

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

The remainder of this section presents the results of the demographic study. We have prepared tables that show a comparison of the actual and expected decrements and the overall ratio of actual to expected results (A/E Ratios) under the current assumptions. If a change is being proposed, the revised A/E Ratios are shown as well. Salary adjustments, other than the economic assumption for wage inflation discussed in the previous section, are treated as demographic assumptions.

Section II: Demographic Assumptions

RATES OF WITHDRAWAL

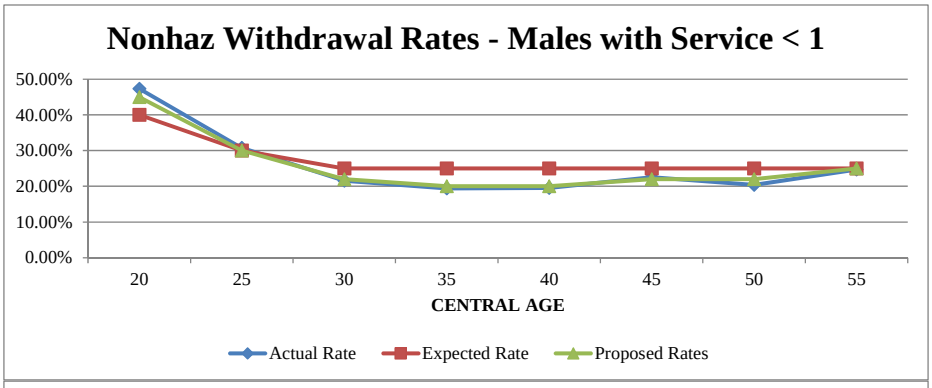
COMPARISON OF ACTUAL AND EXPECTED WITHDRAWALS FROM ACTIVE SERVICE BASED ON CURRENT RATES NON-HAZARDOUS

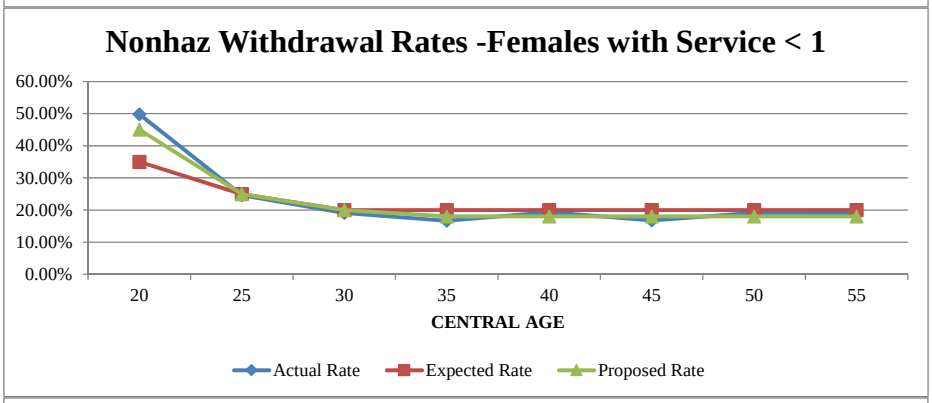
CENTRAL AGE OF GROUP	NUMBER OF WITHDRAWALS					
	NON-HAZARDOUS					
	MALES			FEMALES		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
20	377	337	1.119	283	232	1.220
25	538	561	0.959	529	547	0.967
30	459	498	0.922	603	622	0.969
35	345	366	0.943	461	512	0.900
40	315	351	0.897	482	507	0.951
45	400	431	0.928	569	566	1.005
50	424	412	1.029	603	565	1.067
55	355	313	1.134	480	384	1.250
TOTAL	**3,213**	**3,269**	**0.983**	**4,010**	**3,935**	**1.019**

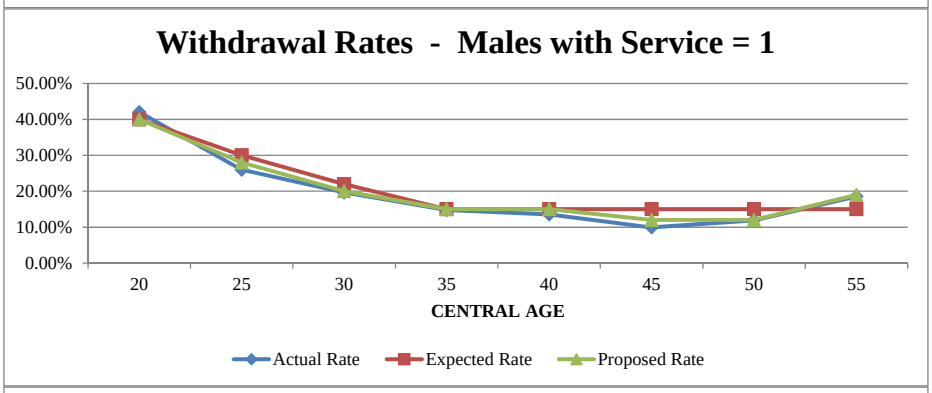
The following graphs show a comparison of the present, actual and proposed rates of withdrawal at each of the service breakdowns.

