

MINNESOTA STATE PATROL RETIREMENT FUND  
4-YEAR EXPERIENCE STUDY  
JULY 1, 2011 THROUGH JUNE 30, 2015

July 26, 2016

Minnesota State Retirement System  
State Patrol Retirement Fund

Dear Board of Directors:

The results of the four-year *actuarial experience study* of the State Patrol Retirement Fund (SPRF) are presented in this report. The investigation was conducted for the purpose of updating the actuarial assumptions used in valuing the actuarial liabilities of the State Patrol Retirement Fund.

The investigation was based upon the statistical data furnished for annual active members and retired life actuarial valuations concerning members who died, withdrew, became disabled or retired during the four-year period of the study by the Minnesota State Retirement System (MSRS). We checked for internal and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the information provided by MSRS.

The investigation covered the four-year period from *July 1, 2011 to June 30, 2015*, and was carried out using generally accepted actuarial principles and techniques.

**We believe that the actuarial assumptions recommended in this experience study report represent individually and in the aggregate reasonable estimates of future experience of the State Patrol Retirement Fund.**

This report should not be relied on for any purpose other than that described above. It was prepared at the request of MSRS and is intended for use by the Retirement System and those designated or approved by the Board. This report may be provided to parties other than MSRS only in its entirety and only with the permission of the Board.

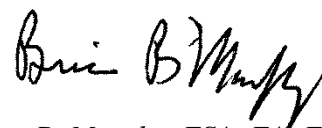
This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. To the best of our knowledge and belief, the information contained in this report was performed in accordance with Minnesota Statutes Section 356.215 and the requirements of the Standards for Actuarial Work established by the Legislative Commission on Pensions and Retirement. We certify that, to the best of our knowledge, this report is complete and accurate and was made in accordance with standards of practice promulgated by the Actuarial Standards Board.

Brian Murphy and Bonnie Wurst are independent of the plan sponsor and are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. In addition, Mr. Murphy meets the requirements of "approved actuary" under Minnesota Statutes Section 356.215, Subdivision 1, Paragraph (c).

Respectfully submitted,



Bonita J. Wurst, ASA, EA, FCA, MAAA



Brian B. Murphy, FSA, EA, FCA, MAAA

**ACTUARIAL EXPERIENCE STUDY  
2011 - 2015**

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## **SECTION A**

### OVERVIEW AND SUMMARY OF RESULTS

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## SUMMARY OF FINDINGS

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The four-year period (July 1, 2011 to June 30, 2015) covered by this experience study provided sufficient data to form a basis for recommending changes in some of the assumptions and/or methods used in actuarial valuations of the State Patrol Retirement Fund (SPRF). The recommended changes in actuarial assumptions and methods resulting from this experience study are summarized below:

### Recommendations:

- Adjust rates of merit and seniority, resulting in an overall increase to the assumed rates of merit and seniority increases:
  - Proposed rates are 7.75%, 2.25%, 1.25% and 1.00% greater than the current rates in the first four years of employment; minor adjustments to the current rates after the fourth year of employment.
  - Proposed rates average approximately 0.25% higher than the current rate.
- Adjust assumed retirement rates:
  - Increase the assumed unreduced retirements (i.e. Normal Retirement) at age 59.
  - Decrease the assumed reduced retirements (i.e. Early Retirement) at ages 50-53 and increase the assumed reduced retirement at age 54. The net effect is fewer assumed early retirements.
- Reduce rates of withdrawal during first three years of employment
- Increase rates of disability for ages 35 to 51.
- Change the base mortality table to the RP-2014 mortality table, white collar adjustment, and with future improvement projected using scale MP-2015 from a base year of 2006.
- Minor changes to the form of payment assumptions.

The recommendations are summarized on the following pages.

Review of economic assumptions (inflation, payroll growth, investment return) and actuarial methods is outside the scope of this experience study. Please refer to GRS' State Employees Retirement Fund experience study dated June 30, 2015.

## INTRODUCTION

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Each year as of June 30, the actuarial liabilities of the System are valued. In order to perform the valuation, assumptions must be made regarding the future experience of the System with regard to the following risk areas:

- Rates of **withdrawal** of active members (leaving before eligible to retire).
- Rates of **disability** among active members.
- Patterns of **pay increases** to active members.
- Rates of **retirement** among active members.
- Rates of **mortality** among active members, retirees, and beneficiaries.
- Long-term rates of **investment return** to be generated by the assets of the System.

Assumptions should be carefully chosen and continually monitored. An unrealistic set of assumptions can lead to:

- Understated costs resulting in either an inability to pay benefits when due, or gradual increases in required contributions as time progresses; and
- Overstated costs resulting in an unnecessarily large burden on the current generation of employers and taxpayers.

All actuarial assumptions are prescribed by Minnesota Statutes, the Legislative Commission on Pensions and Retirement or the MSRS Board of Directors.

A single set of assumptions will not be suitable indefinitely. Things change, and our understanding of things (whether or not they are changing) also changes. The package of assumptions is then adjusted to reflect basic experience trends -- but not random year to year fluctuations. Actuarial assumptions were last revised for the June 30, 2012 actuarial valuation based on the results of the most recent experience study. Assumptions in effect prior to June 30, 2015 are ignored for purposes of this report.

No single experience period should be given full credibility in the setting of actuarial valuation assumptions. When we see significant differences between what is expected from our assumptions and the actual experience, we generally recommend a change in assumptions that produces results somewhere between the actual and expected experience. In this way, with each experience study the actuarial assumptions become better and better representations of actual experience. Consequently, temporary conditions that might influence a particular experience study period will not unduly influence the choice of long-term assumptions.

We are recommending certain changes in assumptions. The various assumption changes are described on the following pages.

## SUMMARY OF DECREMENT EXPERIENCE 2011 - 2015

### Summary of Decrement Experience

Decrement Risk Area	Actual Number	Expected		
		Present Assumptions	Proposed Assumptions	Change
<i>Retirement</i>				
Normal Retirement	96	104.7	106.1	1.4
Early Retirement	44	34.0	30.1	(3.9)
<i>Withdrawal*</i>				
Select period (first three years)	17	10.7	7.1	(3.6)
Ultimate period (after three years)	20	10.0	10.0	-
<i>Disability</i>				
Males	8	6.4	7.4	1.0
Females	3	0.8	0.9	0.1
<i>Mortality</i>				
Healthy Retired Lives - Male	60	65.3	64.7	(0.6)
- Female	1	1.0	0.8	(0.2)
Disabled Retired Lives - Male	4	1.9	1.9	0.0
- Female	0	0.1	0.1	(0.0)
Active Lives - Male	1	2.8	2.0	(0.8)
- Female	0	0.3	0.2	(0.1)

\* The plan experienced more withdrawals than projected by the present assumptions (37 actual terminations versus 20.7 expected). However, the liability associated with these members that left the plan was significantly less than expected. The proposed assumptions more closely match the liability-weighted results.

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**SECTION B**

**PAY INCREASES**

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## **PAY INCREASES DUE TO MERIT AND SENIORITY**

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Pay increases granted to active members typically consist of two pieces:

- An across-the-board, economic type of increase granted to most or all members of the group. This increase is typically tied to inflation or cost of living changes, and
- An increase as a result of merit and seniority. This increase is typically related to the performance of an individual and includes promotions and increased years of experience.

We reviewed total pay increases during the four-year period. Total pay increases from one year to the next can fluctuate based on a number of reasons, including overtime and/or the number of pay periods in a year. For each year, we excluded individual pay increases that were more than 30% and also excluded individual pay increases that were less than -30%. While this was a relatively small number of records, the experience distorted the experience of the overall group. Excluding all of the negative pay increases would have overstated actual pay growth.

In order to study the merit and seniority portion of the salary increase assumption, it is necessary to separate out the portion attributable to wage inflation. Based on our review of salary experience for SPRF members for the period July 1, 2011 through June 30, 2015, we observed members with longer periods of service averaged about 2.0% for this period. Members with less service received increases that were higher than 2.0% in general. For our analysis of the merit and seniority portion of total salary increase, we assumed the salary increase amount in excess of the total salary increase for the longer-service members (i.e. those with 20 or more years of service) was attributable to wage inflation only. This assumes that once SPRF members reach a certain length of service, merit and seniority increases are atypical.

## PAY INCREASES DUE TO MERIT AND SENIORITY

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### Findings

The assumed wage inflation was changed from 3.75% to 3.50% effective July 1, 2015. However, based on the analysis described on the previous page, we estimated the average actual wage inflation component of pay increases was around 2.0% for members of the SPRF during the four years of the study. This estimated actual increase was subtracted from the actual pay increases to obtain the estimated merit/seniority portion of the pay increases. It should be noted that the results of the analysis are very sensitive to the estimated wage inflation component.

Gross actual salary increases averaged 4.23% over the four-year period, ranging from -1.94% in 2013 to 8.67% in 2015. After adjusting for the 2.0% average wage inflation for this period, the average net salary increase (i.e., merit and seniority) averaged 2.23%, ranging from -3.94% to 6.67%. Salaries for state patrol employees during this period were impacted by tough economic conditions; in addition, there appear to be some pay timing issues, where one year may have included an extra pay period compared to others.

Fiscal Year Ending	Count	Gross		Net*	
		Expected	Actual	Expected	Actual
2012	766	5.00%	5.66%	1.50%	3.66%
2013	774	5.02%	-1.94%	1.52%	-3.94%
2014	752	4.94%	4.85%	1.44%	2.85%
2015	722	5.01%	8.67%	1.51%	6.67%
<b>Total</b>	<b>3,014</b>	<b>4.99%</b>	<b>4.23%</b>	<b>1.49%</b>	<b>2.23%</b>

\* Net Expected increases are equal to Gross Expected increases minus assumed wage inflation of 3.5%. Net Actual increases are equal to Gross Actual increases minus the estimated actual wage inflation for the period of 2.0%.

The results of our analysis are shown on the following page. Using the techniques described above, observed merit and seniority pay increases were generally higher than the presently assumed increases for less than 12 years of service and lower than assumed for 12 or more years of service.

### Recommendation

*We recommend adjustments to the current merit/seniority pay increase assumption as shown on the following page. The proposed rates take into account the economic conditions of the prior four years.*

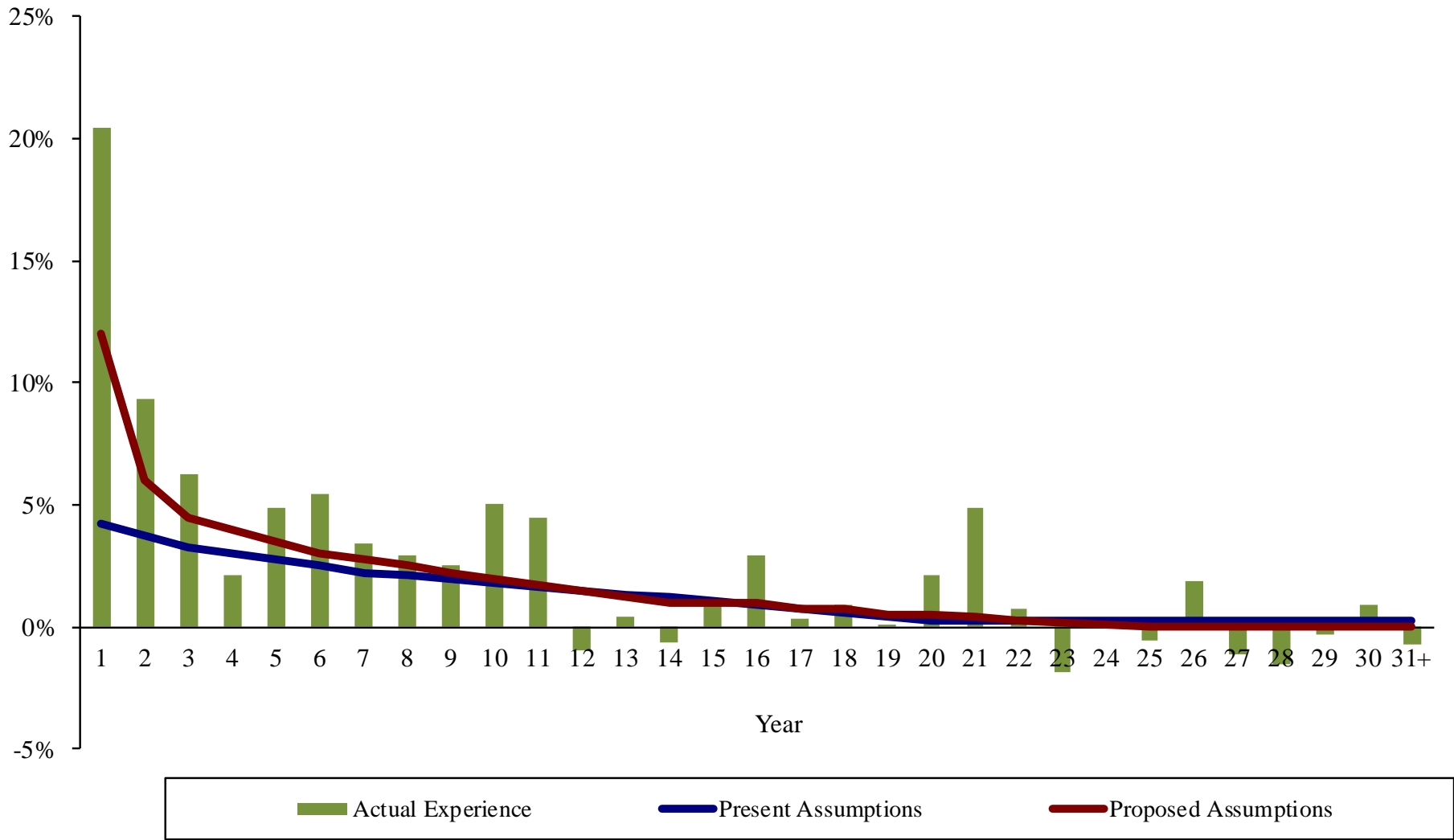
## PAY INCREASES DUE TO MERIT AND SENIORITY