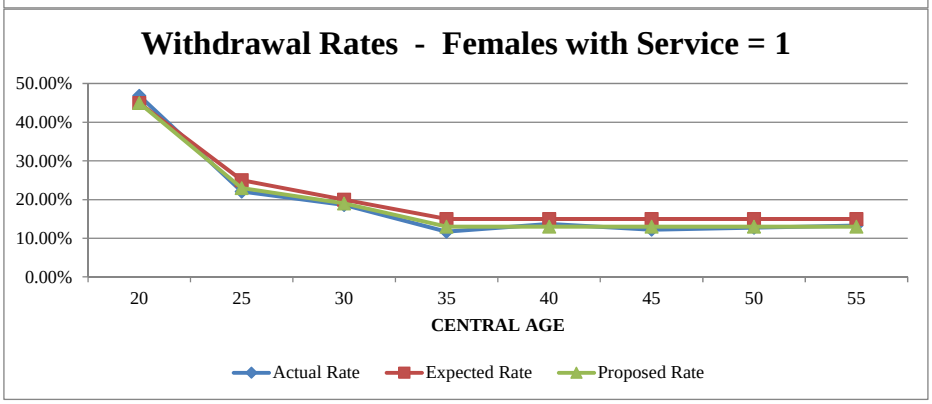
Section II: Demographic Assumptions

RATES OF WITHDRAWAL FOR NONHAZARDOUS ACTIVE MEMBERS

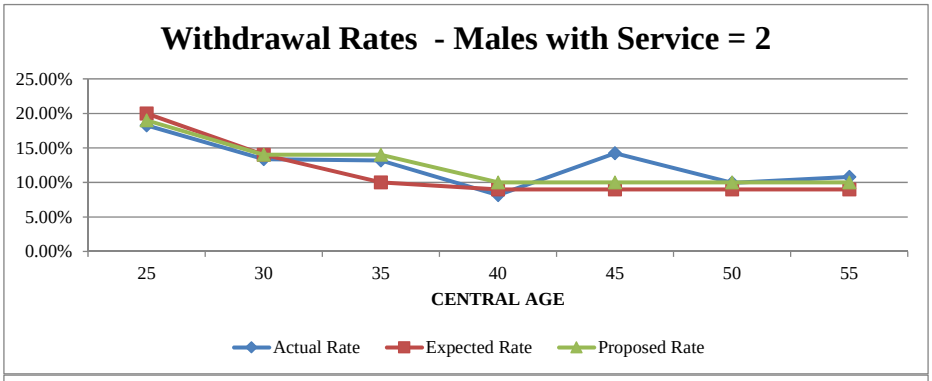


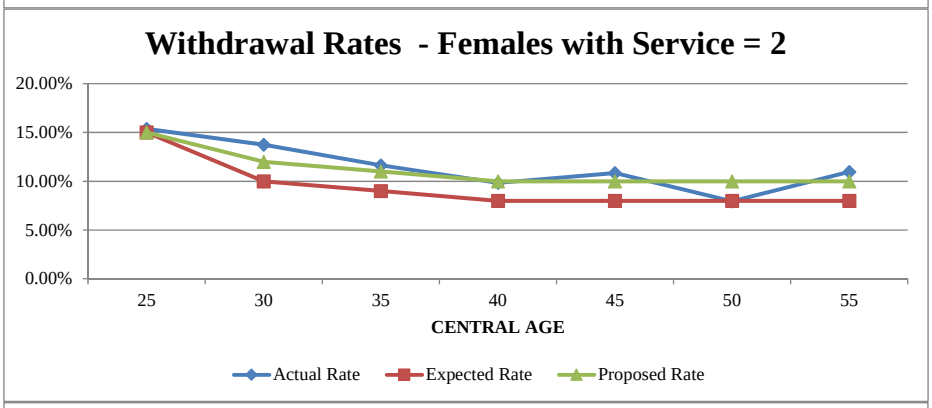


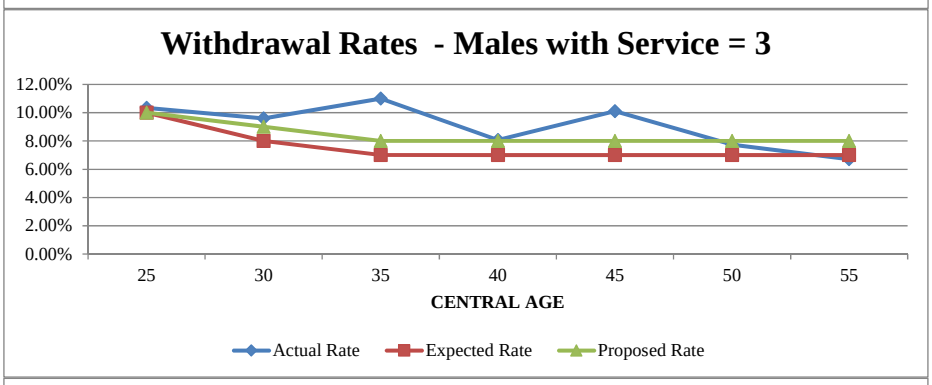


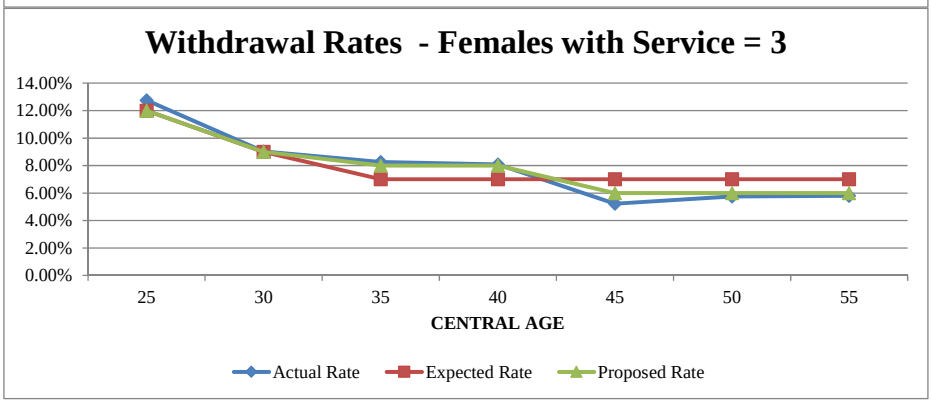


Section II: Demographic Assumptions

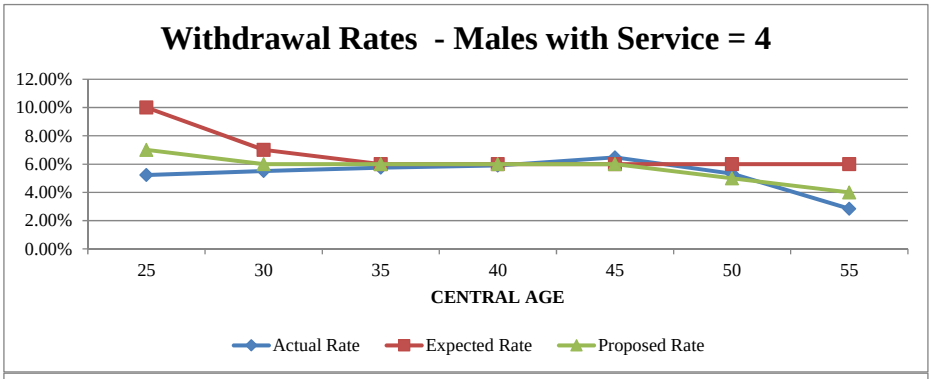


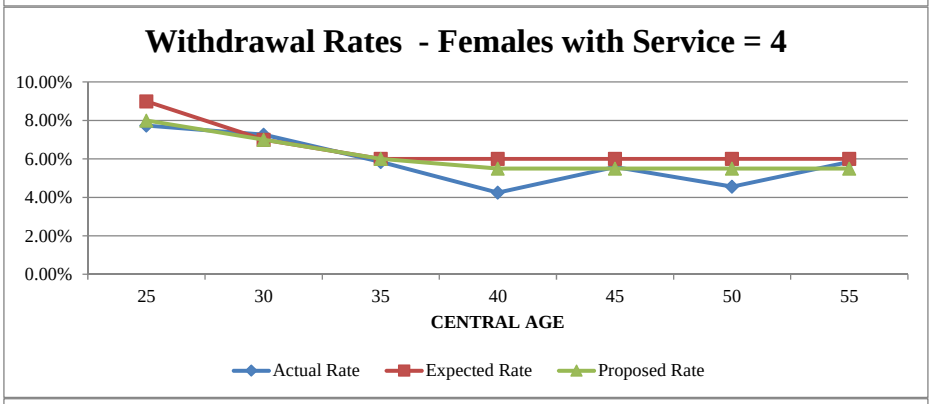


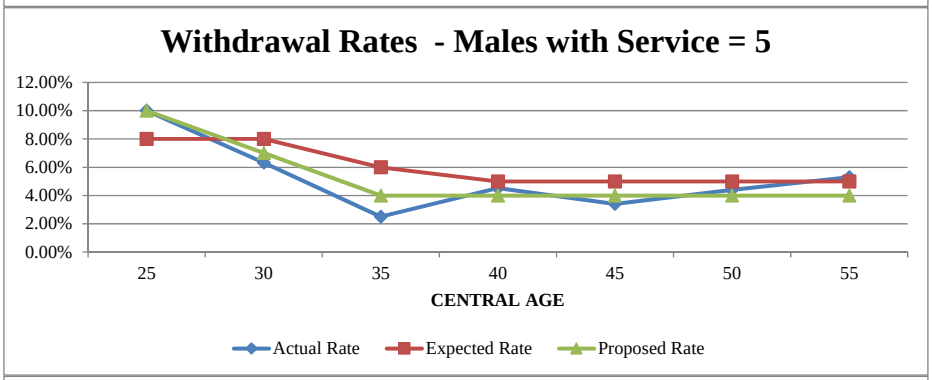


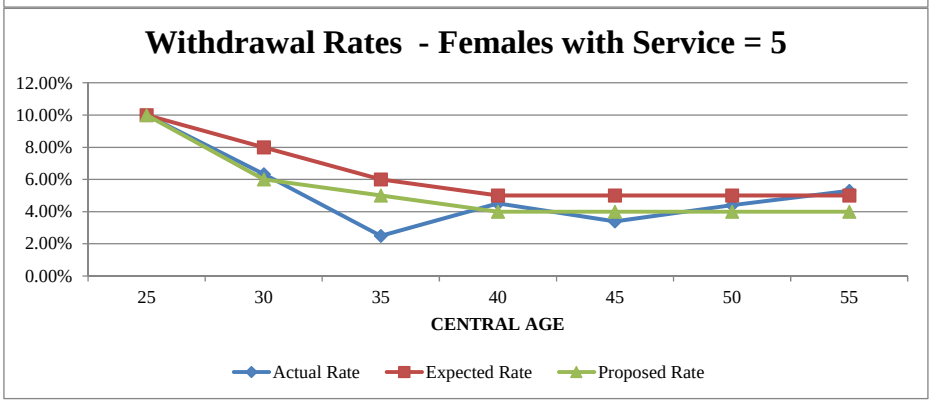


Section II: Demographic Assumptions

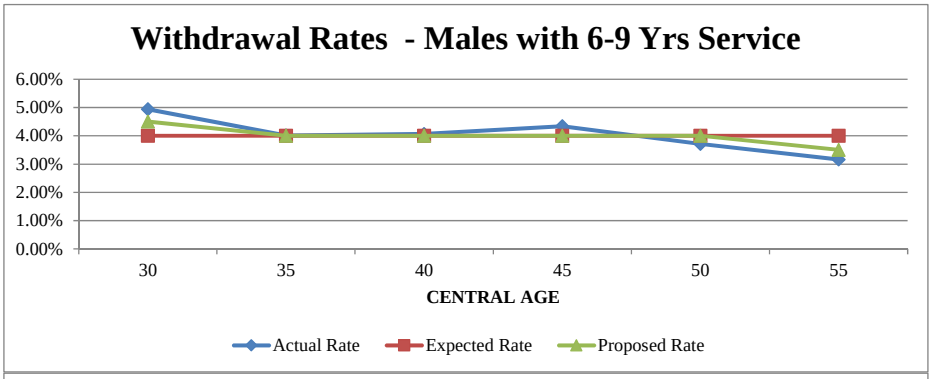


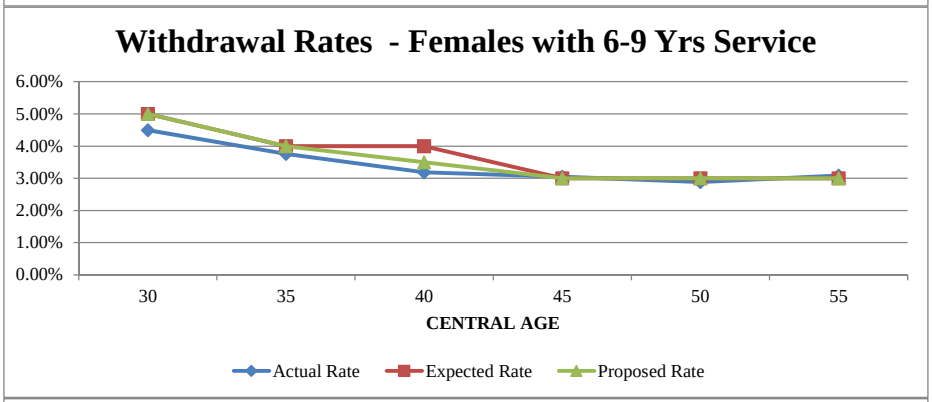


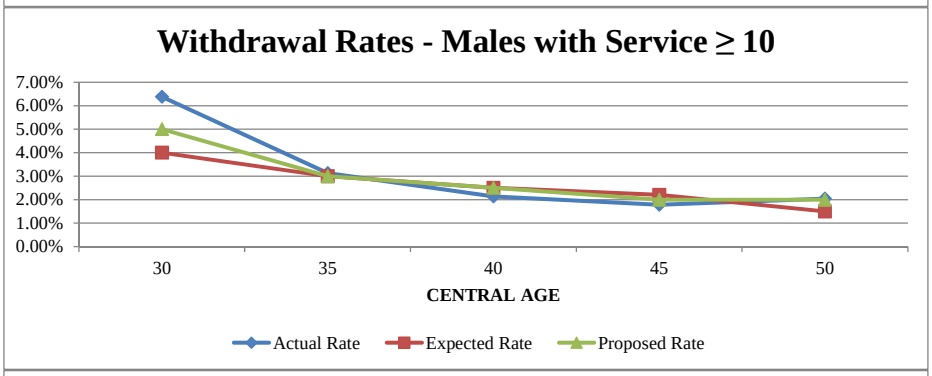


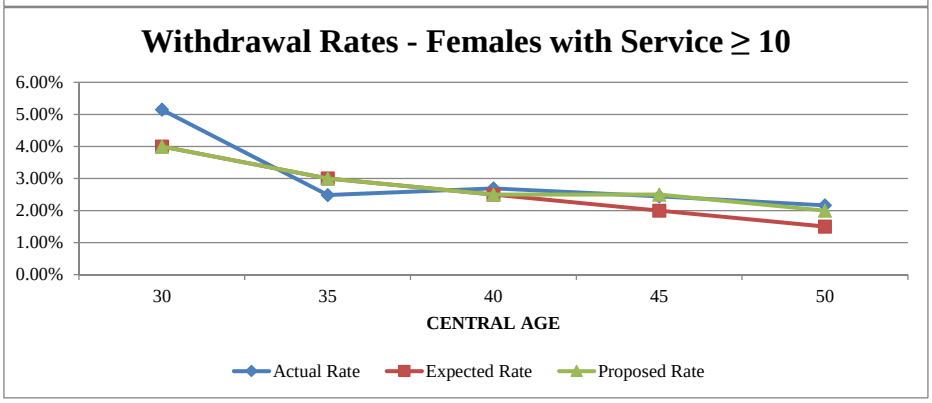


Section II: Demographic Assumptions









Section II: Demographic Assumptions

The rates of withdrawal adopted by the Commission are used to determine the expected number of separations from active service which will occur as a result of resignation or dismissal. Overall, the preceding results indicate that the actual number of nonhazardous withdrawals that occurred during the study period were very close to what was expected. However, we are recommending some minor adjustments in the rates of withdrawal to narrow the difference. An example of a changes is to lower the rates of withdrawal in the first two years of service for ages after 30.

The following tables show a comparison between the present withdrawal rates and the proposed withdrawal rates for nonhazardous members.

COMPARATIVE RATES OF WITHDRAWAL FOR NONHAZARDOUS MEMBERS

PRESENT RATE OF WITHDRAWAL
Nonhazardous Males

AGE	Years of Service							
	0	1	2	3	4	5	6 to 9	10 & over
20	40.0%	40.0%	40.0%	20.0%	20.0%	8.0%	5.0%	5.0%
25	30.0	30.0	20.0	10.0	10.0	8.0	4.0	5.0
30	25.0	22.0	14.0	8.0	7.0	8.0	4.0	4.0
35	25.0	15.0	10.0	7.0	6.0	6.0	4.0	3.0
40	25.0	15.0	9.0	7.0	6.0	5.0	4.0	2.5
45	25.0	15.0	9.0	7.0	6.0	5.0	4.0	2.2
50	25.0	15.0	9.0	7.0	6.0	5.0	4.0	1.5
55	25.0	15.0	9.0	7.0	6.0	5.0	4.0	0.0

PROPOSED RATE OF WITHDRAWAL
Nonhazardous Males

AGE	Years of Service							
	0	1	2	3	4	5	6 to 9	10 & over
20	45.0%	40.0%	40.0%	20.0%	20.0%	10.0%	6.0%	5.0%
25	30.0	28.0	19.0	10.0	7.0	10.0	6.0	5.0
30	22.0	20.0	14.0	9.0	6.0	7.0	4.5	5.0
35	20.0	15.0	14.0	8.0	6.0	4.0	4.0	3.0
40	20.0	15.0	10.0	8.0	6.0	4.0	4.0	2.5
45	22.0	12.0	10.0	8.0	6.0	4.0	4.0	2.0
50	22.0	12.0	10.0	8.0	5.0	4.0	4.0	2.0
55	25.0	19.0	10.0	8.0	4.0	4.0	3.5	2.0