Year	Exposures	Gross Salary % Increase			Net* Salary % Increase		
		Actual	Expected	Proposed	Actual	Expected	Proposed
1	3	22.45%	7.75%	15.50%	20.45%	4.25%	12.00%
2	104	11.35%	7.25%	9.50%	9.35%	3.75%	6.00%
3	120	8.28%	6.75%	8.00%	6.28%	3.25%	4.50%
4	112	4.15%	6.50%	7.50%	2.15%	3.00%	4.00%
5	116	6.89%	6.25%	7.00%	4.89%	2.75%	3.50%
6	144	7.48%	6.00%	6.50%	5.48%	2.50%	3.00%
7	141	5.45%	5.75%	6.25%	3.45%	2.25%	2.75%
8	185	4.92%	5.60%	6.00%	2.92%	2.10%	2.50%
9	164	4.56%	5.45%	5.75%	2.56%	1.95%	2.25%
10	130	7.01%	5.30%	5.50%	5.01%	1.80%	2.00%
11	116	6.48%	5.15%	5.25%	4.48%	1.65%	1.75%
12	95	1.05%	5.00%	5.00%	-0.95%	1.50%	1.50%
13	153	2.41%	4.85%	4.75%	0.41%	1.35%	1.25%
14	192	1.38%	4.70%	4.50%	-0.62%	1.20%	1.00%
15	173	2.88%	4.55%	4.50%	0.88%	1.05%	1.00%
16	167	4.92%	4.40%	4.50%	2.92%	0.90%	1.00%
17	110	2.33%	4.25%	4.25%	0.33%	0.75%	0.75%
18	97	2.93%	4.10%	4.25%	0.93%	0.60%	0.75%
19	75	2.09%	3.95%	4.00%	0.09%	0.45%	0.50%
20	37	4.09%	3.80%	4.00%	2.09%	0.30%	0.50%
21	31	6.87%	3.75%	3.90%	4.87%	0.25%	0.40%
22	37	2.78%	3.75%	3.80%	0.78%	0.25%	0.30%
23	61	0.16%	3.75%	3.70%	-1.84%	0.25%	0.20%
24	82	2.16%	3.75%	3.60%	0.16%	0.25%	0.10%
25	62	1.48%	3.75%	3.50%	-0.52%	0.25%	0.00%
26	62	3.87%	3.75%	3.50%	1.87%	0.25%	0.00%
27	58	0.87%	3.75%	3.50%	-1.13%	0.25%	0.00%
28	50	0.50%	3.75%	3.50%	-1.50%	0.25%	0.00%
29	46	1.73%	3.75%	3.50%	-0.27%	0.25%	0.00%
30	37	2.93%	3.75%	3.50%	0.93%	0.25%	0.00%
31+	54	1.30%	3.75%	3.50%	-0.70%	0.25%	0.00%
<b>Total</b>	<b>3,014</b>	<b>4.23%</b>	<b>4.99%</b>	<b>5.25%</b>	<b>2.23%</b>	<b>1.49%</b>	<b>1.75%</b>

\* Net Expected increases are equal to Gross Expected increases minus assumed wage inflation of 3.5%. Net Actual increases are equal to Gross Actual increases minus the estimated actual wage inflation for the period of 2.0%.

Even though we utilize annualized salary in our analysis, most of the first year experience reflected a salary increase that was greater than 30% and was therefore not included in our analysis (131 of 134 occurrences were excluded).

## PAY INCREASES DUE TO MERIT AND SENIORITY



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## **SECTION C**

### **RETIREMENT EXPERIENCE**

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## UNREDUCED (NORMAL) RETIREMENT

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### Findings

The benefit provisions of the SPRF establish the minimum age and service requirements for unreduced or normal retirement. However, the actual cost of retirement is determined by when members actually retire. The assumption about timing of retirements is a major ingredient in cost calculations. Note that higher rates of retirement with full benefits generally results in higher computed contributions, and vice-versa.

Some members are eligible for retirement but elect to defer the benefit. We included these terminations as retirements for the purposes of this study.

We observed that the rate of retirement during the last experience study period of 2006-2011 was significantly higher at ages 55-57 than during the most recent four years. We found the current assumed rates at these ages to be appropriate when all nine years of experience are taken into account.

The current assumption ends at age 60; in other words, we assume all members currently under the age of 60 will retire by the age of 60. However, for members currently age 60 or older, we assume retirement one year after the valuation date (effectively 18 months due to mid-year decrementing), as required by the Minnesota Standards for Actuarial Work. As such, there are no exposures for ages over 60 since the valuation assumption is all of these members work until the next valuation date and then retire. During the four-year period, there were nine actual retirements at ages 60 or older, including seven actual retirements at age 60. We believe assuming 100% retirement at age 60 is an appropriately conservative approach.

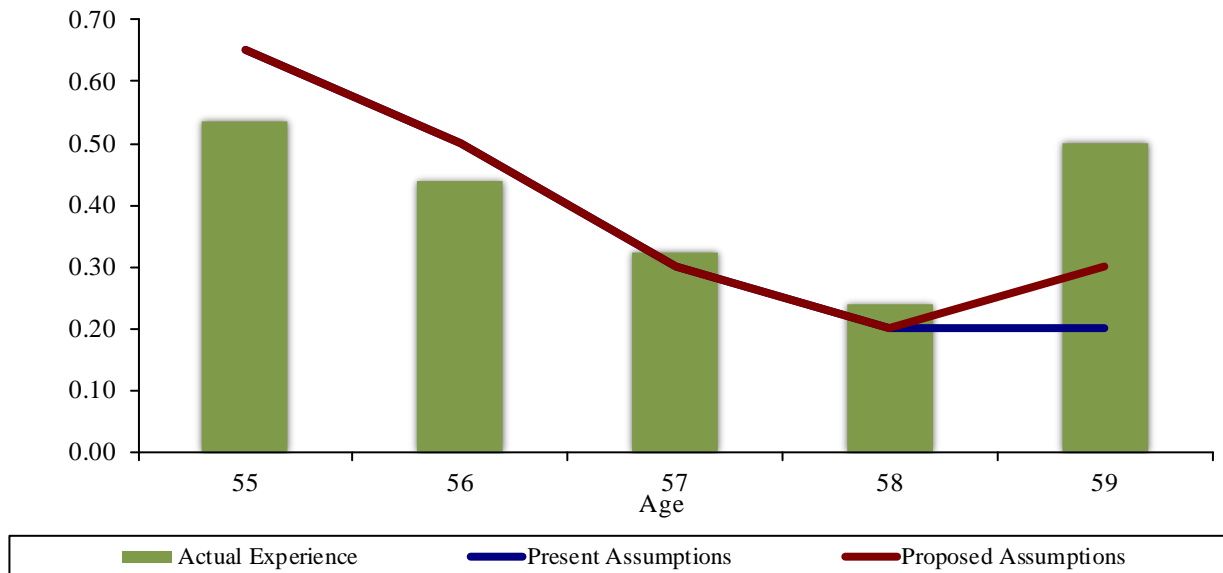
## UNREDUCED (NORMAL) RETIREMENT

### Recommendations

We recommend minor changes to the retirement rates as indicated below. In addition, we recommend the Minnesota Standards for Actuarial Work be modified to remove the requirement that members currently over age 60 delay retirement one year and instead assume these members retire mid-year, the same as members younger than age 60.

Age	Actual Retirements	Exposure	Crude Rates	Rates		Expected Retirements		Actual / Expected	
				Present	Proposed	Present	Proposed	Present	Proposed
55	53	99	53.5%	65.0%	65.0%	64.35	64.35	82.4%	82.4%
56	21	48	43.8%	50.0%	50.0%	24.00	24.00	87.5%	87.5%
57	10	31	32.3%	30.0%	30.0%	9.30	9.30	107.5%	107.5%
58	5	21	23.8%	20.0%	20.0%	4.20	4.20	119.0%	119.0%
59	7	14	50.0%	20.0%	30.0%	2.80	4.20	250.0%	166.7%
60+	*	*	N/A	*	100.0%	0.00	0.00	N/A	N/A
<b>Totals</b>	<b>96</b>	<b>213</b>	<b>45.1%</b>	<b>49.1%</b>	<b>49.8%</b>	<b>104.65</b>	<b>106.05</b>	<b>91.7%</b>	<b>90.5%</b>

\* The current assumption prescribed by the Minnesota Standards for Actuarial Work is that members who have reached 100% retirement eligibility will delay retirement one year. Therefore, even though there are members that are over age 60, these members are not included in the Exposures since retirement is assumed to be delayed one year. There were nine actual retirements over age 60.



## REDUCED (EARLY) RETIREMENT

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### Findings

SPRF members may also retire with a reduced benefit prior to the attainment of Normal Retirement. We refer to these cases as early retirements.

The early retirement benefit payable to SPRF members is equal to 3.0% of average salary for each of the first 33 years of service with a reduction for early retirement determined as follows:

- (a) 0.10% for each month the member is under age 55 for retirements prior to July 1, 2015
- (b) 0.34% for each month the member is under age 55 for retirements after June 30, 2015

Generally, higher rates of early retirement generally result in higher computed contributions due to the enhanced benefit, and vice-versa.

We reviewed the experience during the study period. Overall, the plan experienced more early retirements than projected by the present assumptions (34 expected versus 44 actual – see totals on the following page). Retirements for the year ending June 30, 2015 were significantly greater than the other three years of the study, presumably due to the provision that results in lower benefits for early retirements after June 30, 2015. The plan experienced fewer early retirements than projected by the present assumptions during the first three years of the study (25 expected versus 29 actual).

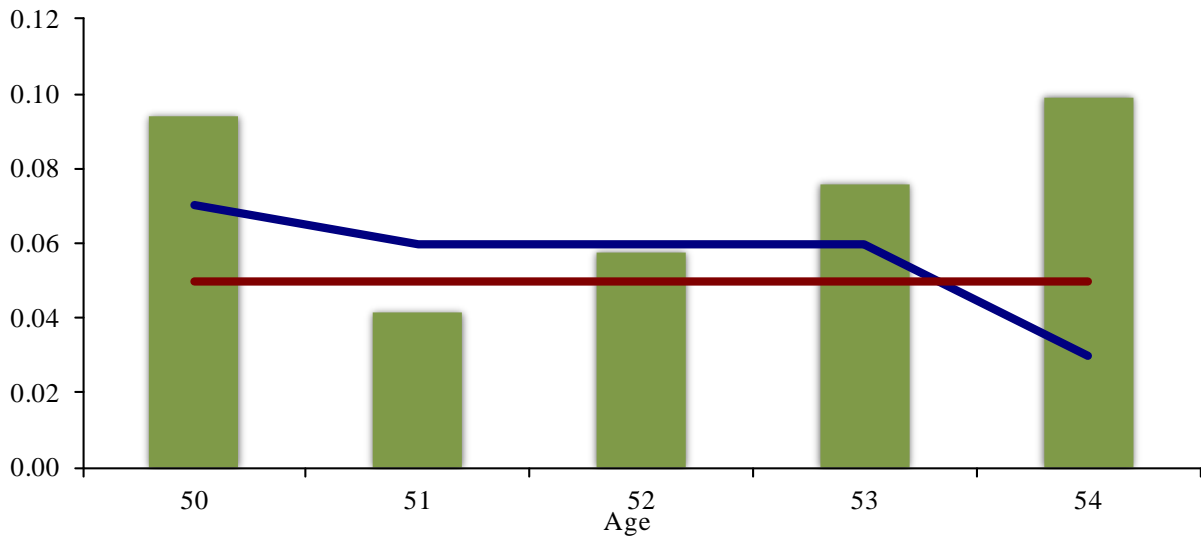
### Recommendation

*We recommend slight adjustments to the reduced early retirement rates, as indicated on the next page. The proposed rates reflect our expectation that there will be fewer early retirements in the future due to less generous early retirement subsidies.*



## REDUCED EARLY RETIREMENT

Age	Actual Retirements	Exposure	Crude Rates	Rates		Expected Retirements		Actual / Expected	
				Present	Proposed	Present	Proposed	Present	Proposed
50	12	128	9.4%	7.0%	5.0%	8.96	6.40	133.9%	187.5%
51	5	121	4.1%	6.0%	5.0%	7.26	6.05	68.9%	82.6%
52	7	122	5.7%	6.0%	5.0%	7.32	6.10	95.6%	114.8%
53	9	119	7.6%	6.0%	5.0%	7.14	5.95	126.1%	151.3%
54	11	111	9.9%	3.0%	5.0%	3.33	5.55	330.3%	198.2%
<b>Totals</b>	<b>44</b>	<b>601</b>	<b>7.3%</b>	<b>5.7%</b>	<b>5.0%</b>	<b>34.01</b>	<b>30.05</b>	<b>129.4%</b>	<b>146.4%</b>



Actual Experience
  Present Assumptions
  Proposed Assumptions

## **RETIREMENT FROM DEFERRED STATUS**

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Members who terminate after completing three years of service (ten if hired after June 30, 2013) are vested and entitled to either a refund of employee contributions, with interest, or a deferred retirement benefit.

While some members actually elect a refund even if it is less valuable than the deferred annuity, the current valuation assumption is that members will elect a refund only if it is more valuable than the deferred annuity. When a member elects a refund that is less valuable than his or her deferred annuity (or when a member elects the deferred annuity even if the refund is more valuable), the plan experiences a small liability gain. Since the current valuation assumption results in very small gains to the plan we recommend no change to this assumption.