Section II: Demographic Assumptions

PRESENT RATE OF WITHDRAWAL Nonhazardous Females								
AGE	Years of Service							
	0	1	2	3	4	5	6 to 9	10 & over
20	35.0%	45.0%	30.0%	20.0%	20.0%	10.0%	5.0%	5.0%
25	25.0	25.0	15.0	12.0	9.0	10.0	5.0	5.0
30	20.0	20.0	10.0	9.0	7.0	8.0	5.0	4.0
35	20.0	15.0	9.0	7.0	6.0	6.0	4.0	3.0
40	20.0	15.0	8.0	7.0	6.0	5.0	4.0	2.5
45	20.0	15.0	8.0	7.0	6.0	5.0	3.0	2.0
50	20.0	15.0	8.0	7.0	6.0	5.0	3.0	1.5
55	20.0	15.0	8.0	7.0	6.0	5.0	3.0	0.0

PROPOSED RATE OF WITHDRAWAL Nonhazardous Females								
AGE	Years of Service							
	0	1	2	3	4	5	6 to 9	10 & over
20	45.0%	45.0%	45.0%	20.0%	8.0%	10.0%	6.0%	4.0%
25	25.0	23.0	15.0	12.0	8.0	10.0	6.0	4.0
30	20.0	19.0	12.0	9.0	7.0	6.0	5.0	4.0
35	18.0	13.0	11.0	8.0	6.0	5.0	4.0	3.0
40	18.0	13.0	10.0	8.0	5.5	4.0	3.5	2.5
45	18.0	13.0	10.0	6.0	5.5	4.0	3.0	2.5
50	18.0	13.0	10.0	6.0	5.5	4.0	3.0	2.0
55	18.0	13.0	10.0	6.0	5.5	4.0	3.0	2.0

COMPARISON OF ACTUAL AND EXPECTED WITHDRAWALS FROM ACTIVE SERVICE BASED ON PROPOSED RATES
NON-HAZARDOUS

CENTRAL AGE OF GROUP	NUMBER OF WITHDRAWALS					
	NONHAZARDOUS					
	MALES			FEMALES		
	Actual	Expected (Proposed)	Ratio of Actual to Expected	Actual	Expected (Proposed)	Ratio of Actual to Expected
20	377	358	1.053	283	264	1.072
25	538	545	0.987	529	533	0.992
30	459	464	0.989	603	613	0.984
35	345	348	0.991	461	495	0.931
40	315	333	0.946	482	478	1.008
45	400	396	1.010	569	582	0.978
50	424	429	0.988	603	601	1.003
55	355	332	1.069	480	391	1.228
TOTAL	**3,213**	**3,205**	**1.002**	**4,010**	**3,957**	**1.013**

COMPARISON OF ACTUAL AND EXPECTED WITHDRAWALS FROM ACTIVE SERVICE BASED ON CURRENT RATES
HAZARDOUS

CENTRAL AGE OF GROUP	NUMBER OF WITHDRAWALS					
	HAZARDOUS					
	MALES			FEMALES		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
20	0	2	0.000	0	1	0.000
25	49	103	0.476	22	39	0.564
30	81	126	0.643	50	66	0.758
35	67	88	0.761	48	50	0.960
40	107	79	1.354	40	45	0.889
45	81	59	1.373	46	33	1.394
50	53	35	1.514	34	20	1.700
55	40	15	2.667	17	10	1.700
TOTAL	**478**	**507**	**0.943**	**257**	**264**	**0.973**

The preceding results indicate that the actual number of hazardous withdrawals that occurred during the study period were less than expected at earlier ages and more than expected at older ages. Therefore, we recommend adjusting the rates of withdrawals to better match the experience.

The following tables show a comparison between the present withdrawal rates and the proposed withdrawal rates for hazardous members.

Section II: Demographic Assumptions

COMPARATIVE RATES OF WITHDRAWAL FOR HAZARDOUS MEMBERS

PRESENT RATE OF WITHDRAWAL Hazardous Males								
AGE	Years of Service							
	0	1	2	3	4	5	6 to 9	10 & over
20	14.00%	14.00%	14.00%	7.00%	7.00%	2.80%	1.75%	1.75%
25	10.50	10.50	7.00	3.50	3.50	2.80	1.40	1.75
30	8.75	7.70	4.90	2.80	2.45	2.80	1.40	1.40
35	8.75	5.25	3.50	2.45	2.10	2.10	1.40	1.05
40	8.75	5.25	3.15	2.45	2.10	1.75	1.40	0.88
45	8.75	5.25	3.15	2.45	2.10	1.75	1.40	0.77
50	8.75	5.25	3.15	2.45	2.10	1.75	1.40	0.53
55	8.75	5.25	3.15	2.45	2.10	1.75	1.40	0.00

PROPOSED RATE OF WITHDRAWAL Hazardous Males								
AGE	Years of Service							
	0	1	2	3	4	5	6 to 9	10 & over
20	6.00%	3.00%	6.00%	3.00%	2.75%	2.00%	1.25%	1.25%
25	6.00	3.00	6.00	3.00	2.75	2.00	1.25	1.25
30	6.00	3.00	4.00	3.00	2.75	2.00	1.25	1.25
35	6.00	3.00	4.00	3.00	2.00	2.00	1.25	1.25
40	8.75	3.00	4.00	3.50	2.00	2.50	1.25	1.25
45	8.75	4.00	4.00	3.50	2.00	2.50	1.25	1.25
50	8.75	5.50	4.00	3.50	2.00	2.50	1.25	1.25
55	8.75	6.00	4.00	3.50	2.00	2.50	1.25	1.25

Section II: Demographic Assumptions

PRESENT RATE OF WITHDRAWAL Hazardous Females								
AGE	Years of Service							
	0	1	2	3	4	5	6 to 9	10 & over
20	19.25%	24.75%	16.50%	11.00%	11.00%	5.50%	2.75%	2.75%
25	13.75	13.75	8.25	6.60	4.95	5.50	2.75	2.75
30	11.00	11.00	5.50	4.95	3.85	4.40	2.75	2.20
35	11.00	8.25	4.95	3.85	3.30	3.30	2.20	1.65
40	11.00	8.25	4.40	3.85	3.30	2.75	2.20	1.38
45	11.00	8.25	4.40	3.85	3.30	2.75	1.65	1.10
50	11.00	8.25	4.40	3.85	3.30	2.75	1.65	0.83
55	11.00	8.25	4.40	3.85	3.30	2.75	1.65	0.00

PROPOSED RATE OF WITHDRAWAL Hazardous Females								
AGE	Years of Service							
	0	1	2	3	4	5	6 to 9	10 & over
20	10.00%	10.00%	5.00%	2.50%	3.00%	3.50%	2.50%	1.25%
25	10.00	10.00	5.00	2.50	3.00	3.50	2.50	1.25
30	12.00	6.00	5.00	2.50	3.00	3.50	2.50	1.25
35	12.00	5.00	6.00	2.50	4.00	3.50	2.50	1.25
40	12.00	5.00	6.00	2.00	4.00	3.50	2.50	1.25
45	12.00	5.00	5.00	2.00	4.00	3.50	2.50	1.25
50	12.00	8.00	5.00	2.00	4.00	3.50	2.50	1.25
55	12.00	8.00	5.00	2.00	4.00	3.50	2.50	1.25

COMPARISON OF ACTUAL AND EXPECTED WITHDRAWALS FROM ACTIVE SERVICE BASED ON PROPOSED RATES
HAZARDOUS

CENTRAL AGE OF GROUP	NUMBER OF WITHDRAWALS					
	HAZARDOUS					
	MALES			FEMALES		
	Actual	Expected (Proposed)	Ratio of Actual to Expected	Actual	Expected (Proposed)	Ratio of Actual to Expected
20	0	1	0.000	0	0	0.000
25	49	57	0.860	22	27	0.815
30	81	95	0.853	50	54	0.926
35	67	80	0.838	48	49	0.980
40	107	94	1.138	40	45	0.889
45	81	76	1.066	46	36	1.278
50	53	50	1.060	34	26	1.308
55	40	28	1.429	17	16	1.063
TOTAL	**478**	**481**	**0.994**	**257**	**253**	**1.016**