For those deferred vested members for whom the deferred benefit is more valuable than a refund, the current valuation assumption is that the member will commence benefits at Normal Retirement Age. We recommend no change to this assumption.

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## **SECTION D**

### **WITHDRAWAL EXPERIENCE**

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## WITHDRAWAL EXPERIENCE

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Members who leave active employment, for reasons other than retirement or death, may be eligible for the following payments from the pension trust:

- A refund of employee contributions, or
- A deferred retirement benefit, if they are vested

Deferred retirement benefits are based on the pay and service credit at the time of withdrawal. The benefit is increased with augmentation from termination until commencement and is payable at Normal Retirement (or at Early Retirement with a reduction). Consequently, members who withdraw receive much less from the plan than members who stay in employment until retirement. Higher rates of withdrawal result in lower computed contributions, and vice-versa.

Our experience with similar systems has shown that sometimes the use of assumptions based solely on counts of people terminating employment does not always reduce the size of the gain or loss in a particular decrement. Sometimes this can be due to the relative magnitude of the actuarial accrued liability of the members that decrement, rather than number counts alone. For example, consider a plan with only two members who are both the same age and assume member one has an actuarial accrued liability of \$10,000 and member two has an actuarial accrued liability of \$90,000. If one of the members leaves and forfeits all of his or her liability, the rate of decrement is one out of two for a rate of 50%. However, the magnitude of the net gain or loss to the system is affected much more if member two leaves employment than if member one leaves employment.

As a result, we have added a column in the following tables that shows the liability-weighted rates. This represents the crude rate of decrement on a liability weighted basis as opposed to strictly a number count basis. The liability weighted rates were found to be more highly correlated with withdrawal than with other decrements. This makes some intuitive sense, since termination decisions are often made based on how much the member has to gain or lose if they change jobs, whereas death and disability is typically not a decision at all, but rather an event that happens to someone.

Some members are eligible for retirement but elect to defer the benefit and are consequently reported for the valuation as a termination with a deferred benefit. We included these terminations as retirements for the purpose of this study.

Current valuation termination rates for members assume a higher rate of termination during the first three years of employment with age-based rates after the 3-year select period.

## WITHDRAWAL EXPERIENCE

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### **Findings**

Overall, the plan experienced more withdrawals than projected by the present assumptions (37 actual terminations versus 21 expected, or approximately 78% more than expected). However, when we reviewed the liability that decremented out of the plan during the prior four-year period, the result was much less dramatic, with only 18% more liability than expected decrementing out of the plan. Even though there were more terminations than expected, the expected number of terminations is relatively low in this plan.

Members are vested after three years of service if hired before July 1, 2013 and are vested after ten years of service if hired after June 30, 2013.

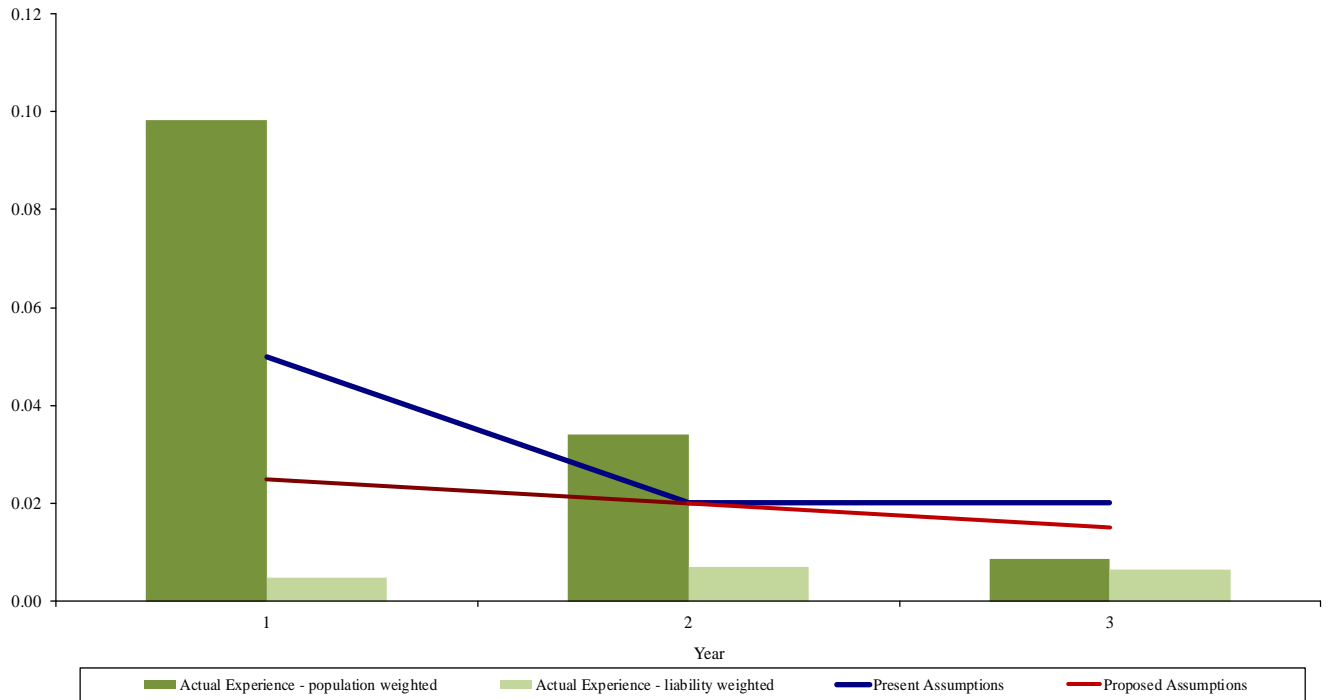
### **Recommendation**

*We recommend a slight decrease to the current termination rates for the first three years of employment to align more closely with the liability-weighted results.*

## WITHDRAWAL EXPERIENCE – SELECT RATES MALES & FEMALES

Year	Withdrawals	Exposure	Crude Rates		Sample Rates		Expected Withdrawals		Ratio of Actuals/Expecteds	
			Population Weighted	Liability Weighted	Old*	New	Old*	New	Old	New
1	12	122	0.0984	0.0049	0.0500	0.0250	6.10	3.05	196.7%	393.4%
2	4	117	0.0342	0.0071	0.0200	0.0200	2.34	2.34	170.9%	170.9%
3	1	114	0.0088	0.0066	0.0200	0.0150	2.28	1.71	43.9%	58.5%
<b>Totals</b>	<b>17</b>	<b>353</b>	<b>0.0482</b>	<b>0.0051</b>	<b>0.0304</b>	<b>0.0201</b>	<b>10.72</b>	<b>7.10</b>	<b>158.6%</b>	<b>239.4%</b>

\* The current withdrawal assumption is based on service for the first three years of employment and based on age after three years of service.



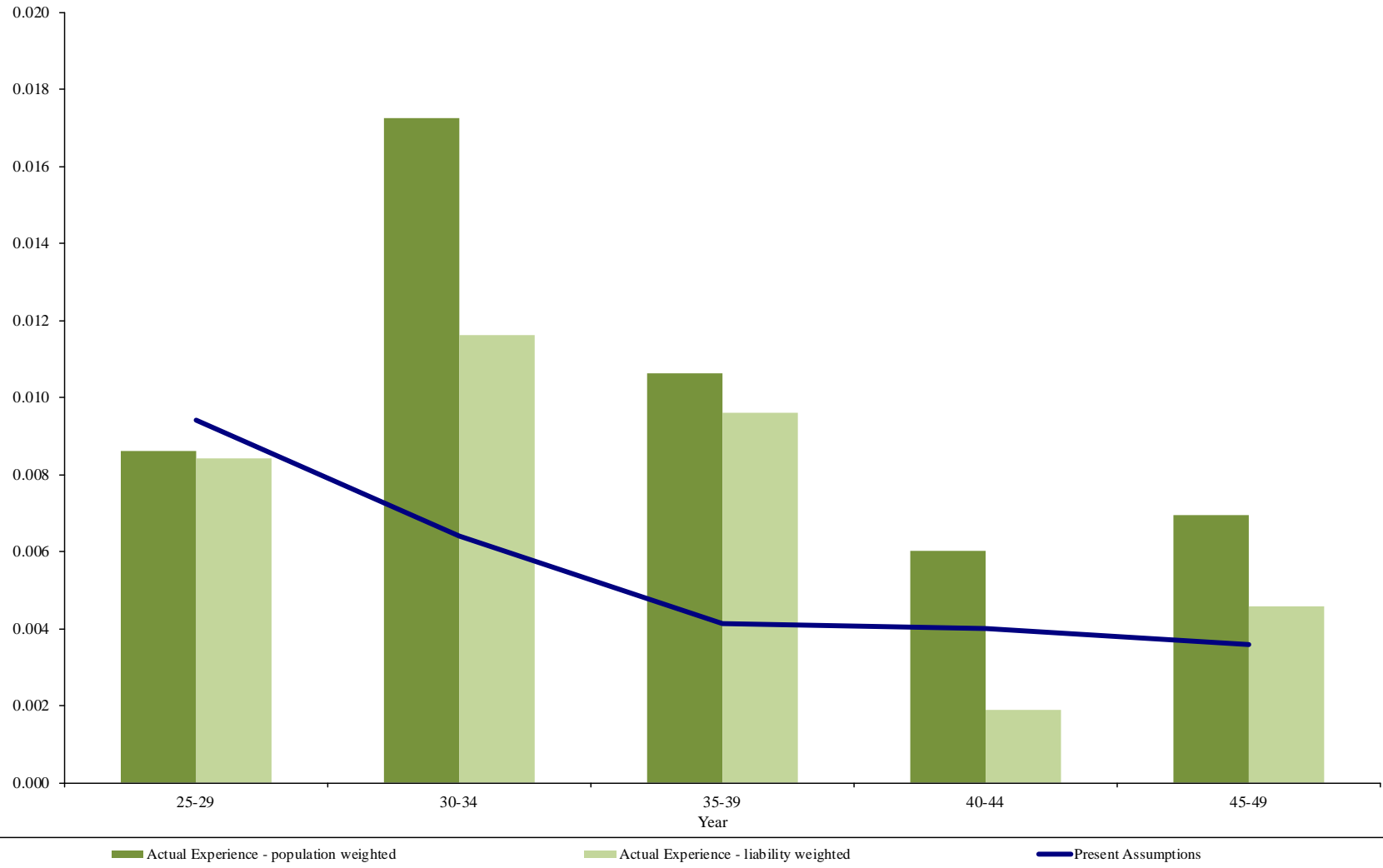
**WITHDRAWAL EXPERIENCE – ULTIMATE RATES  
MALES & FEMALES**

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Age	Withdrawals	Exposure	Crude Rates		Sample Rates		Expected Withdrawals*		Ratio of Actuals/Expected	
			Population Weighted	Liability Weighted	Old	New	Old	New	Old	New
			Under 25	-	-	N/A	N/A	N/A	N/A	-
25-29	1	116	0.0086	0.0084	0.0094	0.0094	1.09	1.09	91.7%	91.7%
30-34	5	290	0.0172	0.0116	0.0064	0.0064	1.86	1.86	268.8%	268.8%
35-39	6	564	0.0106	0.0096	0.0041	0.0041	2.32	2.32	258.6%	258.6%
40-44	4	664	0.0060	0.0019	0.0040	0.0040	2.66	2.66	150.4%	150.4%
45-49	4	577	0.0069	0.0046	0.0036	0.0036	2.07	2.07	193.2%	193.2%
<b>Totals</b>	<b>20</b>	<b>2,211</b>	<b>0.0090</b>	<b>0.0051</b>	<b>0.0045</b>	<b>0.0045</b>	<b>10.00</b>	<b>10.00</b>	<b>200.0%</b>	<b>200.0%</b>

\* The current withdrawal assumption is based on service for the first three years of employment and based on age after three years of service.

## WITHDRAWAL EXPERIENCE MALES & FEMALES



*The proposed ultimate withdrawal assumption is equal to Present Assumptions after the three years of the select period.*



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**SECTION E**

DISABILITY EXPERIENCE

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## DISABILITY EXPERIENCE

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### Findings

The assumed rates of disability (leaving active service due to injury or illness while not entitled to age and service retirement benefits) are a minor ingredient in cost calculations, since the incidence of disability is low. Higher rates of disability generally result in somewhat higher computed contributions, and vice-versa.

Disability payments cease at age 65 (age 55 if disabled after June 30, 2015) or the 5-year anniversary of the effective date of the disability benefit, whichever is later. Normal retirement benefits are paid thereafter.