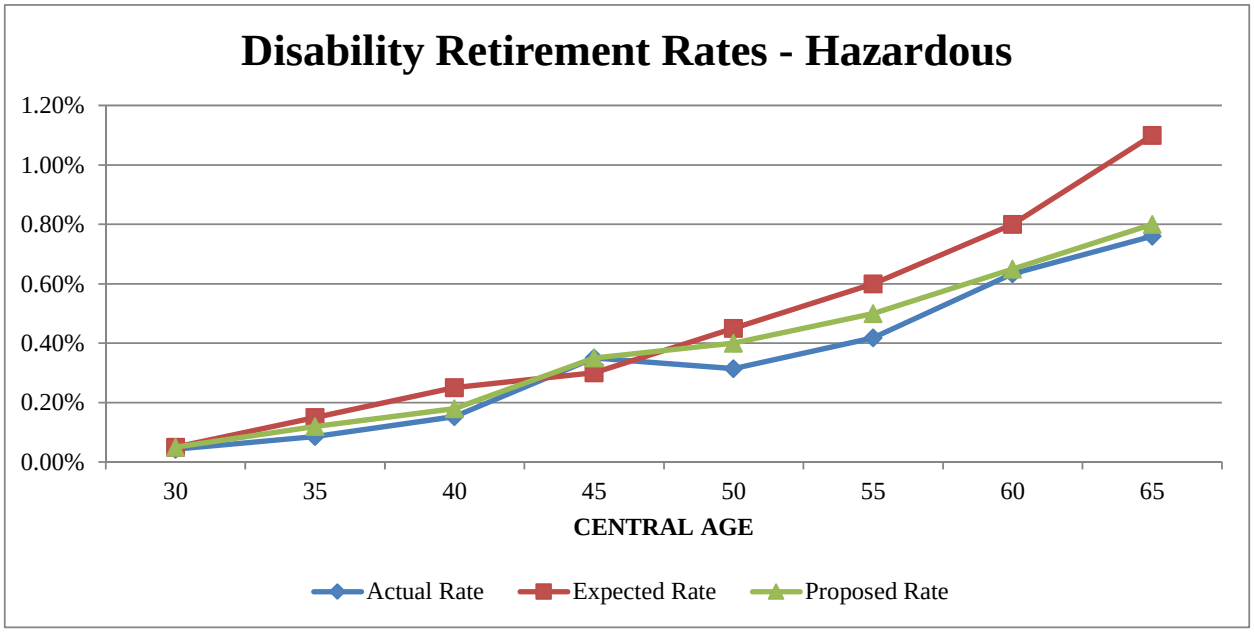
Section II: Demographic Assumptions

RATES OF DISABILITY RETIREMENT

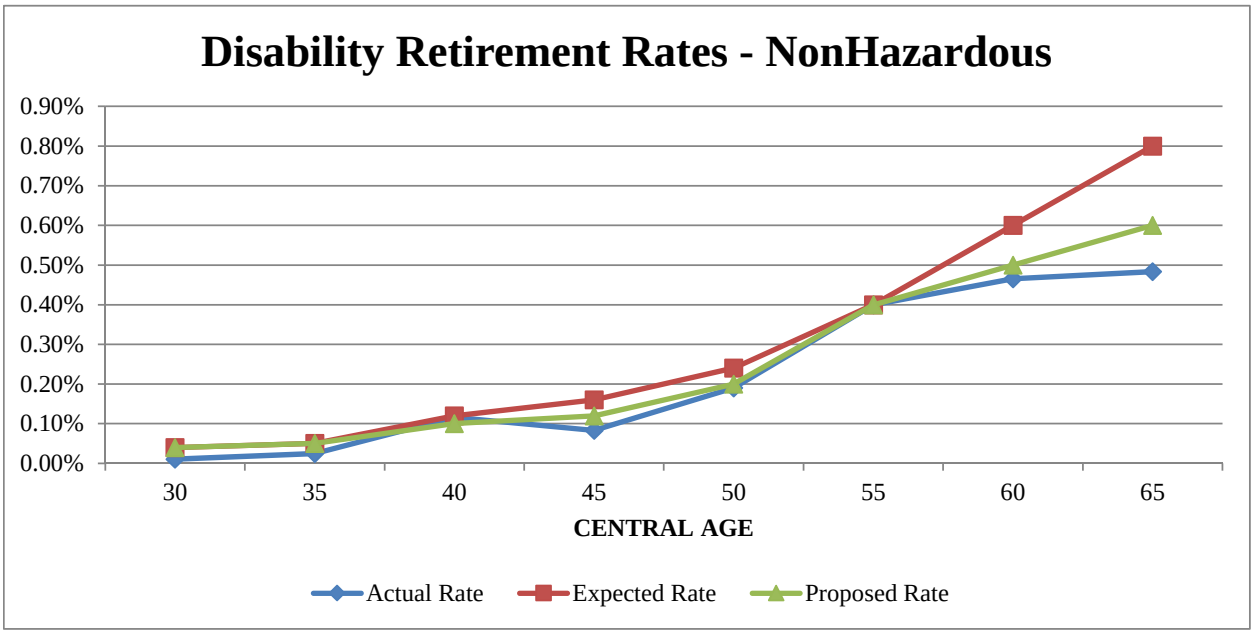
COMPARISON OF ACTUAL AND EXPECTED DISABILITY RETIREMENTS

CENTRAL AGE OF GROUP	NUMBER OF DISABILITY RETIREMENTS					
	Hazardous			Nonhazardous		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
30	2	2	0.858	1	4	0.234
35	5	9	0.571	3	6	0.502
40	12	20	0.612	18	19	0.968
45	29	25	1.167	19	37	0.519
50	18	26	0.698	56	71	0.793
55	15	22	0.696	112	112	0.999
60	13	16	0.792	87	112	0.776
65	13	16	0.815	54	95	0.568
TOTAL	**107**	**135**	**0.791**	**350**	**455**	**0.768**

The following graphs show a comparison of the present, actual, and proposed rates of disability retirements.



Section II: Demographic Assumptions



The preceding results indicate that the actual number of disability retirements was less than expected during the study period over most age groups and for both hazardous and nonhazardous employees. We recommend a slight decrease in the rates of disability retirement at most ages to more closely reflect the experience of the System and we recommend continuation of the post-decrement probability of 20% for In-Service disability retirements and 80% for Not-In-Service disability retirements.

Section II: Demographic Assumptions

The following table shows a comparison between the present disability retirement rates and the proposed rates.

COMPARATIVE RATES OF DISABILITY RETIREMENT

AGE	RATES OF DISABILITY RETIREMENT			
	Hazardous		Nonhazardous	
	Present	Proposed	Present	Proposed
30	0.05%	0.05%	0.04%	0.04%
35	0.15	0.12	0.05	0.05
40	0.25	0.18	0.12	0.10
45	0.30	0.35	0.16	0.12
50	0.45	0.40	0.24	0.20
55	0.60	0.50	0.40	0.40
60	0.80	0.65	0.60	0.50
65	1.10	0.80	0.80	0.60

COMPARISON OF ACTUAL AND EXPECTED DISABILITY RETIREMENTS BASED ON PROPOSED RATES

CENTRAL AGE OF GROUP	**NUMBER OF DISABILITY RETIREMENTS**					
	Hazardous			**Nonhazardous**		
	Actual	Expected (Proposed)	Ratio of Actual to Expected	Actual	Expected (Proposed)	Ratio of Actual to Expected
30	2	2	0.858	1	4	0.265
35	5	7	0.714	3	6	0.502
40	12	14	0.850	18	16	1.161
45	29	29	1.000	19	27	0.692
50	18	23	0.785	56	59	0.952
55	15	18	0.836	112	112	0.999
60	13	13	0.975	87	93	0.931
65	13	13	0.990	54	67	0.802
TOTAL	**107**	**120**	**0.893**	**350**	**384**	**0.910**

RATES OF SERVICE RETIREMENT
COMPARISON OF ACTUAL AND EXPECTED RETIREMENTS
HAZARDOUS

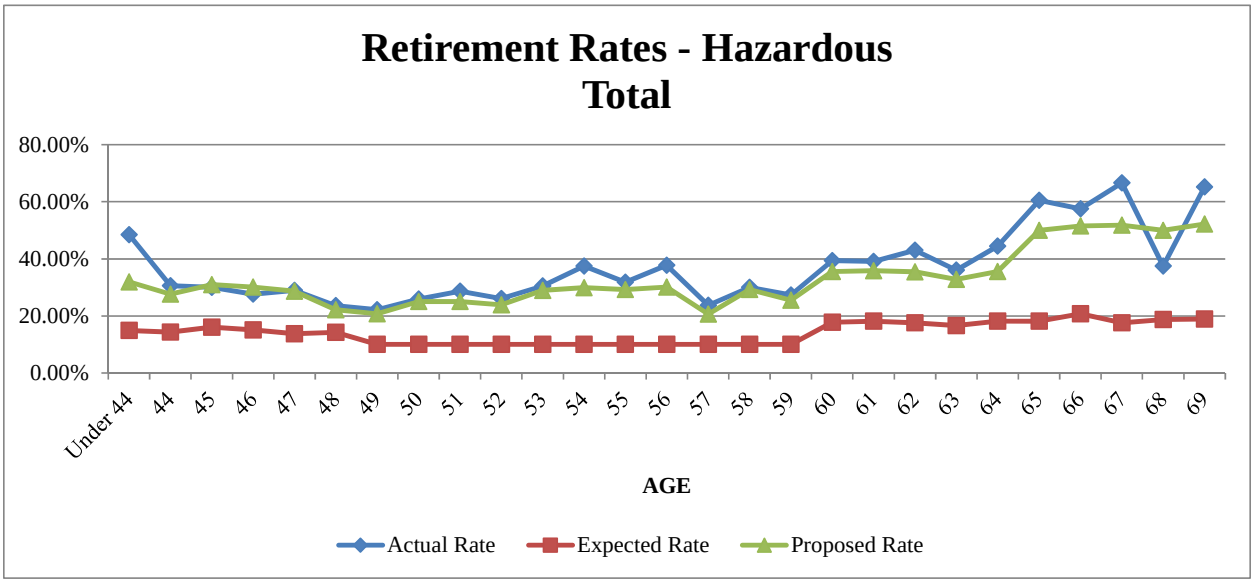
NUMBER OF SERVICE RETIREMENTS HAZARDOUS						
	First Year Eligible			All Years After		
Central Age of Group	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
Under 44	110	33	3.333	36	12	3.000
44	44	23	1.913	29	11	2.636
45	48	33	1.455	49	19	2.579
46	51	32	1.594	51	24	2.125
47	39	22	1.773	60	26	2.308
48	42	25	1.680	40	25	1.600
49	35	8	4.375	40	26	1.538
50	36	8	4.500	47	24	1.958
51	39	8	4.875	46	22	2.091
52	27	5	5.400	34	19	1.789
53	23	5	4.600	38	15	2.533
54	37	6	6.167	33	13	2.538
55	23	4	5.750	26	11	2.364
56	28	5	5.600	26	10	2.600
57	16	3	5.333	15	10	1.500
58	16	3	5.333	23	10	2.300
59	15	3	5.000	14	8	1.750
60	14	7	2.000	27	11	2.455
61	18	7	2.571	18	9	2.000
62	12	5	2.400	22	9	2.444
63	7	3	2.333	15	8	1.875
64	10	4	2.500	10	5	2.000
65	10	3	3.333	13	4	3.250
66	11	5	2.200	8	2	4.000
67	4	2	2.000	14	3	4.667
68	4	2	2.000	5	2	2.500
69	8	2	4.000	7	2	3.500
70	3	5	0.600	2	1	2.000
71	1	1	1.000	1	1	1.000
72	1	1	1.000	0	0	0.000
73	0	0	0.000	0	0	0.000
74	0	0	0.000	1	0	0.000
75	0	0	0.000	0	0	0.000
76	0	0	0.000	0	0	0.000
77	0	0	0.000	0	0	0.000
78	0	0	0.000	0	0	0.000
79	0	0	0.000	0	0	0.000
80	0	0	0.000	0	0	0.000
TOTAL	**732**	**273**	**2.681**	**750**	**342**	**2.193**

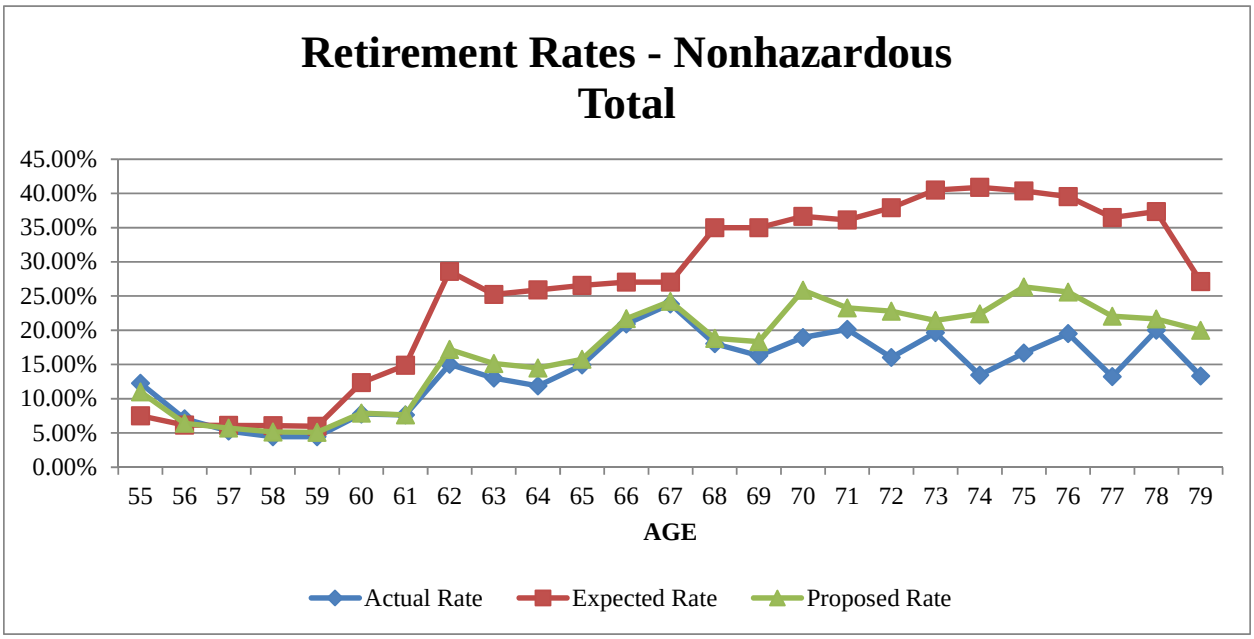
COMPARISON OF ACTUAL AND EXPECTED RETIREMENTS
NON-HAZARDOUS

NUMBER OF SERVICE RETIRMENTS NON-HAZARDOUS									
Central Age of Group	Early Retirement			Normal Retirement					
				First Year			Other Years		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
55	140	247	0.567	418	94	4.447			
56	95	175	0.543	0	1	0.000	179	63	2.841
57	85	169	0.503	2	1	2.000	107	54	1.981
58	80	158	0.506	1	0	0.000	68	45	1.511
59	83	149	0.557	0	0	0.000	56	38	1.474
60	67	208	0.322	98	94	1.043	62	58	1.069
61	69	232	0.297	23	23	1.000	103	125	0.824
62	11	7	1.571	198	425	0.466	134	221	0.606
63	5	3	1.667	17	33	0.515	221	434	0.509
64	7	2	3.500	4	28	0.143	170	364	0.467
65				18	39	0.462	177	309	0.573
66				12	34	0.353	205	246	0.833
67				7	24	0.292	168	174	0.966
68				7	23	0.304	86	120	0.717
69				2	10	0.200	61	93	0.656
70				15	78	0.192	56	59	0.949
71				4	13	0.308	54	91	0.593
72				2	16	0.125	36	74	0.486
73				1	6	0.167	32	62	0.516
74				1	6	0.167	17	49	0.347
75				0	8	0.000	19	38	0.500
76				0	3	0.000	16	29	0.552
77				0	2	0.000	9	23	0.391
78				0	0	0.000	12	22	0.545
79				1	1	1.000	5	11	0.455
80				0	0	0.000	8	34	0.235
TOTAL	**642**	**1,350**	**0.476**	**831**	**962**	**0.864**	**2,061**	**2,836**	**0.727**

Section II: Demographic Assumptions

The following graphs show a comparison of the present and actual rates of service retirements.





Section II: Demographic Assumptions

The preceding results indicate that for hazardous service retirements, the actual number of retirements overall was significantly higher than the expected number over this period, especially in the first year of eligibility for retirement. Similar experience was seen in the 2011 experience investigation. Therefore, we recommend increasing rates of retirement for hazardous employees at mostly all ages.

For non-hazardous service retirements, the tables on the preceding pages show actual and expected experience for early retirement, first year of normal retirement and ultimate normal retirement. The numbers are further broken down by Tier. The following key observations were found in the experience:

- Actual early retirements for Tiers II and IIA were less than expected,
- Actual first year eligible Tier I retirements were concentrated around age 55,
- Actual ultimate retirements were slightly less than expected for Tier I but significantly less than expected for Tiers II and IIA,
- Over the four year period, there were 134 service retirements from Tier III, most of those were transfers from the Alternate Retirement Plan (ARP).

Therefore, we recommend new service retirement rates for all Tiers, including Tier III.

Section II: Demographic Assumptions

COMPARATIVE RATES OF PRESENT AND PROPOSED RETIREMENT

AGE	ANNUAL RATES OF SERVICE RETIREMENT HAZARDOUS – Tier 1, 2 & 2A			
	Present		Proposed	
	First Year Eligible	All Years After	First Year Eligible	All Years After
40	18%	10%	50%	50%
41	18%	10%	30%	40%
42	18%	10%	30%	35%
43	18%	10%	30%	30%
44	18%	10%	30%	25%
45	25%	10%	40%	25%
46	25%	10%	40%	25%
47	25%	10%	40%	25%
48	25%	10%	40%	15%
49	10%	10%	40%	15%
50	10%	10%	40%	20%
51	10%	10%	40%	20%
52	10%	10%	40%	20%
53	10%	10%	40%	25%
54	10%	10%	40%	25%
55	10%	10%	40%	25%
56	10%	10%	40%	25%
57	10%	10%	40%	15%
58	10%	10%	40%	25%
59	10%	10%	40%	20%
60	25%	15%	50%	30%
61	25%	15%	50%	30%
62	25%	15%	50%	30%
63	25%	15%	50%	30%
64	25%	15%	50%	30%
65	25%	15%	50%	50%
66	25%	15%	50%	50%
67	25%	15%	50%	50%
68	25%	15%	50%	50%
69	25%	15%	50%	50%
70-79	100%	20%	50%	30%
80	100%	100%	100%	100%

AGE	ANNUAL RATES OF SERVICE RETIREMENT HAZARDOUS – Tier 3			
	Present		Proposed	
	First Year Eligible	All Years After	First Year Eligible	All Years After
40-49	18%	10%	20%	20%
50-59	25%	10%	20%	20%
60-69	10%	10%	20%	20%
70-79	100%	20%	20%	20%
80	100%	100%	100%	100%

COMPARATIVE RATES OF PRESENT AND PROPOSED RETIREMENT

AGE	ANNUAL RATES OF SERVICE RETIREMENT NON-HAZARDOUS – Tier 1					
	Present			Proposed		
	Early Retirement	Normal Retirement		Early Retirement	Normal Retirement	
		First Year	All Years After		First Year	All Years After
55	7.5%	7.5%		6.0%	28.0%	
56	5.0%	7.5%	7.5%	6.0%	10.0%	15.0%
57	5.0%	7.5%	7.5%	6.0%	10.0%	12.5%
58	5.0%	7.5%	7.5%	6.0%	10.0%	10.0%
59	5.0%	7.5%	7.5%	6.0%	10.0%	10.0%
60		12.5%	12.5%		12.5%	12.5%
61		15.0%	15.0%		15.0%	12.5%
62		10.0%	30.0%		10.0%	20.0%
63		35.0%	25.0%		35.0%	15.0%
64		45.0%	25.0%		45.0%	10.0%
65		65.0%	25.0%		65.0%	15.0%
66		65.0%	25.0%		65.0%	20.0%
67		65.0%	25.0%		65.0%	22.0%
68-69		65.0%	25.0%		65.0%	15.0%
70-79		100.0%	20.0%		100.0%	15.0%
80		100.0%	100.0%		100.0%	100.0%

AGE	ANNUAL RATES OF SERVICE RETIREMENT NON-HAZARDOUS – Tier 2 & 2A					
	Present			Proposed		
	Early Retirement	Normal Retirement		Early Retirement	Normal Retirement	
		First Year	All Years After		First Year	All Years After
55	7.5%			4.5%		
56-59	5.0%			4.0%		
60	12.5%	12.5%		4.0%	13.5%	
61	15.0%	15.0%	15.0%	4.0%	15.0%	13.0%
62		10.0%	30.0%		15.0%	24.0%
63		35.0%	25.0%		15.0%	15.0%
64		45.0%	25.0%		15.0%	15.0%
65		65.0%	25.0%		25.0%	15.0%
66		65.0%	25.0%		25.0%	21.0%
67		65.0%	25.0%		25.0%	24.0%
68-69		65.0%	25.0%		25.0%	18.0%
70		100.0%	20.0%		50.0%	20.0%
71		100.0%	20.0%		50.0%	24.0%
72-75		100.0%	20.0%		50.0%	22.0%
76		100.0%	20.0%		100.0%	25.0%
77		100.0%	20.0%		100.0%	22.0%
78		100.0%	20.0%		100.0%	25.0%
79		100.0%	20.0%		100.0%	22.0%
80		100.0%	100.0%		100.0%	100.0%

Section II: Demographic Assumptions

COMPARATIVE RATES OF PRESENT AND PROPOSED RETIREMENT

AGE	ANNUAL RATES OF SERVICE RETIREMENT					
	NON-HAZARDOUS – Tier 3					
	Present			Proposed		
	Early Retirement	Normal Retirement		Early Retirement	Normal Retirement	
		First Year	All Years After		First Year	All Years After
58	5.0%			5.0%		
59	5.0%			7.0%		
60	5.0%			9.0%		
61	10.0%			10.0%		
62	10.0%			12.0%		
63	10.0%	35.0%		12.0%	32.0%	
64	10.0%	45.0%	25.0%	12.0%	30.0%	30.0%
65		65.0%	25.0%		28.0%	25.0%
66		65.0%	25.0%		25.0%	35.0%
67		65.0%	25.0%		25.0%	35.0%
68		65.0%	25.0%		25.0%	35.0%
69		65.0%	25.0%		25.0%	30.0%
70-74		100.0%	20.0%		50.0%	30.0%
75-79		100.0%	20.0%		100.0%	30.0%
80		100.0%	100.0%		100.0%	100.0%

COMPARISON OF ACTUAL AND PROPOSED RETIREMENTS
HAZARDOUS

NUMBER OF SERVICE RETIREMENTS HAZARDOUS						
	First Year Eligible			All Years After		
Central Age of Group	Actual	Proposed	Ratio of Actual to Proposed	Actual	Proposed	Ratio of Actual to Proposed
Under 44	110	60	1.833	36	37	0.973
44	44	39	1.128	29	28	1.036
45	48	52	0.923	49	48	1.021
46	51	50	1.020	51	61	0.836
47	39	34	1.147	60	64	0.938
48	42	40	1.050	40	37	1.081
49	35	31	1.129	40	39	1.026
50	36	31	1.161	47	48	0.979
51	39	30	1.300	46	44	1.045
52	27	19	1.421	34	37	0.919
53	23	20	1.150	38	38	1.000
54	37	24	1.542	33	32	1.031
55	23	17	1.353	26	28	0.929
56	28	18	1.556	26	25	1.041
57	16	12	1.333	15	15	1.000
58	16	14	1.143	23	24	0.958
59	15	12	1.250	14	15	0.933
60	14	15	0.933	27	23	1.174
61	18	15	1.200	18	19	0.947
62	12	10	1.200	22	18	1.222
63	7	5	1.400	15	15	1.000
64	10	7	1.429	10	9	1.111
65	10	6	1.667	13	13	1.000
66	11	10	1.100	8	7	1.143
67	4	4	1.000	14	10	1.400
68	4	5	0.800	5	8	0.625
69	8	5	1.600	7	7	1.000
70	3	5	0.600	2	2	1.000
71	1	1	1.000	1	1	1.000
72	1	1	1.000	0	0	0.000
73	0	0	0.000	0	0	0.000
74	0	0	0.000	1	0	0.000
75	0	0	0.000	0	0	0.000
76	0	0	0.000	0	0	0.000
77	0	0	0.000	0	0	0.000
78	0	0	0.000	0	0	0.000
79	0	0	0.000	0	0	0.000
80	0	0	0.000	0	0	0.000
TOTAL	**732**	**592**	**1.236**	**750**	**752**	**0.997**

COMPARISON OF ACTUAL AND PROPOSED RETIREMENTS
NON-HAZARDOUS

NUMBER OF SERVICE RETIRMENTS
NON-HAZARDOUS

Central Age of Group	Early Retirement			Normal Retirement					
				First Year			Other Years		
	Actual	Proposed	Ratio of Actual to Proposed	Actual	Proposed	Ratio of Actual to Proposed	Actual	Proposed	Ratio of Actual to Proposed
55	140	149	0.941	418	352	1.188			
56	95	123	0.772	0	1	0.000	179	126	1.421
57	85	119	0.714	2	1	2.000	107	90	1.189
58	80	113	0.708	1	1	1.000	68	59	1.153
59	83	108	0.769	0	0	0.000	56	51	1.098
60	67	71	0.944	98	101	0.970	62	58	1.069
61	69	66	1.045	23	23	1.000	103	106	0.972
62	11	9	1.222	198	221	0.896	134	163	0.822
63	5	4	1.250	17	18	0.944	221	261	0.847
64	7	3	2.333	4	11	0.364	170	208	0.817
65				18	20	0.900	177	187	0.947
66				12	13	0.923	205	212	0.967
67				7	9	0.778	168	169	0.994
68				7	9	0.778	86	88	0.977
69				2	4	0.500	61	67	0.910
70				15	40	0.375	56	58	0.966
71				4	7	0.571	54	61	0.885
72				2	8	0.250	36	46	0.783
73				1	3	0.333	32	33	0.970
74				1	3	0.333	17	27	0.630
75				0	8	0.000	19	22	0.864
76				0	3	0.000	16	18	0.889
77				0	2	0.000	9	13	0.692
78				0	0	0.000	12	13	0.923
79				1	1	1.000	5	8	0.625
80				0	0	0.000	8	34	0.235
TOTAL	**642**	**765**	**0.839**	**831**	**859**	**0.967**	**2,061**	**2,178**	**0.946**