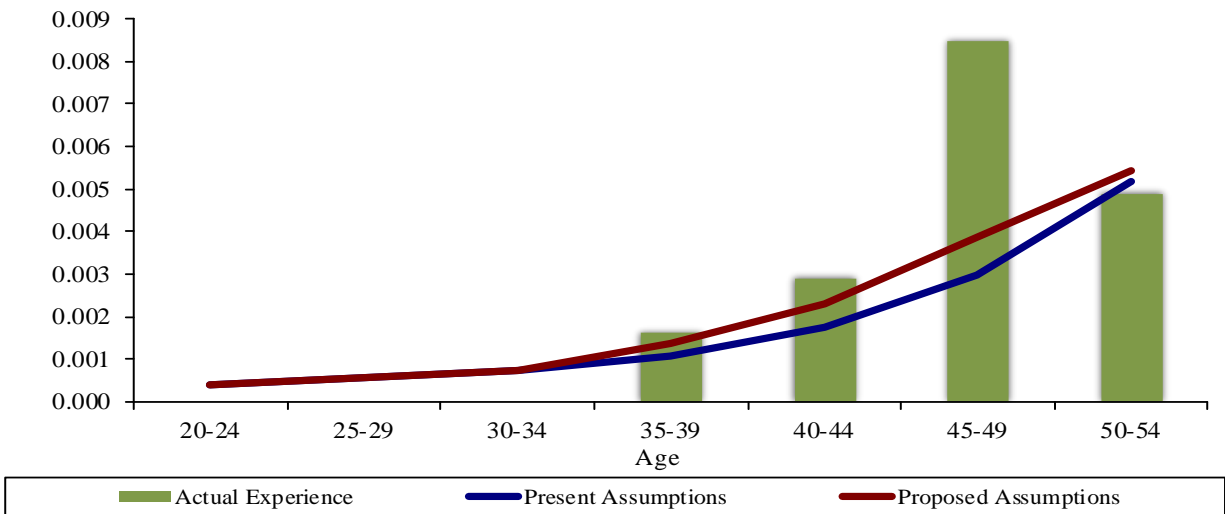
We reviewed the disability experience during the four-year period. The results are shown on the following page. Overall, the actual number of disability retirements (11) is higher than the number projected by the present assumption (7 – see chart on the following page). There were significantly more occurrences during the last 2 years of the study, possibly because of the provision described above affecting disability retirements after June 30, 2015. We recommend increasing rates by a factor of 1.25 for ages 35-39 and 1.30 for ages 40-49. In addition, rates at ages 50 and 51 are smoothed in order to produce a table of rates that is increasing.

### Recommendation

*We recommend adopting higher rates of disability incidence for ages 35 to 51.*

## DISABILITY EXPERIENCE MALES & FEMALES

Age	Disabilities	Exposure	Crude Rates	Sample Rates		Expected Disabilities		Ratio of Actuals/Expecteds	
				Old	New	Old	New	Old	New
20-24	-	24	0.0000	0.0004	0.0004	0.01	0.01	0.0%	0.0%
25-29	-	247	0.0000	0.0006	0.0006	0.14	0.14	0.0%	0.0%
30-34	-	388	0.0000	0.0007	0.0007	0.28	0.28	0.0%	0.0%
35-39	1	616	0.0016	0.0011	0.0014	0.67	0.84	148.9%	119.1%
40-44	2	686	0.0029	0.0018	0.0023	1.21	1.57	165.8%	127.5%
45-49	5	589	0.0085	0.0030	0.0038	1.75	2.27	286.0%	220.0%
50-54	3	611	0.0049	0.0052	0.0054	3.14	3.28	95.4%	91.6%
<b>Totals</b>	<b>11</b>	<b>3,161</b>	<b>0.0035</b>	<b>0.0023</b>	<b>0.0027</b>	<b>7.20</b>	<b>8.39</b>	<b>152.7%</b>	<b>131.1%</b>



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**SECTION F**  
MORTALITY EXPERIENCE

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## MORTALITY EXPERIENCE

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Post-retirement mortality is an important component in cost calculations and should be updated from time to time to reflect current and expected future longevity improvements. Pre-retirement mortality is a relatively minor component in cost calculations. The frequency of pre-retirement deaths is so low that mortality assumptions based on actual experience can only be produced for very large retirement systems, if at all.

### *Actuarial Standards of Practice*

Actuarial Standards of Practice (ASOP) No. 35 Disclosure Section 4.1.1 states, “The disclosure of the mortality assumption should contain sufficient detail to permit another qualified actuary to understand the provision made for future mortality improvement. If the actuary assumes zero mortality improvement after the measurement date, the actuary should state that no provision was made for future mortality improvement.” The current mortality rates used in the valuation include a provision for future mortality improvement.

### *The New Mortality Tables and Projection Scale*

The Society of Actuaries (SOA) released updated mortality tables late in 2014 which reflect the improvement in longevity of the studied group of private pension plan participants, and which also reflects projected future improvements for current and future generations of participants. The new mortality table is called the RP-2014 table. The mortality improvement scale is called the MP-2014 improvement scale. In 2015, the SOA released an updated mortality improvement scale called MP-2015. The mortality improvement scale is applied to the RP-2014 table to show the improvements in mortality that are expected to occur.

The SOA has developed base experience tables and collar-specific experience versions of the RP-2014 tables. The Blue Collar tables have higher mortality rates than the base tables and the White Collar tables have lower mortality than the base tables.

### *Mortality Improvement Observations at a National Level*

The updated mortality and mortality improvement tables show that among males age 65, overall longevity rose 2.0 years, from 84.6 in 2000 to 86.6 in 2014. Saying it another way, men age 65 in the year 2000 were expected to live to be 84.6 years old. Men age 65 in the year 2014 were expected to live to be 86.6 years old. For women age 65, overall longevity rose 2.4 years, from age 86.4 in 2000 to age 88.8 in 2014.

## MORTALITY EXPERIENCE

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### Findings

Similar to the withdrawal decrement, we have added a column in the following tables that shows the liability-weighted rates. This represents the crude rate of decrement on a liability weighted basis as opposed to strictly a number count basis. The RP-2014 mortality rates were developed by the Society of Actuaries using benefit-weighted experience. As such, we show both liability-weighted and population-weighted results in the following exhibits.

#### Healthy Retirees

We reviewed the mortality experience of healthy retirees during the four-year period. Due to potential anti-selection bias as well as data needs which are outside the scope of the annual valuation process, we did not include beneficiary and survivor mortality experience in our study. The results are shown on the following pages.

The plan experienced slightly fewer deaths (61) than projected by the present assumptions (66).

#### Disabled Retirees

We reviewed the mortality experience of disabled retirees during the four-year period. The results are shown on the following pages.

The plan experienced more deaths among disabled retirees (4) than projected by the present assumptions (2).

#### Active Members

We reviewed the mortality experience among active members during the four-year period. The results are shown on the following pages.

The plan experienced fewer deaths among active members (1) than projected by the present assumptions (3).

## MORTALITY EXPERIENCE

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### Recommendations

*Given the small number of plan participants, plan-specific experience should not be relied upon to be credible. We recommend adoption of the following RP-2014 mortality tables:*

Healthy Male Retirees:	RP-2014 Male Healthy Annuitant Mortality Table, adjusted for white collar and mortality improvements using projection scale MP-2015.
Healthy Female Retirees:	RP-2014 Female Healthy Annuitant Mortality Table, adjusted for white collar and mortality improvements using projection scale MP-2015.
Disabled Male Retirees:	RP-2014 Male Healthy Annuitant Mortality Table, adjusted for white collar and mortality improvements using projection scale MP-2015.
Disabled Female Retirees:	RP-2014 Female Healthy Annuitant Mortality Table, adjusted for white collar and mortality improvements using projection scale MP-2015.
Male Active Members:	RP-2014 Male Employee Mortality Table, adjusted for white collar and mortality improvements using projection scale MP-2015.
Female Active Members:	RP-2014 Female Employee Mortality Table, adjusted for white collar and mortality improvements using projection scale MP-2015.

The RP-2014 tables as published by the Society of Actuaries (SOA) are based on rates for 2006. The SOA applied eight years of projection scale MP-2014 to produce the rates published as the “RP-2014” table, to be used for calendar year 2014. Recently, the SOA published an update to the MP-2014 projection scale, called MP-2015, which generally reflects lower improvements to life expectancy than MP-2014. All the proposed tables referred to in the above exhibit are based on the appropriate RP-2014 table as published by the Society of Actuaries (i.e. healthy retiree, disabled retiree, or employee), projected backwards to 2006 using Scale MP-2014, and projected forward from 2006 using Scale MP-2015. In addition, mortality rates at some ages were adjusted to prevent decreasing mortality rates.

**POST-RETIREMENT MORTALITY EXPERIENCE  
HEALTHY MALES**

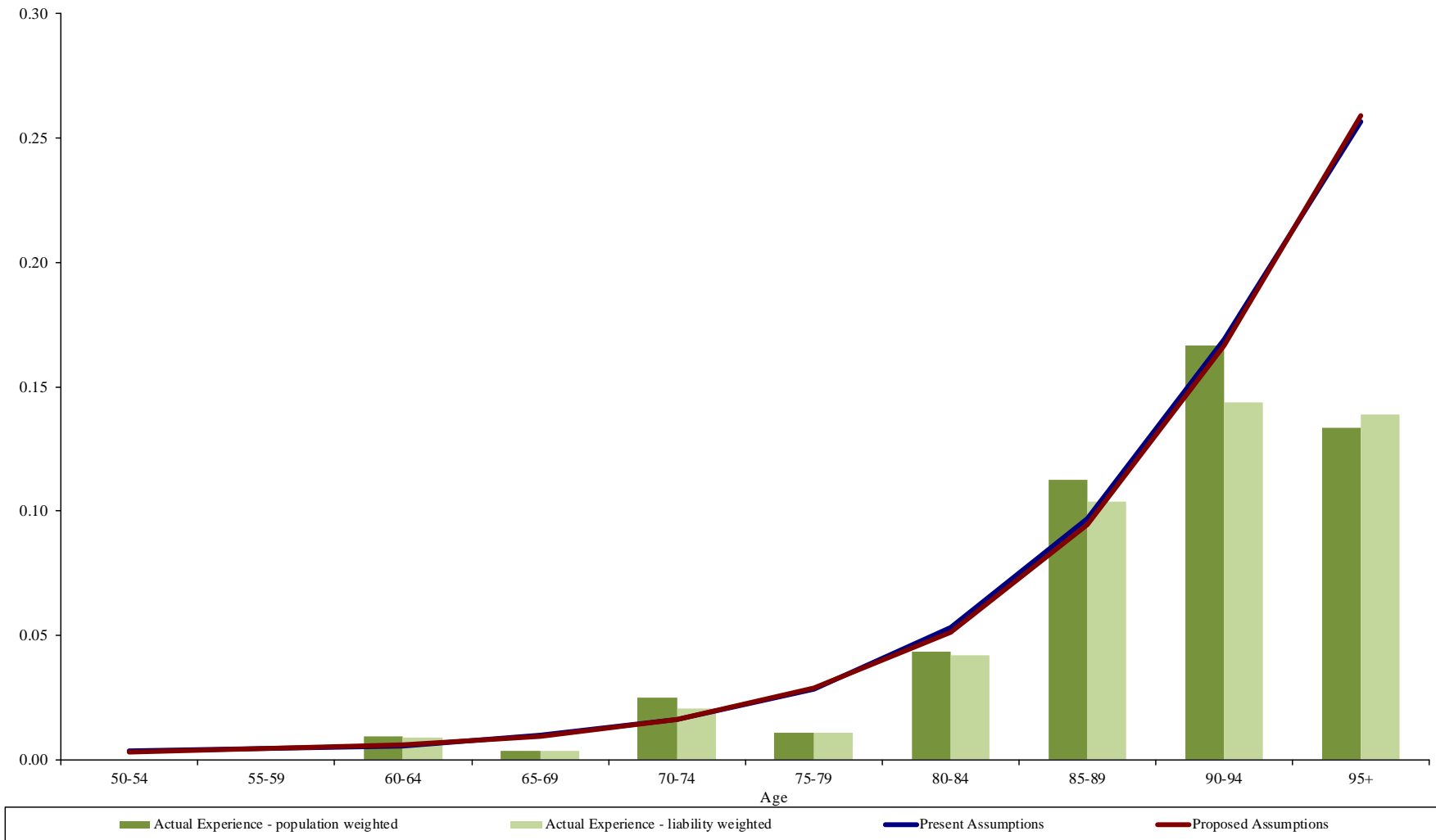
Age	Deaths	Exposure	Crude Rates		Sample Rates		Expected Deaths		Ratio of Actuals/Expecteds	
			Population Weighted	Liability Weighted	Old*	New*	Old*	New*	Old	New*
50-54	-	66	0.00000	0.00000	0.00335	0.00329	0.27	0.23	0.0%	0.0%
55-59	-	463	0.00000	0.00000	0.00431	0.00442	1.99	2.08	0.0%	0.0%
60-64	5	543	0.00921	0.00907	0.00553	0.00607	3.02	3.31	165.6%	151.1%
65-69	2	581	0.00344	0.00337	0.00981	0.00946	5.70	5.50	35.1%	36.4%
70-74	11	443	0.02483	0.02076	0.01615	0.01633	7.03	7.08	156.5%	155.4%
75-79	3	281	0.01068	0.01082	0.02835	0.02863	7.87	7.96	38.1%	37.7%
80-84	10	230	0.04348	0.04176	0.05313	0.05144	12.18	11.80	82.1%	84.7%
85-89	17	151	0.11258	0.10395	0.09675	0.09466	14.02	13.68	121.3%	124.3%
90-94	10	60	0.16667	0.14351	0.16898	0.16678	9.58	9.45	104.4%	105.8%
95+	2	15	0.13333	0.13876	0.25657	0.25919	3.60	3.60	55.6%	55.6%
<b>Totals</b>	<b>60</b>	<b>2,833</b>	<b>0.02118</b>	<b>0.01410</b>	<b>0.02304</b>	<b>0.02283</b>	<b>65.26</b>	<b>64.69</b>	<b>91.9%</b>	<b>92.8%</b>

\* In order to show the fit for the four-year period of the study, Sample Rates and Expected Deaths were determined using the current/proposed mortality rates projected forward/backward to the mid-point of the study using proposed projection scale.

Due to potential anti-selection bias as well as data needs which are outside the scope of the annual valuation process, we did not include beneficiary and survivor mortality experience in our study.