RATES OF MORTALITY

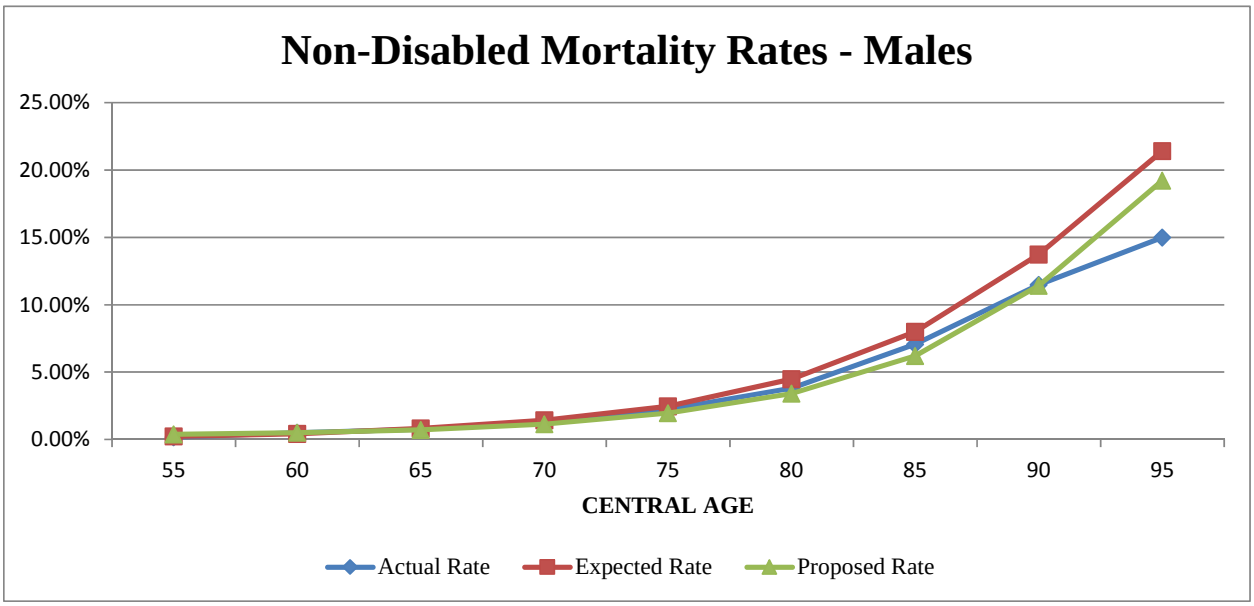
COMPARISON OF ACTUAL AND EXPECTED CASES OF POST-RETIREMENT DEATHS

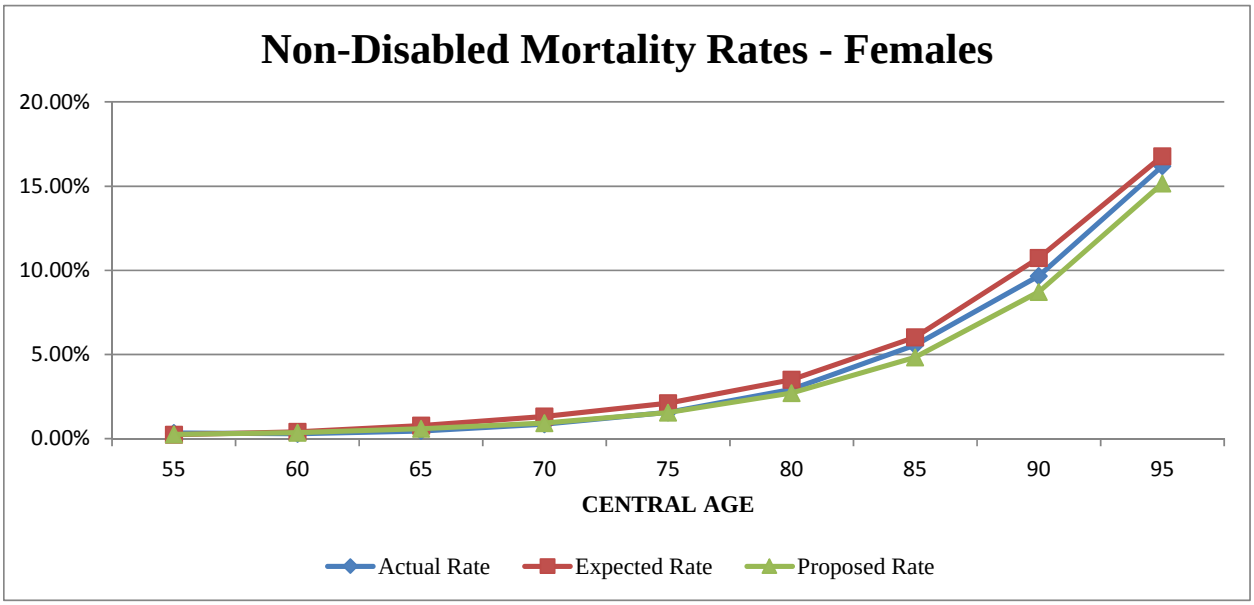
CENTRAL AGE OF GROUP	NUMBER OF POST-RETIREMENT DEATHS					
	MALES			FEMALES		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
SERVICE RETIREMENTS AND BENEFICIARIES						
55 & Under	26	20	1.326	29	11	2.658
60	54	46	1.176	31	45	0.691
65	112	121	0.928	70	120	0.585
70	174	187	0.933	128	195	0.655
75	215	237	0.906	183	247	0.741
80	303	356	0.850	296	353	0.838
85	407	460	0.885	493	534	0.923
90	326	390	0.836	531	591	0.899
95	115	164	0.700	311	322	0.964
98 & Over	28	29	0.950	100	88	1.131
TOTAL	**1,760**	**2,010**	**0.876**	**2,172**	**2,506**	**0.867**
DISABILITY RETIREMENTS						
47 & Under	8	11	0.727	4	4	1.000
50	5	15	0.323	11	8	1.363
55	11	26	0.426	13	19	0.696
60	31	32	0.976	33	28	1.193
65	23	34	0.679	27	34	0.787
70	18	26	0.680	35	31	1.113
75	25	23	1.098	18	26	0.681
80	27	18	1.468	26	26	0.993
85	15	13	1.162	16	17	0.964
88 & Over	9	9	1.000	22	20	1.100
TOTAL	**172**	**208**	**0.828**	**205**	**213**	**0.960**

Section II: Demographic Assumptions

The following graphs show a comparison of the present, actual and proposed rates of post-retirement deaths.

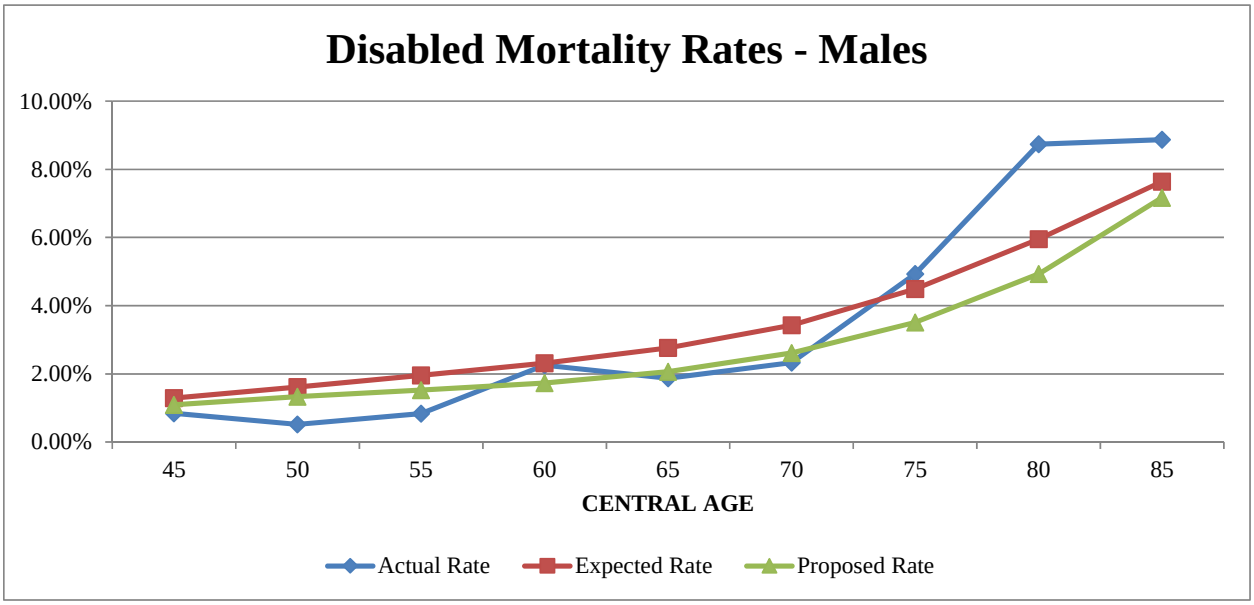
POST-RETIREMENT DEATHS
SERVICE RETIREMENTS AND BENEFICIARIES
OF DECEASED MEMBERS

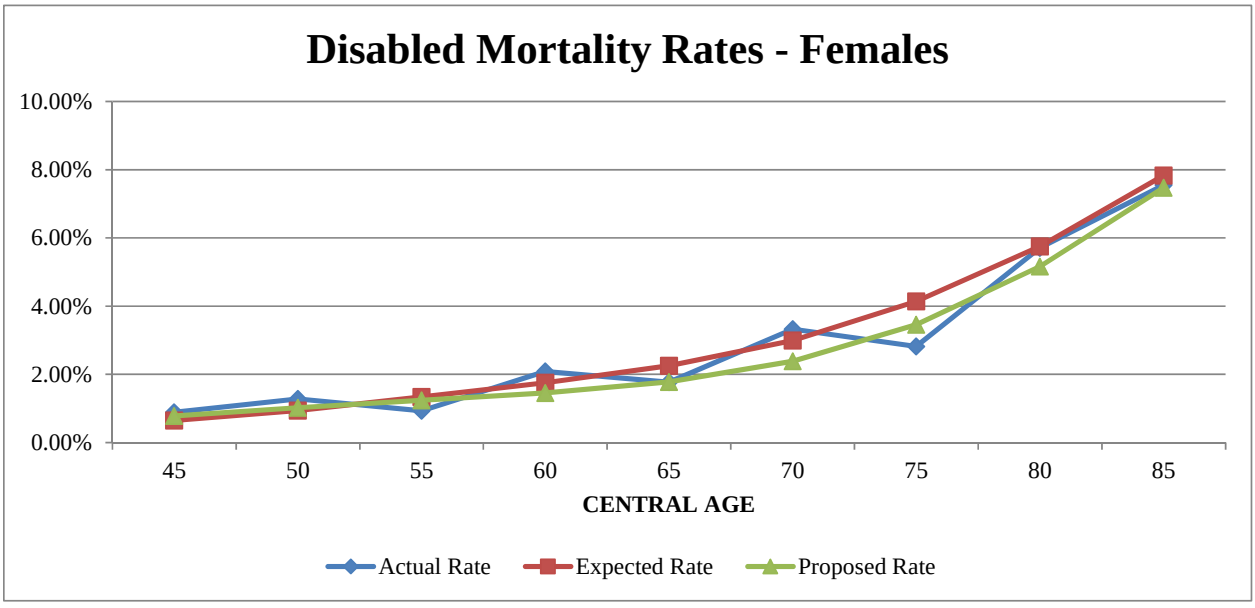




Section II: Demographic Assumptions

POST-RETIREMENT DEATHS
DISABILITY RETIREMENTS





Section II: Demographic Assumptions

Assumed rates of post-retirement mortality are very important assumptions for the actuarial valuation because they predict life expectancies and therefore, the duration of pension payments. As life expectancies are expected to continue to increase in the future, mortality rates are usually projected by actuaries to anticipate expected mortality improvements.

The current assumed rates of mortality for both males and females anticipated more deaths than actually occurred during the four year study period. The male rates predicted 87.6% of actual deaths and the female rates predicted 86.7% of actual deaths. When projecting future mortality improvements, we would expect actual deaths during the study period to be somewhat greater than expected deaths which is not the case. We recommend a change to the mortality rates used in the actuarial valuations that is based on updated mortality research and produces rates which anticipates the continuing trend in mortality improvement.

We recommend that the rates of retiree and beneficiary mortality be revised to the RP-2014 White Collar Mortality Table projected to 2020 by Scale BB at 95% for females. Compared to the current mortality table, this new mortality table extends life expectancy by an estimated 1.5 years for males and 2.0 years for females.

In addition, we recommend that the rates of disability mortality be revised to the RP-2014 Disabled Retiree Mortality Table at 65% for males and 85% for females.

For pre-retirement mortality, we recommend that the rates of mortality be revised to the RP-2014 White Collar Mortality Table projected to 2020 by Scale BB at 60% for males and 55% for females.

Section II: Demographic Assumptions

The following table shows a comparison between the present and proposed rates of mortality.

COMPARATIVE RATES OF POST-RETIREMENT SERVICE RETIREMENTS AND BENEFICIARIES OF DECEASED MEMBERS

AGE	RATES OF POST-RETIREMENT DEATH			
	SERVICE RETIREMENTS & BENEFICIARIES			
	MALES		FEMALES	
	Present	Proposed	Present	Proposed
35	0.059%	0.036%	0.033%	0.023%
40	0.086	0.043	0.044	0.031
45	0.107	0.067	0.069	0.052
50	0.142	0.272	0.101	0.194
55	0.219	0.384	0.198	0.250
60	0.414	0.501	0.392	0.348
65	0.810	0.705	0.760	0.579
70	1.425	1.133	1.311	0.933
75	2.460	1.943	2.083	1.553
80	4.483	3.407	3.482	2.688
85	8.075	6.247	5.981	4.826
90	14.180	11.809	11.053	8.908

COMPARATIVE RATES OF POST-RETIREMENT DISABILITY MORTALITY

AGE	RATES OF POST-RETIREMENT DEATH			
	DISABILITY RETIREMENTS			
	MALES		FEMALES	
	Present	Proposed	Present	Proposed
35	1.241%	0.595%	0.596%	0.335%
40	1.241	0.715	0.596	0.464
45	1.241	1.108	0.596	0.769
50	1.594	1.326	0.923	1.012
55	1.949	1.519	1.324	1.231
60	2.312	1.729	1.747	1.445
65	2.760	2.060	2.242	1.773
70	3.442	2.623	3.011	2.397
75	4.514	3.529	4.178	3.489
80	6.016	4.980	5.785	5.188
85	7.788	7.365	8.016	7.686
90	10.087	11.245	11.204	11.275

Section II: Demographic Assumptions

The following shows a comparison of the actual and expected post-retirement deaths based on new revised rates of mortality.

COMPARISON OF ACTUAL AND EXPECTED CASES OF POST-RETIREMENT DEATHS BASED ON REVISED MORTALITY RATES

CENTRAL AGE OF GROUP	NUMBER OF POST-RETIREMENT DEATHS					
	MALES			FEMALES		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
SERVICE RETIREMENTS AND BENEFICIARIES						
55 & Under	26	30	0.874	29	13	2.318
60	54	54	1.002	31	40	0.778
65	112	104	1.073	70	91	0.772
70	174	148	1.178	128	139	0.919
75	215	188	1.145	183	182	1.003
80	303	271	1.117	296	273	1.083
85	407	357	1.139	493	428	1.151
90	326	324	1.005	531	479	1.108
95	115	148	0.780	311	291	1.068
98 & Over	28	29	0.972	100	96	1.039
TOTAL	**1,760**	**1,653**	**1.065**	**2,172**	**2,033**	**1.068**
DISABILITY RETIREMENTS						
47 & Under	8	8	0.967	4	4	0.966
50	5	13	0.390	11	9	1.256
55	11	20	0.547	13	17	0.752
60	31	24	1.303	33	23	1.441
65	23	25	0.909	27	27	0.993
70	18	20	0.892	35	25	1.396
75	25	18	1.404	18	22	0.815
80	27	15	1.771	26	23	1.107
85	15	12	1.238	16	16	1.010
88 & Over	9	10	0.866	22	21	1.039
TOTAL	**172**	**166**	**1.036**	**205**	**188**	**1.091**

RATES OF SALARY INCREASE

COMPARISON OF ACTUAL AND EXPECTED SALARIES OF ACTIVE MEMBERS

SALARIES AT END OF YEAR (Millions)			
SERVICE OF GROUP	MALES AND FEMALES		
	Actual	Expected	Ratio of Actual to Expected
0	458	359	1.276
1	361	374	0.965
2	343	338	1.015
3	440	432	1.019
4	504	490	1.029
5	569	552	1.031
6	562	545	1.031
7	485	472	1.028
8	411	400	1.028
9	387	377	1.027
10	385	378	1.019
11	479	469	1.021
12	561	548	1.024
13	548	535	1.024
14	487	472	1.032
15+	5,903	5,776	1.022
TOTAL	**12,883**	**12,517**	**1.029**

The preceding results indicate that salary increases were slightly higher than expected over this four-year period. We recommend no change in the merit rates of salary increase at this time.

OTHER ASSUMPTIONS AND METHODS

ASSETS: Currently, the actuarial value of assets recognizes a portion of the difference between the market value of assets and the expected actuarial value of assets, based on the assumed valuation rate of return. The amount recognized each year is 20% of the difference between market value and expected actuarial value. In addition, the actuarial value of assets is constrained to an 80% to 120% corridor around the market value of assets. This methodology is a common asset smoothing method and we recommend no change at this time.

VALUATION COST METHOD: The valuation cost method is used to allocate the present value of benefits between past service (actuarial accrued liability) and future service (normal cost). Currently, the valuation uses the Projected Unit Credit (PUC) Cost Method. Since this method is currently being reviewed by a collective group in the State of Connecticut, we have not reviewed a change as part of this study.

AMORTIZATION METHOD: As of the 2014 actuarial valuation, a level percent of payroll with a closed 17-year period is used as an amortization method to pay off the Unfunded Actuarial Accrued Liability (UAAL). Since this method is also currently being reviewed by a collective group in the State of Connecticut, we have not reviewed a change as part of this study.

However, we do recommend that the Actuarial Subcommittee and the Commission consider a layered UAAL amortization approach beginning with the 2016 valuation. Under the current method, all future changes in the UAAL will be amortized by a shrinking period. As amortization periods decrease, payments will become increasingly more volatile with certain experience. To avoid the volatility of short amortization periods, we recommend new UAAL layers composed of experience gains and losses be amortized over a closed 25-year period from the valuation date they were initially measured. Also, changes to assumptions and methods would also be captured in the any UAAL layers.

PERCENT MARRIED: Currently, 80% of active members are assumed to be married with the male three years older than his spouse. Active members are assumed to have two children. Since the data we currently have does not include spousal information, we will recommend no change to this assumption at this time, but will review closely during the next experience study.

SERVICE-RELATED DEATHS: Currently, 20% of pre-retirement deaths are assumed to be service related. Since the data we currently have does not distinguish deaths, we will recommend no change at this time.

SERVICE-RELATED DISABILITY: Currently, 20% of disability retirements are assumed to be service-related. We have reviewed the data and recommend no changes at this time.

Appendix A – Proposed Demographic Assumptions

TABLE 1
RATES OF WITHDRAWAL FROM ACTIVE SERVICE

PROPOSED RATE OF WITHDRAWAL								
AGE	Years of Service							
	0	1	2	3	4	5	6 to 9	10 & over
Hazardous Males								
Under 18	6.00 %	3.00 %	6.00 %	3.00 %	2.75 %	2.00 %	1.25 %	1.25 %
18-22	6.00	3.00	6.00	3.00	2.75	2.00	1.25	1.25
23-27	6.00	3.00	6.00	3.00	2.75	2.00	1.25	1.25
28-32	6.00	3.00	4.00	3.00	2.75	2.00	1.25	1.25
33-37	6.00	3.00	4.00	3.00	2.00	2.00	1.25	1.25
38-42	8.75	3.00	4.00	3.50	2.00	2.50	1.25	1.25
43-47	8.75	4.00	4.00	3.50	2.00	2.50	1.25	1.25
48-52	8.75	5.50	4.00	3.50	2.00	2.50	1.25	1.25
53-57	8.75	6.00	4.00	3.50	2.00	2.50	1.25	1.25
58 & Over	8.75	6.00	4.00	3.50	2.00	2.50	1.25	0.00
Hazardous Females								
Under 18	10.00 %	10.00 %	5.00 %	2.50 %	3.00 %	3.50 %	2.50 %	1.25 %
18-22	10.00	10.00	5.00	2.50	3.00	3.50	2.50	1.25
23-27	10.00	10.00	5.00	2.50	3.00	3.50	2.50	1.25
28-32	12.00	6.00	5.00	2.50	3.00	3.50	2.50	1.25
33-37	12.00	5.00	6.00	2.50	4.00	3.50	2.50	1.25
38-42	12.00	5.00	6.00	2.00	4.00	3.50	2.50	1.25
43-47	12.00	5.00	5.00	2.00	4.00	3.50	2.50	1.25
48-52	12.00	8.00	5.00	2.00	4.00	3.50	2.50	1.25
53-57	12.00	8.00	5.00	2.00	4.00	3.50	2.50	1.25
58 & Over	12.00	8.00	5.00	2.00	4.00	3.50	2.50	0.00
Nonhazardous Males								
Under 18	45.00 %	45.00 %	40.00 %	20.00 %	20.00 %	10.00 %	6.00 %	5.00 %
18-22	45.00	40.00	40.00	20.00	20.00	10.00	6.00	5.00
23-27	30.00	28.00	19.00	10.00	7.00	10.00	6.00	5.00
28-32	22.00	20.00	14.00	9.00	6.00	7.00	4.50	5.00
33-37	20.00	15.00	14.00	8.00	6.00	4.00	4.00	3.00
38-42	20.00	15.00	10.00	8.00	6.00	4.00	4.00	2.50
43-47	22.00	12.00	10.00	8.00	6.00	4.00	4.00	2.00
48-52	22.00	12.00	10.00	8.00	5.00	4.00	4.00	2.00
53-57	25.00	19.00	10.00	8.00	4.00	4.00	3.50	2.00
58 & Over	25.00	19.00	10.00	8.00	4.00	4.00	3.50	2.00
Nonhazardous Females								
Under 18	45.00 %	45.00 %	45.00 %	20.00 %	8.00 %	10.00 %	6.00 %	4.00 %
18-22	45.00	45.00	45.00	20.00	8.00	10.00	6.00	4.00
23-27	25.00	23.00	15.00	12.00	8.00	10.00	6.00	4.00
28-32	20.00	19.00	12.00	9.00	7.00	6.00	5.00	4.00
33-37	18.00	13.00	11.00	8.00	6.00	5.00	4.00	3.00
38-42	18.00	13.00	10.00	8.00	5.50	4.00	3.50	2.50
43-47	18.00	13.00	10.00	6.00	5.50	4.00	3.00	2.50
48-52	18.00	13.00	10.00	6.00	5.50	4.00	3.00	2.00
53-57	18.00	13.00	10.00	6.00	5.50	4.00	3.00	2.00
58 & Over	18.00	13.00	10.00	6.00	5.50	4.00	3.00	2.00