## POST-RETIREMENT MORTALITY EXPERIENCE HEALTHY MALES



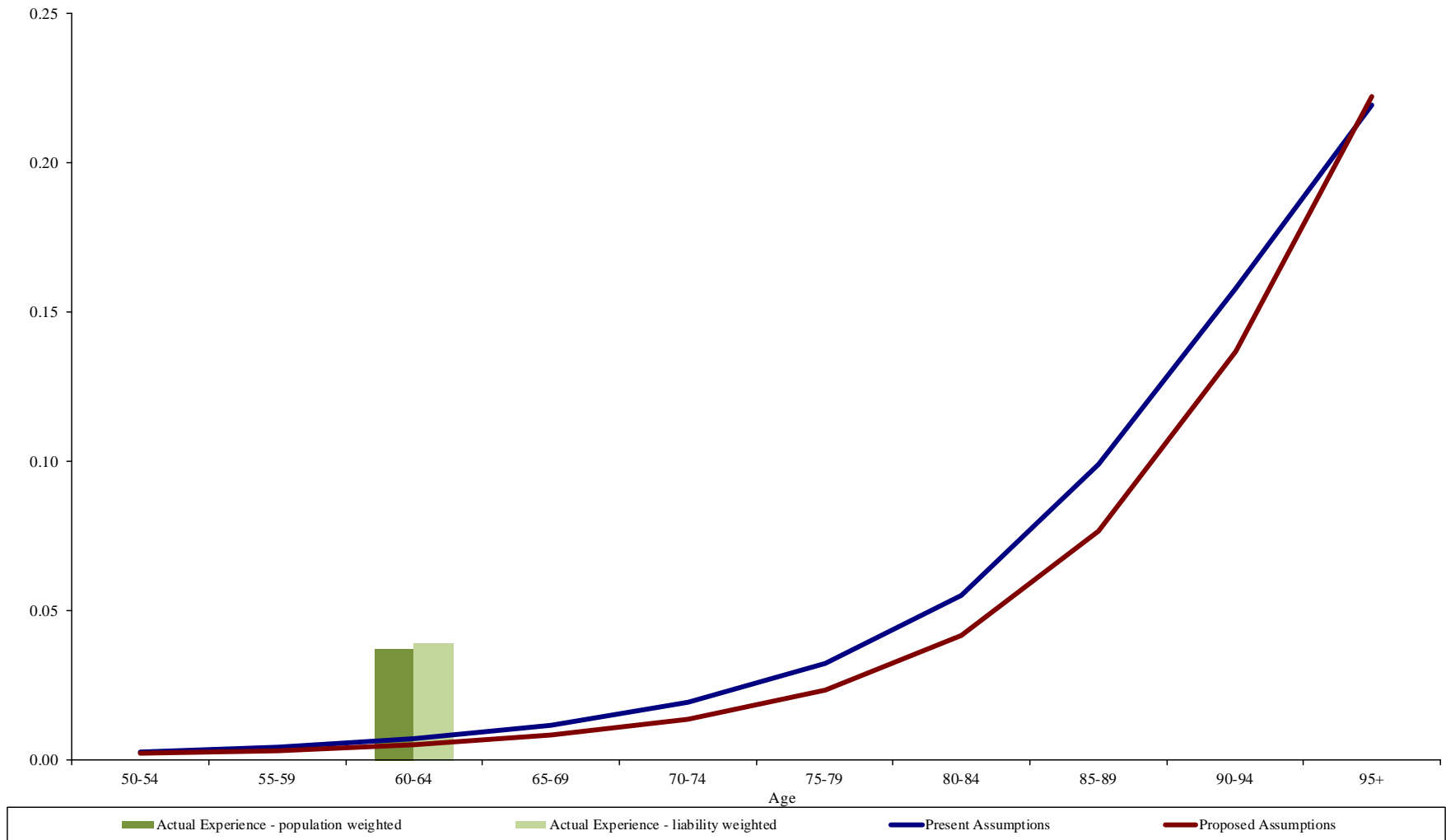
**POST-RETIREMENT MORTALITY EXPERIENCE  
HEALTHY FEMALES**

Age	Deaths	Exposure	Crude Rates		Sample Rates		Expected Deaths		Ratio of Actuals/Expected	
			Population Weighted	Liability Weighted	Old*	New*	Old*	New*	Old	New*
50-54	-	21	0.00000	0.00000	0.00254	0.00232	0.06	0.05	0.0%	0.0%
55-59	-	42	0.00000	0.00000	0.00440	0.00322	0.19	0.14	0.0%	0.0%
60-64	1	27	0.03704	0.03938	0.00705	0.00507	0.19	0.13	526.3%	769.2%
65-69	-	24	0.00000	0.00000	0.01173	0.00833	0.29	0.20	0.0%	0.0%
70-74	-	6	0.00000	0.00000	0.01928	0.01372	0.11	0.07	0.0%	0.0%
75-79	-	-	N/A	N/A	0.03221	0.02341	-	-	N/A	N/A
80-84	-	4	0.00000	0.00000	0.05520	0.04176	0.20	0.16	0.0%	0.0%
85-89	-	-	N/A	N/A	0.09888	0.07660	-	-	N/A	N/A
90-94	-	-	N/A	N/A	0.15816	0.13682	-	-	N/A	N/A
95+	-	-	N/A	N/A	0.21928	0.22203	-	-	N/A	N/A
<b>Totals</b>	<b>1</b>	<b>124</b>	<b>0.00806</b>	<b>0.00883</b>	<b>0.00839</b>	<b>0.00605</b>	<b>1.04</b>	<b>0.75</b>	<b>96.2%</b>	<b>133.3%</b>

\* In order to show the fit for the four-year period of the study, Sample Rates and Expected Deaths were determined using the current/proposed mortality rates projected forward/backward to the mid-point of the study using proposed projection scale.

Due to potential anti-selection bias as well as data needs which are outside the scope of the annual valuation process, we did not include beneficiary and survivor mortality experience in our study.

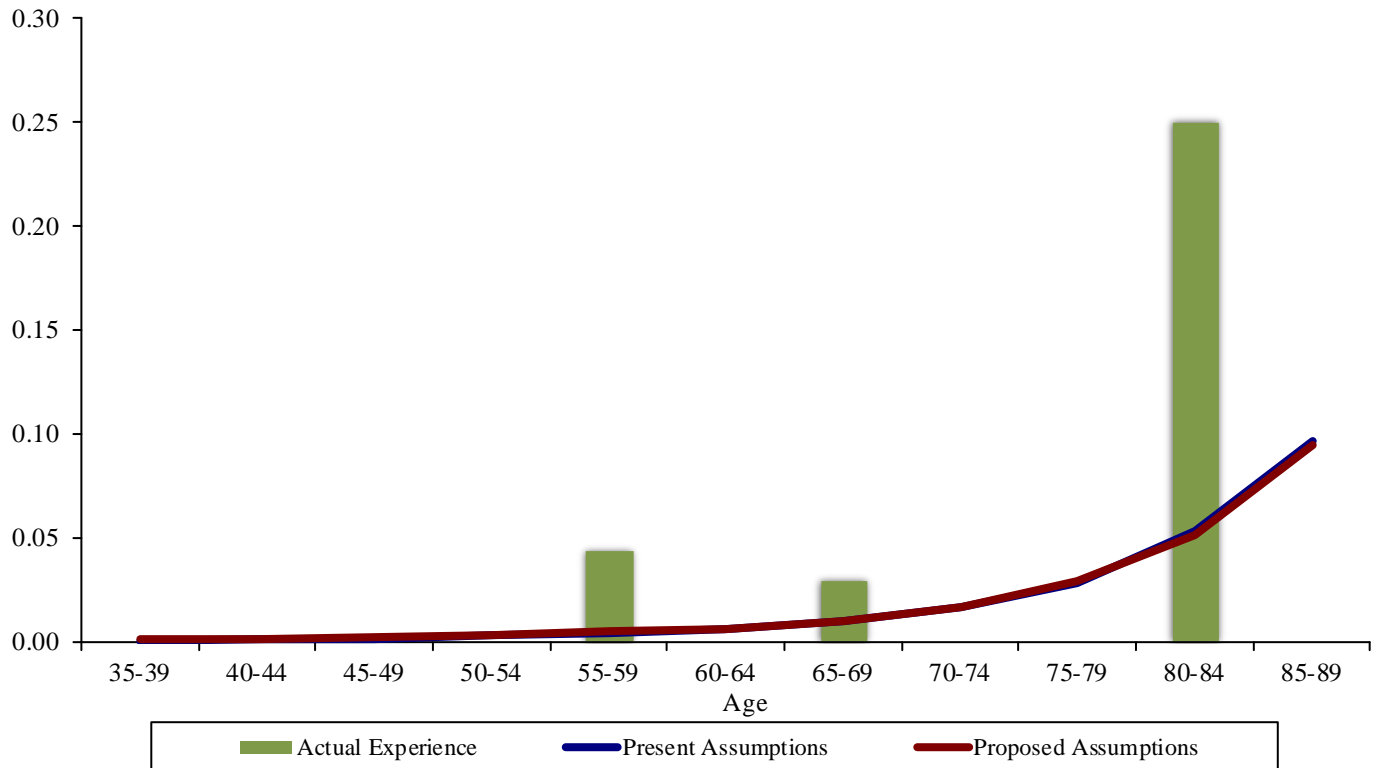
# POST-RETIREMENT MORTALITY EXPERIENCE HEALTHY FEMALES



## POST-RETIREMENT MORTALITY EXPERIENCE DISABLED MALES

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths		Ratio of Actuals/Expecteds	
				Old*	New*	Old*	New*	Old	New*
35-39	-	2	0.00000	0.00056	0.00097	-	-	N/A	N/A
40-44	-	11	0.00000	0.00081	0.00147	0.01	0.02	0.0%	0.0%
45-49	-	14	0.00000	0.00113	0.00224	0.02	0.03	0.0%	0.0%
50-54	-	25	0.00000	0.00335	0.00329	0.08	0.08	0.0%	0.0%
55-59	1	23	0.04348	0.00431	0.00442	0.10	0.10	1000.0%	1000.0%
60-64	-	30	0.00000	0.00553	0.00607	0.16	0.18	0.0%	0.0%
65-69	1	34	0.02941	0.00981	0.00946	0.33	0.32	303.0%	312.5%
70-74	-	15	0.00000	0.01615	0.01633	0.23	0.23	0.0%	0.0%
75-79	-	7	0.00000	0.02835	0.02863	0.18	0.18	0.0%	0.0%
80-84	2	8	0.25000	0.05313	0.05144	0.42	0.41	476.2%	487.8%
85-89	-	4	0.00000	0.09675	0.09466	0.36	0.35	0.0%	0.0%
<b>Totals</b>	<b>4</b>	<b>173</b>	<b>0.02312</b>	<b>0.01092</b>	<b>0.01098</b>	<b>1.89</b>	<b>1.90</b>	<b>211.6%</b>	<b>210.5%</b>

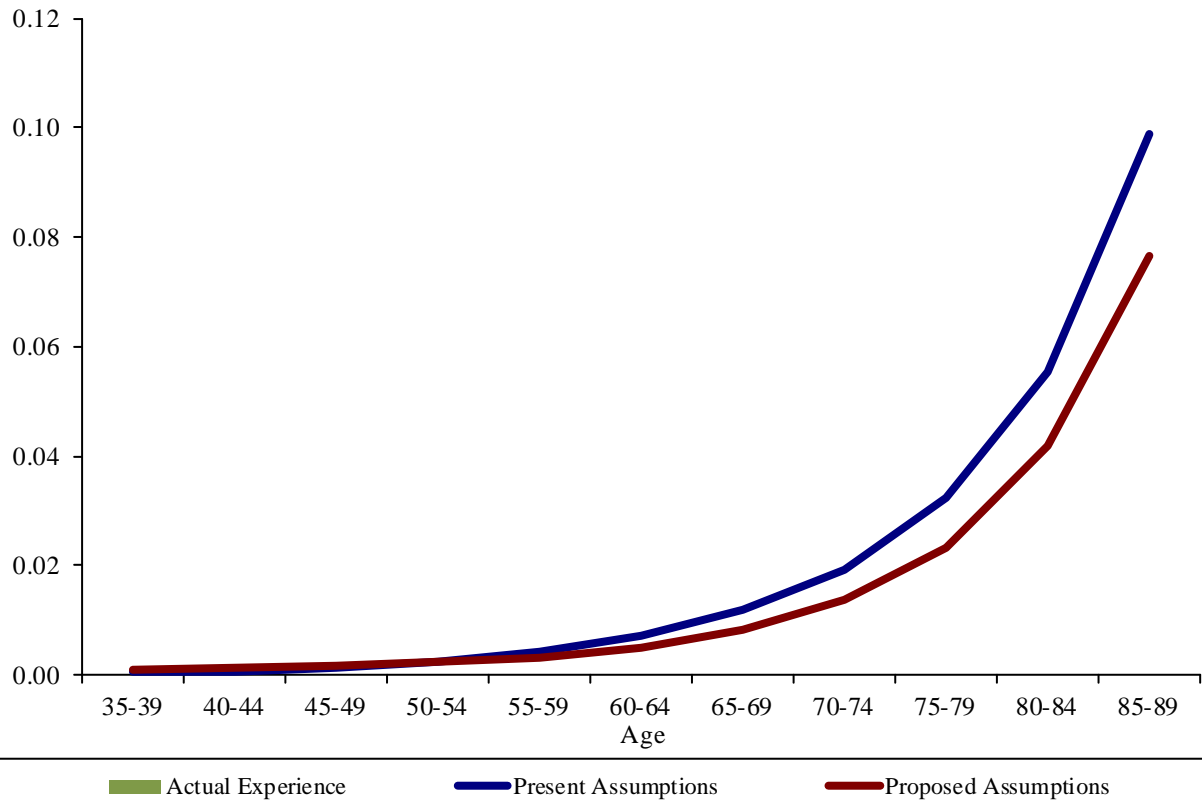
\* In order to show the fit for the four-year period of the study, Sample Rates and Expected Deaths were determined using the current/proposed mortality rates projected forward/backward to the mid-point of the study using proposed projection scale.



## POST-RETIREMENT MORTALITY EXPERIENCE DISABLED FEMALES

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths		Ratio of Actuals/Expecteds	
				Old*	New*	Old*	New*	Old	New*
35-39	-	-	N/A	0.00047	0.00097	-	-	N/A	N/A
40-44	-	-	N/A	0.00069	0.00136	-	-	N/A	N/A
45-49	-	8	0.00000	0.00121	0.00179	0.01	0.01	0.0%	0.0%
50-54	-	5	0.00000	0.00254	0.00232	0.02	0.02	0.0%	0.0%
55-59	-	10	0.00000	0.00440	0.00322	0.03	0.02	0.0%	0.0%
60-64	-	4	0.00000	0.00705	0.00507	0.04	0.03	0.0%	0.0%
65-69	-	-	N/A	0.01173	0.00833	-	-	N/A	N/A
70-74	-	-	N/A	0.01928	0.01372	-	-	N/A	N/A
75-79	-	-	N/A	0.03221	0.02341	-	-	N/A	N/A
80-84	-	-	N/A	0.05520	0.04176	-	-	N/A	N/A
85-89	-	-	N/A	0.09888	0.07660	-	-	N/A	N/A
<b>Totals</b>	-	<b>27</b>	<b>0.00000</b>	<b>0.00370</b>	<b>0.00296</b>	<b>0.10</b>	<b>0.08</b>	<b>0.0%</b>	<b>0.0%</b>

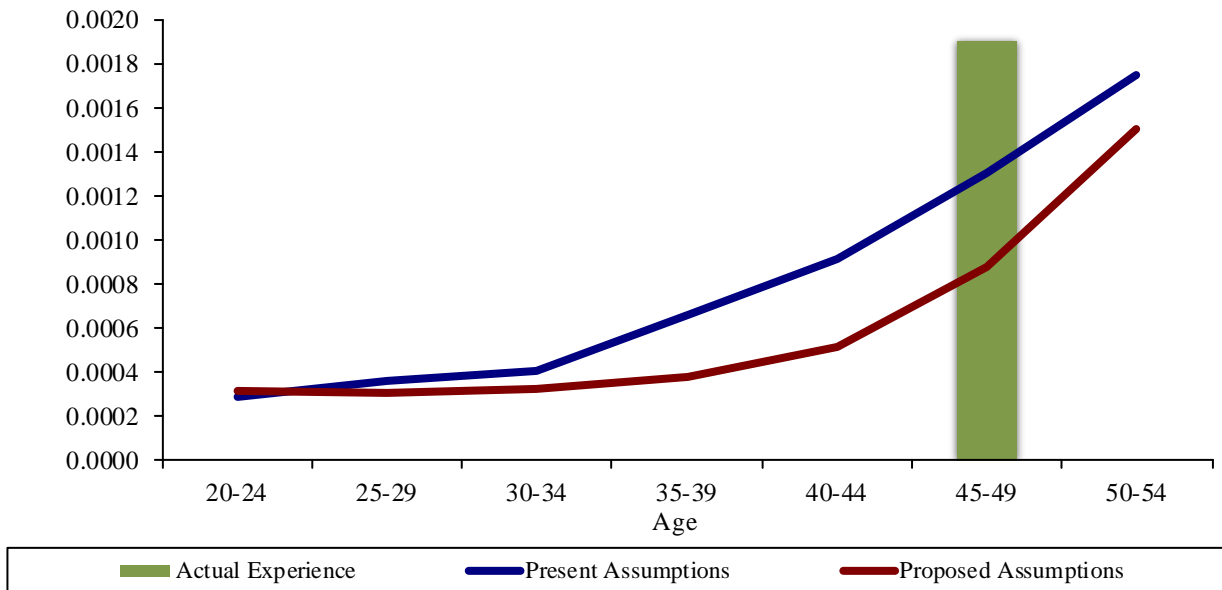
\* In order to show the fit for the four-year period of the study, Sample Rates and Expected Deaths were determined using the current/proposed mortality rates projected forward/backward to the mid-point of the study using proposed projection scale.



## PRE-RETIREMENT MORTALITY EXPERIENCE HEALTHY MALES

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths		Ratio of Actuals/Expecteds	
				Old*	New*	Old*	New*	Old	New
20-24	0	20	0.0000	0.0003	0.0003	0.01	0.01	0.0%	0.0%
25-29	0	225	0.0000	0.0004	0.0003	0.08	0.07	0.0%	0.0%
30-34	0	339	0.0000	0.0004	0.0003	0.14	0.11	0.0%	0.0%
35-39	0	551	0.0000	0.0007	0.0004	0.37	0.21	0.0%	0.0%
40-44	0	600	0.0000	0.0009	0.0005	0.55	0.31	0.0%	0.0%
45-49	1	527	0.0019	0.0013	0.0009	0.69	0.46	144.9%	217.4%
50-54	0	542	0.0000	0.0018	0.0015	0.95	0.81	0.0%	0.0%
<b>Totals</b>	<b>1</b>	<b>2,804</b>	<b>0.0004</b>	<b>0.0010</b>	<b>0.0007</b>	<b>2.79</b>	<b>1.98</b>	<b>35.8%</b>	<b>50.5%</b>

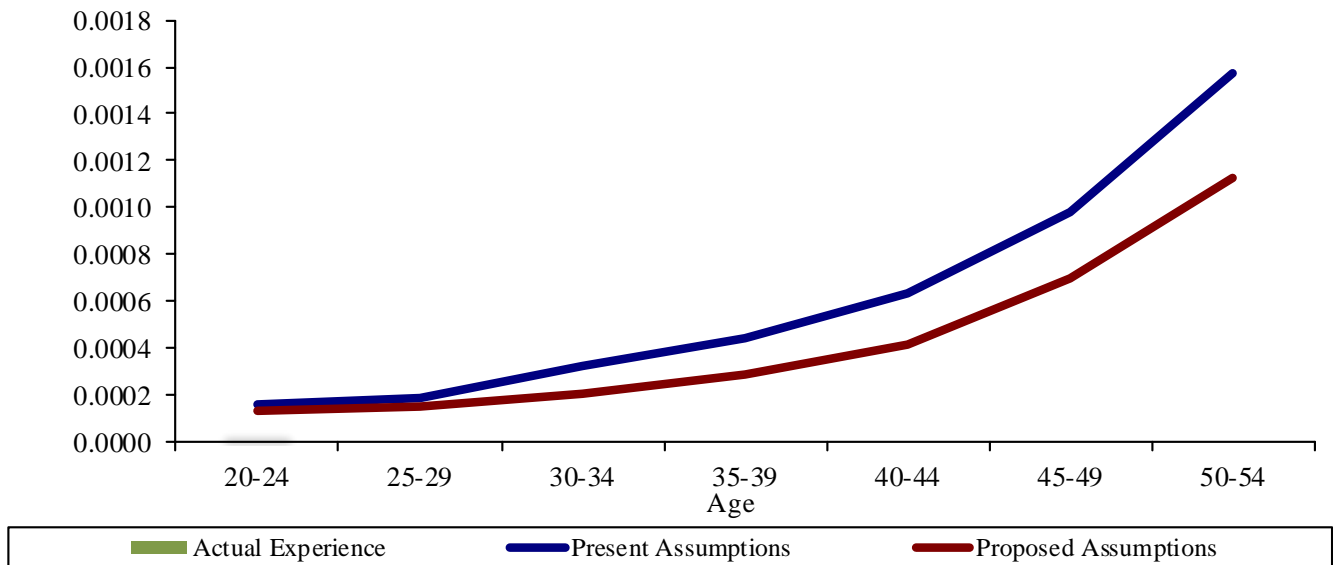
\* In order to show the fit for the four-year period of the study, Sample Rates and Expected Deaths were determined using the current/proposed mortality rates projected forward/backward to the mid-point of the study using proposed projection scale.



## PRE-RETIREMENT MORTALITY EXPERIENCE HEALTHY FEMALES

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths		Ratio of Actuals/Expecteds	
				Old*	New*	Old*	New*	Old	New*
20-24	0	4	0.0000	0.0002	0.0001	0.00	0.00	0.0%	0.0%
25-29	0	22	0.0000	0.0002	0.0002	0.00	0.00	0.0%	0.0%
30-34	0	49	0.0000	0.0003	0.0002	0.02	0.01	0.0%	0.0%
35-39	0	65	0.0000	0.0004	0.0003	0.03	0.02	0.0%	0.0%
40-44	0	86	0.0000	0.0006	0.0004	0.06	0.04	0.0%	0.0%
45-49	0	62	0.0000	0.0010	0.0007	0.06	0.04	0.0%	0.0%
50-54	0	69	0.0000	0.0016	0.0011	0.11	0.08	0.0%	0.0%
<b>Totals</b>	<b>0</b>	<b>357</b>	<b>0.0000</b>	<b>0.0008</b>	<b>0.0005</b>	<b>0.28</b>	<b>0.19</b>	<b>0.0%</b>	<b>0.0%</b>

\* In order to show the fit for the four-year period of the study, Sample Rates and Expected Deaths were determined using the current/proposed mortality rates projected forward/backward to the mid-point of the study using proposed projection scale.



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## **SECTION G**

### MISCELLANEOUS AND TECHNICAL ASSUMPTIONS

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## MARITAL STATUS

---

Upon the death of an active married SPRF member, a benefit is payable to the surviving spouse. If the SPRF member is unmarried at the time of death, the non-spouse beneficiary (estate if no beneficiary) is entitled to a refund of accumulated contributions with interest.

The current valuation assumption is 85% of male and female members are married.

### Findings

We reviewed the marital status of healthy members retiring from active status during the four-year period. The results are shown below.

Gender	Married New Retirees	Total New Retirees	Crude Rates	Sample Rates		Expected Married Retirees		Ratio of Actuals/Expecteds	
				Old	New	Old	New	Old	New
Males	112	135	0.8296	0.8500	0.8500	114.75	114.75	97.6%	97.6%
Females	7	13	0.5385	0.8500	0.8500	11.05	11.05	63.3%	63.3%
<b>Total</b>	<b>119</b>	<b>148</b>	<b>0.8041</b>	<b>0.8500</b>	<b>0.8500</b>	<b>125.80</b>	<b>125.80</b>	<b>94.6%</b>	<b>94.6%</b>

Members who terminated employment and were retirement eligible were included in the retirement analysis in this report but are excluded from this analysis.

The experience shows that slightly fewer new retirees are married than expected. This experience is consistent with the experience from the prior study. The experience for female retirees is not credible due to the number of female retirements during the period.

### Recommendation

*We recommend no change to the assumed percentage of members that are married.*

## AGE OF SURVIVOR

---

Joint & Survivor annuity benefit amounts are determined based on the member's and survivor's age. Currently, the valuation assumes that male members have a beneficiary two years younger and female members have a beneficiary two years older.

### Findings

We reviewed the ages of married new retirees and their beneficiaries during the four-year period. The results are shown below.

Gender	Married New Retirees	Average Age Difference	Expected Age Difference		Ratio of Actuals/Expecteds	
			Old	New	Old	New
Males	112	2.23	2.00	2.00	111.4%	111.4%
Females	7	(0.93)	(2.00)	(2.00)	46.5%	46.5%
<b>Total</b>	<b>119</b>					

The experience shows that actual age differences among new retirees are close to expected for male retirees. This experience is consistent with the experience from the prior study. The experience for female retirees is not credible due to the number of female retirements during the period.

### Recommendation

*We recommend no change to the age difference assumption for new married retirees.*

## CHILDREN OF MEMBERS

---

Upon the death of an active member of the SPRF, the surviving spouse or legal guardian receives a benefit for each dependent child until the child is 18 years of age (23 years if a full-time student).

The current valuation assumption is each active member has two children; the first child is assumed to be born when the member is age 28 and the second child is assumed to be born when the member is age 31.

The valuation data does not contain information regarding children of active members. As such, we are unable to evaluate the credibility of this assumption.

### **Recommendation**

*We recommend no change to the assumption regarding children of active members.*

## FORM OF PAYMENT

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Upon retirement, a member can elect any of the following forms of payment:

- Single life annuity – the benefit is paid for the lifetime of the member. No benefit is payable to a beneficiary upon the member’s death.
- 15-Year Certain & Life – a reduced benefit is paid for the lifetime of the member. If the member dies before 180 payments have been made, the benefit continues to be paid to a beneficiary until 180 payments have been made.
- 50% Joint & Survivor – a reduced benefit is paid for the lifetime of the member. Upon death of the member, 50% of the benefit is paid to a beneficiary. If the beneficiary predeceases the member, the benefit reverts back to the single life annuity amount.
- 75% Joint & Survivor – a reduced benefit is paid for the lifetime of the member. Upon death of the member, 75% of the benefit is paid to a beneficiary. If the beneficiary predeceases the member, the benefit reverts back to the single life annuity amount.
- 100% Joint & Survivor – a reduced benefit is paid for the lifetime of the member. Upon death of the member, 100% of the benefit is paid to a beneficiary. If the beneficiary predeceases the member, the benefit reverts back to the single life annuity amount.