TABLE 2
RATES OF SERVICE RETIREMENT FROM ACTIVE SERVICE

RATES OF SERVICE RETIREMENT			
HAZARDOUS			
AGE	Tier 1, 2 & 2A		Tier 3
	First Year Eligible	All Years After	
40	50%	50%	20%
41	30%	40%	20%
42	30%	35%	20%
43	30%	30%	20%
44	30%	25%	20%
45	40%	25%	20%
46	40%	25%	20%
47	40%	25%	20%
48	40%	15%	20%
49	40%	15%	20%
50	40%	20%	20%
51	40%	20%	20%
52	40%	20%	20%
53	40%	25%	20%
54	40%	25%	20%
55	40%	25%	20%
56	40%	25%	20%
57	40%	15%	20%
58	40%	25%	20%
59	40%	20%	20%
60	50%	30%	20%
61	50%	30%	20%
62	50%	30%	20%
63	50%	30%	20%
64	50%	30%	20%
65	50%	50%	20%
66	50%	50%	20%
67	50%	50%	20%
68	50%	50%	20%
69	50%	50%	20%
70-79	100%	30%	20%
80	100%	100%	100%

Appendix A – Proposed Demographic Assumptions

RATES OF SERVICE RETIREMENT									
NON-HAZARDOUS									
AGE	Tier 1			Tier 2 & 2A			Tier 3		
	Early Retirement	Normal Retirement		Early Retirement	Normal Retirement		Early Retirement	Normal Retirement	
		First Year	Other Years		First Year	Other Years		First Year	Other Years
55	6.0%	28.0%		4.5%					
56	6.0%	10.0%	15.0%	4.0%					
57	6.0%	10.0%	12.5%	4.0%					
58	6.0%	10.0%	10.0%	4.0%			5.0%		
59	6.0%	10.0%	10.0%	4.0%			7.0%		
60		12.5%	12.5%	4.0%	13.5%		9.0%		
61		15.0%	12.5%	4.0%	15.0%	13.0%	10.0%		
62		10.0%	20.0%		15.0%	24.0%	12.0%		
63		35.0%	15.0%		15.0%	15.0%	12.0%	32.0%	
64		45.0%	10.0%		15.0%	15.0%	12.0%	30.0%	30.0%
65		65.0%	15.0%		25.0%	15.0%		28.0%	25.0%
66		65.0%	20.0%		25.0%	21.0%		25.0%	35.0%
67		65.0%	22.0%		25.0%	24.0%		25.0%	35.0%
68		65.0%	15.0%		25.0%	18.0%		25.0%	35.0%
69		65.0%	15.0%		25.0%	18.0%		25.0%	30.0%
70		100.0%	15.0%		50.0%	20.0%		50.0%	30.0%
71		100.0%	15.0%		50.0%	24.0%		50.0%	30.0%
72		100.0%	15.0%		50.0%	22.0%		50.0%	30.0%
73		100.0%	15.0%		50.0%	22.0%		50.0%	30.0%
74		100.0%	15.0%		50.0%	22.0%		50.0%	30.0%
75		100.0%	15.0%		100.0%	22.0%		100.0%	30.0%
76		100.0%	15.0%		100.0%	25.0%		100.0%	30.0%
77		100.0%	15.0%		100.0%	22.0%		100.0%	30.0%
78		100.0%	15.0%		100.0%	25.0%		100.0%	30.0%
79		100.0%	15.0%		100.0%	22.0%		100.0%	30.0%
80		100.0%	100.0%		100.0%	100.0%		100.0%	100.0%

TABLE 3
RATES OF DISABILITY RETIREMENT FROM ACTIVE SERVICE

AGE	RATES OF DISABILITY	
	Hazardous	Nonhazardous
25	0.0000 %	0.0000 %
26	0.0000	0.0000
27	0.0000	0.0000
28	0.0500	0.0400
29	0.0500	0.0400
30	0.0500	0.0400
31	0.0500	0.0400
32	0.0500	0.0400
33	0.1200	0.0500
34	0.1200	0.0500
35	0.1200	0.0500
36	0.1200	0.0500
37	0.1200	0.0500
38	0.1800	0.1000
39	0.1800	0.1000
40	0.1800	0.1000
41	0.1800	0.1000
42	0.1800	0.1000
43	0.3500	0.1200
44	0.3500	0.1200
45	0.3500	0.1200
46	0.3500	0.1200
47	0.3500	0.1200
48	0.4000	0.2000
49	0.4000	0.2000
50	0.4000	0.2000
51	0.4000	0.2000
52	0.4000	0.2000
53	0.5000	0.4000
54	0.5000	0.4000
55	0.5000	0.4000
56	0.5000	0.4000
57	0.5000	0.4000
58	0.6500	0.5000
59	0.6500	0.5000
60	0.6500	0.5000
61	0.6500	0.5000
62	0.6500	0.5000
63	0.8000	0.6000
64	0.8000	0.6000
65	0.8000	0.6000
66	0.8000	0.6000
67	0.8000	0.6000
68	1.3500	0.6000
69	1.3500	0.6000
70	1.3500	0.6000

Appendix A – Proposed Demographic Assumptions

TABLE 4
RATES OF MORTALITY FOR ACTIVE MEMBERS, SERVICE RETIREMENTS AND BENEFICIARIES OF DECEASED MEMBERS

AGE	MALES	FEMALES	AGE	MALES	FEMALES
19	0.0254 %	0.0128 %	70	1.1327 %	0.9326 %
20	0.0280	0.0128	71	1.2606	1.0297
21	0.0309	0.0128	72	1.4042	1.1387
22	0.0336	0.0128	73	1.5645	1.2609
23	0.0351	0.0130	74	1.7433	1.3983
24	0.0356	0.0133	75	1.9434	1.5532
25	0.0333	0.0136	76	2.1680	1.7280
26	0.0318	0.0141	77	2.4212	1.9254
27	0.0309	0.0147	78	2.7081	2.1485
28	0.0305	0.0154	79	3.0345	2.4013
29	0.0307	0.0162	80	3.4073	2.6878
30	0.0311	0.0172	81	3.8341	3.0132
31	0.0319	0.0182	82	4.3230	3.3830
32	0.0329	0.0192	83	4.8825	3.8034
33	0.0339	0.0203	84	5.5209	4.2817
34	0.0350	0.0215	85	6.2467	4.8257
35	0.0360	0.0225	86	7.0686	5.4441
36	0.0369	0.0236	87	8.0450	6.1458
37	0.0379	0.0250	88	9.1504	6.9408
38	0.0393	0.0267	89	10.3994	7.8398
39	0.0410	0.0287	90	11.8087	8.9084
40	0.0432	0.0312	91	13.3420	10.0932
41	0.0463	0.0340	92	14.9781	11.3879
42	0.0499	0.0375	93	16.7041	12.7902
43	0.0546	0.0416	94	18.5160	14.3001
44	0.0603	0.0464	95	20.4167	15.9196
45	0.0670	0.0517	96	22.4133	17.6514
46	0.0748	0.0577	97	24.5139	19.4978
47	0.0837	0.0643	98	26.5647	21.3306
48	0.0935	0.0713	99	28.8598	23.3932
49	0.1043	0.0788	100	30.8378	25.2718
50	0.2715	0.1937	101	33.0373	27.3187
51	0.2928	0.2033	102	35.0365	29.2339
52	0.3145	0.2138	103	37.2282	31.3418
53	0.3368	0.2257	104	39.1624	33.2618
54	0.3596	0.2373	105	41.2831	35.3659
55	0.3838	0.2504	106	43.0946	37.2267
56	0.4047	0.2651	107	44.8227	39.0307
57	0.4252	0.2820	108	46.4592	40.7656
58	0.4479	0.3012	109	47.9987	42.4217
59	0.4731	0.3231	110	49.4376	43.9908
60	0.5009	0.3480	111	50.0000	45.4674
61	0.5319	0.3883	112	50.0000	46.8480
62	0.5668	0.4301	113	50.0000	47.5000
63	0.6065	0.4766	114	50.0000	47.5000
64	0.6522	0.5259	115	50.0000	47.5000
65	0.7050	0.5786	116	50.0000	47.5000
66	0.7664	0.6359	117	50.0000	47.5000
67	0.8375	0.6987	118	50.0000	47.5000
68	0.9193	0.7683	119	50.0000	47.5000
69	1.0192	0.8458	120	100.0000	100.0000

Appendix A – Proposed Demographic Assumptions

TABLE 5
RATES OF MORTALITY FOR DISABILITY RETIREMENTS

AGE	MALES	FEMALES	AGE	MALES	FEMALES
19	0.4200 %	0.1896 %	70	2.6225 %	2.3973 %
20	0.4622	0.1896	71	2.7721	2.5738
21	0.5111	0.1896	72	2.9361	2.7702
22	0.5555	0.1896	73	3.1158	2.9876
23	0.5794	0.1943	74	3.3127	3.2268
24	0.5873	0.1979	75	3.5287	3.4888
25	0.5509	0.2026	76	3.7657	3.7751
26	0.5259	0.2095	77	4.0264	4.0866
27	0.5111	0.2190	78	4.3136	4.4250
28	0.5054	0.2295	79	4.6303	4.7916
29	0.5077	0.2411	80	4.9800	5.1881
30	0.5145	0.2553	81	5.3665	5.6163
31	0.5270	0.2705	82	5.7938	6.0780
32	0.5429	0.2857	83	6.2663	6.5753
33	0.5600	0.3020	84	6.7883	7.1104
34	0.5782	0.3184	85	7.3647	7.6857
35	0.5953	0.3348	86	8.0003	8.3040
36	0.6101	0.3512	87	8.7003	8.9684
37	0.6272	0.3723	88	9.4703	9.6823
38	0.6488	0.3969	89	10.3164	10.4498
39	0.6773	0.4273	90	11.2453	11.2754
40	0.7148	0.4636	91	12.1852	12.1907
41	0.7638	0.5069	92	13.1365	13.1908
42	0.8252	0.5585	93	14.1001	14.2707
43	0.9027	0.6193	94	15.0764	15.4253
44	0.9971	0.6895	95	16.0660	16.6498
45	1.1075	0.7692	96	17.0697	17.9392
46	1.1532	0.8190	97	18.0879	19.2885
47	1.1978	0.8683	98	19.1214	20.6927
48	1.2416	0.9169	99	20.1708	22.1468
49	1.2842	0.9649	100	21.2366	23.6461
50	1.3257	1.0121	101	22.3194	25.1852
51	1.3660	1.0583	102	23.4200	26.7596
52	1.4054	1.1032	103	24.5389	28.3640
53	1.4437	1.1470	104	25.6767	29.9935
54	1.4814	1.1893	105	26.8340	31.6432
55	1.5190	1.2307	106	28.0115	33.3081
56	1.5569	1.2714	107	29.1348	34.9222
57	1.5962	1.3123	108	30.1985	36.4745
58	1.6374	1.3541	109	31.1992	37.9562
59	1.6814	1.3980	110	32.1344	39.3602
60	1.7293	1.4449	111	32.5000	40.6813
61	1.7819	1.4963	112	32.5000	41.9166
62	1.8403	1.5532	113	32.5000	42.5000
63	1.9054	1.6174	114	32.5000	42.5000
64	1.9781	1.6901	115	32.5000	42.5000
65	2.0595	1.7731	116	32.5000	42.5000
66	2.1503	1.8680	117	32.5000	42.5000
67	2.2511	1.9763	118	32.5000	42.5000
68	2.3629	2.0997	119	32.5000	42.5000
69	2.4864	2.2396	120	100.0000	100.0000

Appendix A – Proposed Demographic Assumptions

TABLE 6

RATES OF ANTICIPATED SALARY INCREASES*

SERVICE OF GROUP	SALARY INCREASE RATES
0	10.00 %
1	20.00
2	10.00
3	6.25
4	6.00
5	5.75
6	5.50
7	5.50
8	5.50
9	5.50
10	5.00
11	5.00
12	5.00
13	5.00
14	5.00
15+	4.00

* Includes Inflation