There is no actuarial reduction for the bounce-back feature (i.e., this is subsidized by the plan). Married members retiring from active status are currently assumed to elect annuities as follows:

Males:	0% elect 15-Year Certain & Life
	15% elect 50% Joint & Survivor option
	25% elect 75% Joint & Survivor option
	35% elect 100% Joint & Survivor option
Females:	0% elect 15-Year Certain & Life
	25% elect 50% Joint & Survivor option
	30% elect 75% Joint & Survivor option
	5% elect 100% Joint & Survivor option

Remaining married and unmarried members are assumed to elect the Single Life option.

### Findings

We reviewed the benefit elections of married new retirees and their beneficiaries during the four-year period. The results are shown on the following pages.

We found slightly more married new retirees are electing the 100% joint & survivor option for both males and females. The experience for female retirees is not credible due to the number of female retirements during the period.

### Recommendation

*We recommend increasing the assumed percentage of males electing joint and survivor annuities, as indicated on the following page, and reducing the assumed percentage of males electing the single life annuity accordingly. We also recommend using the same form of payment assumption for both male and female retirees.*

## FORM OF PAYMENT

### *Male Experience*

Form of Payment	Actual Electing Annuity	Married New Retirees	Crude Rates	Sample Rates		Expected Electing Annuity		Ratio of Actuals/Expecteds	
				Old	New	Old	New	Old	New
Life annuity	17	112	0.1518	0.2500	0.1500	28.00	16.80	60.7%	101.2%
15-year certain & life	-	112	0.0000	0.0000	0.0000	-	-	N/A	N/A
50% joint & survivor	21	112	0.1875	0.1500	0.2000	16.80	22.40	125.0%	93.8%
75% joint & survivor	10	112	0.0893	0.2500	0.1000	28.00	11.20	35.7%	89.3%
100% joint & survivor	64	112	0.5714	0.3500	0.5500	39.20	61.60	163.3%	103.9%
<b>Total</b>	<b>112</b>	<b>112</b>	<b>1.0000</b>	<b>1.0000</b>	<b>1.0000</b>	<b>112.00</b>	<b>112.00</b>		

### *Female Experience*

Form of Payment	Actual Electing Annuity	Married New Retirees	Crude Rates	Sample Rates		Expected Electing Annuity		Ratio of Actuals/Expecteds	
				Old	New	Old	New	Old	New
Life annuity	4	7	0.5714	0.4000	0.1500	2.80	1.05	142.9%	381.0%
15-year certain & life	-	7	0.0000	0.0000	0.0000	-	-	N/A	N/A
50% joint & survivor	-	7	0.0000	0.2500	0.2000	1.75	1.40	0.0%	0.0%
75% joint & survivor	-	7	0.0000	0.3000	0.1000	2.10	0.70	N/A	0.0%
100% joint & survivor	3	7	0.4286	0.0500	0.5500	0.35	3.85	857.1%	77.9%
<b>Total</b>	<b>7</b>	<b>7</b>	<b>1.0000</b>	<b>1.0000</b>	<b>1.0000</b>	<b>7.00</b>	<b>7.00</b>		

## ACTUARIAL EQUIVALENT OPTIONAL FORM FACTORS

---

Joint and Survivor benefits are actuarially equivalent to the Single-life annuity. Current actuarial equivalent factors are based on the RP-2000 mortality table for healthy annuitants, white collar adjustment, projected to 2027 using Scale AA, set back two years for males and set forward one year for females, blended 95% males, and 6.5% post-retirement interest.

### **Recommendation**

*We recommend the actuarial equivalent factors be updated to reflect changes in expected mortality, interest rate, and benefit increase assumption, as applicable. We will work with MSRS staff to develop appropriate factors.*

## **PROPOSED MISCELLANEOUS AND TECHNICAL ASSUMPTIONS**

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### **Background**

A number of miscellaneous and technical assumptions are used in the actuarial valuation. The present assumptions are listed on the following page.

### **Recommendation**

*Miscellaneous and Technical Assumptions are listed on page G-7. We recommend that the Liability Adjustments related to Combined Service Annuities be reviewed and updated (we note that the LCPR Actuary is currently working on such a review). This assumption has been unchanged since 2002. We recommend continued use of the other Miscellaneous and Technical Assumptions.*

## MISCELLANEOUS AND TECHNICAL ASSUMPTIONS

---

<b><i>Benefit Service</i></b>	Exact fractional service is used to determine the amount of benefit payable.
<b><i>Decrement Operation</i></b>	Withdrawal decrements do not operate during retirement eligibility.
<b><i>Decrement Timing</i></b>	Decrements of all types are assumed to occur mid-year.
<b><i>Eligibility Testing</i></b>	Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.
<b><i>Forfeitures</i></b>	For vested separations from service, it is assumed that members separating will withdraw their contributions and forfeit an annuity benefit when the value of member contributions is greater than the value of the annuity benefit.
<b><i>Incidence of Contributions</i></b>	Contributions are assumed to be received on a monthly basis, per the Standards of Actuarial Work.
<b><i>Liability Adjustments</i></b>	Liabilities for active members are increased by 0% and liabilities for former members are increased by 30% to account for the effect of some participants having eligibility for a Combined Service Annuity. We are unable to judge the reasonableness of this assumption without additional data and without performing a substantial amount of additional work beyond the scope of this assignment.
<b><i>Pay Increase Timing</i></b>	Pay increases were assumed to be at the beginning of the fiscal year. This is equivalent to assuming that reported pays represent amounts paid to members during the year ended on the valuation date.
<b><i>Service Credit Accruals</i></b>	Members were assumed to accrue one year of service credit per year.



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**SECTION H**

PROPOSED ASSUMPTION LISTING

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**PROPOSED ACTUARIAL ASSUMPTIONS  
BASED ON 2011-2015 EXPERIENCE STUDY**

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**MERIT AND SENIORITY PAY INCREASES**

<b>% Merit &amp; Seniority Increases in Salaries Next Year</b>	
<b>Year</b>	<b>Rate</b>
1	12.00%
2	6.00%
3	4.50%
4	4.00%
5	3.50%
6	3.00%
7	2.75%
8	2.50%
9	2.25%
10	2.00%
11	1.75%
12	1.50%
13	1.25%
14	1.00%
15	1.00%
16	1.00%
17	0.75%
18	0.75%
19	0.50%
20	0.50%
21	0.40%
22	0.30%
23	0.20%
24	0.10%
25	0.00%
26	0.00%
27	0.00%
28	0.00%
29	0.00%
30	0.00%
31+	0.00%

**PROPOSED ACTUARIAL ASSUMPTIONS  
BASED ON 2011-2015 EXPERIENCE STUDY**

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**AGE & SERVICE RETIREMENT PATTERN  
UNREDUCED (NORMAL) RETIREMENT**

Age	% Retiring
55	65.0%
56	50.0%
57	30.0%
58	20.0%
59	30.0%
60+	100.0%

*\* The current assumption prescribed by the Minnesota Standards for Actuarial Work is that members who have reached 100% retirement eligibility will delay retirement one year.*

**PROPOSED ACTUARIAL ASSUMPTIONS  
BASED ON 2011-2015 EXPERIENCE STUDY**

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**AGE & SERVICE RETIREMENT PATTERN  
REDUCED (EARLY) RETIREMENT**

<b>Age</b>	<b>% Retiring</b>
50	5.0%
51	5.0%
52	5.0%
53	5.0%
54	5.0%

**PROPOSED ACTUARIAL ASSUMPTIONS  
BASED ON 2011-2015 EXPERIENCE STUDY**

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**WITHDRAWAL**

Age	% Terminating	
	Male	Female
20	0.0147	0.0147
21	0.0140	0.0140
22	0.0133	0.0133
23	0.0127	0.0127
24	0.0120	0.0120
25	0.0113	0.0113
26	0.0107	0.0107
27	0.0100	0.0100
28	0.0093	0.0093
29	0.0087	0.0087
30	0.0080	0.0080
31	0.0073	0.0073
32	0.0067	0.0067
33	0.0060	0.0060
34	0.0053	0.0053
35	0.0047	0.0047
36	0.0040	0.0040
37	0.0040	0.0040
38	0.0040	0.0040
39	0.0040	0.0040
40	0.0040	0.0040
41	0.0040	0.0040
42	0.0040	0.0040
43	0.0040	0.0040
44	0.0040	0.0040
45	0.0040	0.0040
46	0.0040	0.0040
47	0.0040	0.0040
48	0.0040	0.0040
49	0.0020	0.0020
50+	0.0000	0.0000

**PROPOSED ACTUARIAL ASSUMPTIONS  
BASED ON 2011-2015 EXPERIENCE STUDY**

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**DISABILITY RATES**

Age	% Becoming Disabled	
	Male	Female
20	0.0003	0.0003
21	0.0003	0.0003
22	0.0004	0.0004
23	0.0004	0.0004
24	0.0005	0.0005
25	0.0005	0.0005
26	0.0005	0.0005
27	0.0006	0.0006
28	0.0006	0.0006
29	0.0006	0.0006
30	0.0006	0.0006
31	0.0007	0.0007
32	0.0007	0.0007
33	0.0008	0.0008
34	0.0008	0.0008
35	0.0011	0.0011
36	0.0013	0.0013
37	0.0013	0.0013
38	0.0015	0.0015
39	0.0016	0.0016
40	0.0018	0.0018
41	0.0021	0.0021
42	0.0023	0.0023
43	0.0025	0.0025
44	0.0027	0.0027
45	0.0030	0.0030
46	0.0034	0.0034
47	0.0038	0.0038
48	0.0043	0.0043
49	0.0048	0.0048
50	0.0048	0.0048
51	0.0048	0.0048
52	0.0051	0.0051
53	0.0058	0.0058
54	0.0064	0.0064
55+	0.0000	0.0000

**PROPOSED ACTUARIAL ASSUMPTIONS  
BASED ON 2011-2015 EXPERIENCE STUDY**

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**HEALTHY POST-RETIREMENT MORTALITY RATES**

Age in 2013	% Dying Next Year*		Age in 2013	% Dying Next Year*	
	Male	Female		Male	Female
50	0.0028	0.0021	75	0.0226	0.0186
51	0.0031	0.0022	76	0.0252	0.0207
52	0.0033	0.0023	77	0.0282	0.0231
53	0.0035	0.0024	78	0.0316	0.0258
54	0.0037	0.0026	79	0.0355	0.0289
55	0.0040	0.0028	80	0.0399	0.0325
56	0.0042	0.0030	81	0.0449	0.0365
57	0.0044	0.0032	82	0.0506	0.0411
58	0.0046	0.0034	83	0.0572	0.0464
59	0.0049	0.0037	84	0.0646	0.0523
60	0.0052	0.0040	85	0.0731	0.0591
61	0.0056	0.0045	86	0.0826	0.0668
62	0.0060	0.0050	87	0.0934	0.0755
63	0.0065	0.0056	88	0.1054	0.0853
64	0.0070	0.0062	89	0.1188	0.0962
65	0.0077	0.0068	90	0.1338	0.1084
66	0.0084	0.0075	91	0.1497	0.1217
67	0.0093	0.0083	92	0.1663	0.1360
68	0.0103	0.0091	93	0.1834	0.1511
69	0.0115	0.0100	94	0.2008	0.1670
70	0.0129	0.0111	95	0.2185	0.1838
71	0.0144	0.0123	96	0.2381	0.2019
72	0.0161	0.0136	97	0.2584	0.2211
73	0.0180	0.0150	98	0.2795	0.2412
74	0.0202	0.0167	99	0.3014	0.2622

\* The rates shown are RP-2014 mortality for healthy annuitants, with adjustments, if applicable (see Section G). Recommended rates include adjustments for white collar and mortality improvements from 2006 to the mid-point of this study (2013) using projection scale MP-2015.

**PROPOSED ACTUARIAL ASSUMPTIONS  
BASED ON 2011-2015 EXPERIENCE STUDY**

---

**DISABLED POST-RETIREMENT MORTALITY RATES**

Age in 2013	% Dying Next Year*		Age in 2013	% Dying Next Year*	
	Male	Female		Male	Female
20	0.0003	0.0001	55	0.0040	0.0028
21	0.0003	0.0002	56	0.0042	0.0030
22	0.0003	0.0002	57	0.0044	0.0032
23	0.0003	0.0002	58	0.0046	0.0034
24	0.0004	0.0002	59	0.0049	0.0037
25	0.0004	0.0003	60	0.0052	0.0040
26	0.0004	0.0003	61	0.0056	0.0045
27	0.0005	0.0003	62	0.0060	0.0050
28	0.0005	0.0004	63	0.0065	0.0056
29	0.0005	0.0004	64	0.0070	0.0062
30	0.0006	0.0005	65	0.0077	0.0068
31	0.0006	0.0005	66	0.0084	0.0075
32	0.0007	0.0006	67	0.0093	0.0083
33	0.0007	0.0007	68	0.0103	0.0091
34	0.0008	0.0007	69	0.0115	0.0100
35	0.0008	0.0008	70	0.0129	0.0111
36	0.0009	0.0009	71	0.0144	0.0123
37	0.0010	0.0010	72	0.0161	0.0136
38	0.0010	0.0010	73	0.0180	0.0150
39	0.0011	0.0011	74	0.0202	0.0167
40	0.0012	0.0012	75	0.0226	0.0186
41	0.0013	0.0013	76	0.0252	0.0207
42	0.0015	0.0014	77	0.0282	0.0231
43	0.0016	0.0014	78	0.0316	0.0258
44	0.0017	0.0015	79	0.0355	0.0289
45	0.0019	0.0016	80	0.0399	0.0325
46	0.0020	0.0017	81	0.0449	0.0365
47	0.0022	0.0018	82	0.0506	0.0411
48	0.0024	0.0019	83	0.0572	0.0464
49	0.0026	0.0020	84	0.0646	0.0523
50	0.0028	0.0021	85	0.0731	0.0591
51	0.0031	0.0022	86	0.0826	0.0668
52	0.0033	0.0023	87	0.0934	0.0755
53	0.0035	0.0024	88	0.1054	0.0853
54	0.0037	0.0026	89	0.1188	0.0962

\* The rates shown are RP-2014 mortality for disabled annuitants, with adjustments, if applicable (see Section G). Recommended rates include mortality improvements from 2006 to the mid-point of this study (2013) using projection scale MP-2015.



**PROPOSED ACTUARIAL ASSUMPTIONS  
BASED ON 2011-2015 EXPERIENCE STUDY**

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**HEALTHY PRE-RETIREMENT MORTALITY RATES**

Age in 2013	% Dying Next Year*		Age in 2013	% Dying Next Year*	
	Male	Female		Male	Female
20	0.0003	0.0001	46	0.0008	0.0006
21	0.0003	0.0001	47	0.0009	0.0007
22	0.0003	0.0001	48	0.0010	0.0008
23	0.0003	0.0001	49	0.0011	0.0008
24	0.0003	0.0001	50	0.0012	0.0009
25	0.0003	0.0001	51	0.0014	0.0010
26	0.0003	0.0002	52	0.0015	0.0011
27	0.0003	0.0002	53	0.0016	0.0012
28	0.0003	0.0002	54	0.0018	0.0013
29	0.0003	0.0002	55	0.0020	0.0014
30	0.0003	0.0002	56	0.0022	0.0016
31	0.0003	0.0002	57	0.0024	0.0017
32	0.0003	0.0002	58	0.0027	0.0018
33	0.0003	0.0002	59	0.0030	0.0020
34	0.0004	0.0002	60	0.0033	0.0021
35	0.0004	0.0003	61	0.0037	0.0023
36	0.0004	0.0003	62	0.0041	0.0025
37	0.0004	0.0003	63	0.0046	0.0027
38	0.0004	0.0003	64	0.0052	0.0030
39	0.0004	0.0003	65	0.0059	0.0032
40	0.0004	0.0004	66	0.0066	0.0036
41	0.0005	0.0004	67	0.0075	0.0041
42	0.0005	0.0004	68	0.0084	0.0046
43	0.0006	0.0005	69	0.0095	0.0051
44	0.0006	0.0005	70	0.0107	0.0057
45	0.0007	0.0006			

\* The rates shown are RP-2014 mortality for employees, with adjustments, if applicable (see Section G). Recommended rates include adjustments for white collar and mortality improvements from 2006 to the mid-point of this study (2013) using projection scale MP-2015.

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**SECTION I**  
GLOSSARY

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## GLOSSARY

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The following glossary is intended to provide definitions of a number of terms which are used throughout this report and which are somewhat unique to the discussion of an Experience Study.

**Actuarial Decrement.** The actual number of decrements which occurred during the study. This number is a straight tabulation of the actual number of occurrences of the particular decrement in question. Normally, the actual number of decrements will be subdivided by age and possibly sex.

**Aggregate Assumptions.** Assumptions which vary only by sex and/or age. The impact of year of service on the decrement is ignored. All experience is combined by age and/or sex without regard to service. Rates of death and disablement are more appropriate to aggregate measurement in a retirement system.

**Crude Rate of Decrement.** The rate of decrement determined by dividing the actual number of the respective decrement for that age and sex by the corresponding exposure for that age and sex. The rate is described as a crude rate because no smoothing or elimination of statistical fluctuations has been made. It is indicative of the underlying true rate of the decrement and is the basis used in graduation to obtain the graduated or tabular rate.

**Decrements.** The decrements are the means by which a member ceases to be a member. For active members, the decrements are death, withdrawal, service retirement, and disability retirement. For retired members, the only decrement is death. The purpose of the Experience Study is to determine the underlying rates of each decrement.

**Expected Decrement.** This is the number of occurrences of a given decrement expected to occur for a given age and sex based on the number of lives exposed to the risk of the particular decrement and the current assumed rate for that decrement. It may also be referred to as the tabular number of decrements. It is the number of deaths, withdrawals, retirements, or disabilities (whichever is applicable) that would have actually occurred had the actuarial assumptions been exactly realized.

## GLOSSARY

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**Exposure.** The number of lives exposed to a given risk of decrement for a particular age and sex. It represents the number of members who could have potentially died, retired, become disabled, or withdrawn at that particular age and for that particular sex. This term will also be described as “the number exposed to a given risk.”

**Graduated Rates.** Graduation is the mathematical process by which a set of crude rates of a particular type is translated into graduated or tabular rates. The graduation process attempts to smooth out statistical fluctuations and to arrive at a set of rates that adequately fit the underlying actual experience of the crude rates that are being graduated. The graduation process involves smoothing the results, but at the same time trying to fit the results to be consistent with the original data. It requires that the actuary exercise his or her judgment in what the underlying shape of the risk curve should look like.

**Interpolated Rates.** For the active rates of decrement (death, disability, retirement, and withdrawal), the actuary will develop graduated rates based on quinquennial age groupings (see definition). To arrive at the rates of decrement for ages between two quinquennial ages, the graduated quinquennial rates must be interpolated for these intermediate ages. The interpolated results are arrived at by applying a mathematical interpolation formula to the quinquennial graduated rates.

**Merit and Seniority Pay Increase Rate.** The portion of the total salary scale which varies by service. It reflects the impact of moving up the salary grid in a given year, rather than the increase in the overall grid. It includes the salary increase associated with promotions during the year.

**Quinquennial Age Groupings.** For the active decrements, it is preferable to group the experience in five-year age groups for graduation and analysis purposes so as to minimize statistical fluctuations resulting from a lack of exposure which may occur for individual ages. Quinquennial age grouping is the five-year age grouping which is used to develop the graduated rates of decrement for active membership. The quinquennial age is the central age of the five-year grouping.

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**SECTION J**

**APPENDIX**

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## **APPENDIX – DETAILED EXPERIENCE ANALYSIS**

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In this section, we present the annual experience for each major assumption that was analyzed for the study. Please note that totals may not sum correctly due to rounding of intermediate results.

**APPENDIX – DETAILED EXPERIENCE ANALYSIS  
SALARY INCREASES**

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**2011-2015 Experience**

<b>Year</b>	<b>Exposure</b>	<b>Gross Actual Increases</b>	<b>Gross Expected Increases</b>
1	3	22.45%	7.75%
2	104	11.35%	7.25%
3	120	8.28%	6.75%
4	112	4.15%	6.50%
5	116	6.89%	6.25%
6	144	7.48%	6.00%
7	141	5.45%	5.75%
8	185	4.92%	5.60%
9	164	4.56%	5.45%
10	130	7.01%	5.30%
11	116	6.48%	5.15%
12	95	1.05%	5.00%
13	153	2.41%	4.85%
14	192	1.38%	4.70%
15	173	2.88%	4.55%
16	167	4.92%	4.40%
17	110	2.33%	4.25%
18	97	2.93%	4.10%
19	75	2.09%	3.95%
20	37	4.09%	3.80%
21	31	6.87%	3.75%
22	37	2.78%	3.75%
23	61	0.16%	3.75%
24	82	2.16%	3.75%
25	62	1.48%	3.75%
26	62	3.87%	3.75%
27	58	0.87%	3.75%
28	50	0.50%	3.75%
29	46	1.73%	3.75%
30	37	2.93%	3.75%
31+	54	1.30%	3.75%
<b>Totals</b>	<b>3,014</b>	<b>4.23%</b>	<b>4.99%</b>

**APPENDIX – DETAILED EXPERIENCE ANALYSIS  
SALARY INCREASES**

---

**2011-2012 Experience**

<b>Year</b>	<b>Exposure</b>	<b>Gross Actual Increases</b>	<b>Gross Expected Increases</b>
1	-	0.00%	7.75%
2	1	27.31%	7.25%
3	65	6.91%	6.75%
4	12	8.13%	6.50%
5	42	8.99%	6.25%
6	37	9.28%	6.00%
7	57	8.48%	5.75%
8	55	6.04%	5.60%
9	20	6.17%	5.45%
10	5	5.58%	5.30%
11	39	6.14%	5.15%
12	36	2.82%	5.00%
13	76	4.59%	4.85%
14	47	5.26%	4.70%
15	19	3.21%	4.55%
16	32	4.66%	4.40%
17	18	4.73%	4.25%
18	27	4.58%	4.10%
19	-	0.00%	3.95%
20	-	0.00%	3.80%
21	9	9.43%	3.75%
22	29	3.91%	3.75%
23	27	5.17%	3.75%
24	27	3.84%	3.75%
25	-	0.00%	3.75%
26	24	2.27%	3.75%
27	18	3.37%	3.75%
28	14	4.72%	3.75%
29	4	7.57%	3.75%
30	12	1.80%	3.75%
31+	14	2.99%	3.75%
<b>Totals</b>	<b>766</b>	<b>5.66%</b>	<b>5.00%</b>



**APPENDIX – DETAILED EXPERIENCE ANALYSIS**  
**SALARY INCREASES**

---

**2012-2013 Experience**

<b>Year</b>	<b>Exposure</b>	<b>Gross Actual Increases</b>	<b>Gross Expected Increases</b>
1	-	0.00%	7.75%
2	40	6.01%	7.25%
3	1	-1.57%	6.75%
4	62	-0.14%	6.50%
5	12	0.91%	6.25%
6	40	-1.05%	6.00%
7	37	-0.61%	5.75%
8	56	-0.93%	5.60%
9	56	0.38%	5.45%
10	20	2.24%	5.30%
11	5	5.25%	5.15%
12	38	-3.77%	5.00%
13	36	-3.44%	4.85%
14	73	-5.04%	4.70%
15	48	-2.64%	4.55%
16	19	-4.72%	4.40%
17	33	-4.33%	4.25%
18	19	-1.77%	4.10%
19	25	-3.21%	3.95%
20	-	0.00%	3.80%
21	-	0.00%	3.75%
22	8	-1.31%	3.75%
23	26	-3.99%	3.75%
24	24	-2.85%	3.75%
25	26	-3.55%	3.75%
26	-	0.00%	3.75%
27	22	-5.94%	3.75%
28	16	-3.63%	3.75%
29	13	-5.22%	3.75%
30	3	-3.52%	3.75%
31+	16	-4.30%	3.75%
<b>Totals</b>	<b>774</b>	<b>-1.94%</b>	<b>5.02%</b>

**APPENDIX – DETAILED EXPERIENCE ANALYSIS**  
**SALARY INCREASES**

---

**2013-2014 Experience**

<b>Year</b>	<b>Exposure</b>	<b>Gross Actual Increases</b>	<b>Gross Expected Increases</b>
1	-	0.00%	7.75%
2	19	13.97%	7.25%
3	37	8.62%	6.75%
4	1	4.30%	6.50%
5	61	6.52%	6.25%
6	9	2.88%	6.00%
7	40	5.83%	5.75%
8	37	6.87%	5.60%
9	53	5.93%	5.45%
10	55	6.37%	5.30%
11	19	6.01%	5.15%
12	4	11.17%	5.00%
13	37	3.37%	4.85%
14	36	3.03%	4.70%
15	71	3.88%	4.55%
16	47	3.77%	4.40%
17	19	4.80%	4.25%
18	33	2.92%	4.10%
19	19	0.62%	3.95%
20	23	3.91%	3.80%
21	-	0.00%	3.75%
22	-	0.00%	3.75%
23	8	-3.27%	3.75%
24	24	3.80%	3.75%
25	19	3.46%	3.75%
26	22	3.01%	3.75%
27	-	0.00%	3.75%
28	20	0.84%	3.75%
29	15	2.21%	3.75%
30	12	4.87%	3.75%
31+	12	3.74%	3.75%
<b>Totals</b>	<b>752</b>	<b>4.85%</b>	<b>4.94%</b>

**APPENDIX – DETAILED EXPERIENCE ANALYSIS**  
**SALARY INCREASES**

---

**2014-2015 Experience**

<b>Year</b>	<b>Exposure</b>	<b>Gross Actual Increases</b>	<b>Gross Expected Increases</b>
1	3	22.45%	7.75%
2	44	14.71%	7.25%
3	17	13.32%	6.75%
4	37	10.04%	6.50%
5	1	12.45%	6.25%
6	58	12.92%	6.00%
7	7	10.66%	5.75%
8	37	10.15%	5.60%
9	35	8.25%	5.45%
10	50	9.77%	5.30%
11	53	7.00%	5.15%
12	17	5.73%	5.00%
13	4	4.63%	4.85%
14	36	7.68%	4.70%
15	35	8.25%	4.55%
16	69	8.47%	4.40%
17	40	5.57%	4.25%
18	18	5.43%	4.10%
19	31	7.27%	3.95%
20	14	4.38%	3.80%
21	22	5.83%	3.75%
22	-	0.00%	3.75%
23	-	0.00%	3.75%
24	7	7.32%	3.75%
25	17	6.96%	3.75%
26	16	7.46%	3.75%
27	18	6.70%	3.75%
28	-	0.00%	3.75%
29	14	6.00%	3.75%
30	10	3.90%	3.75%
31+	12	4.36%	3.75%
<b>Totals</b>	<b>722</b>	<b>8.67%</b>	<b>5.01%</b>

**APPENDIX – DETAILED EXPERIENCE ANALYSIS  
RETIREMENT**

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**2011-2015 Experience**

<b>Age</b>	<b>Actual Retirements</b>	<b>Exposure</b>	<b>Expected Retirements</b>	<b>Actual/ Expected</b>
50	12	128	8.96	133.9%
51	5	121	7.26	68.9%
52	7	122	7.32	95.6%
53	9	119	7.14	126.1%
54	11	111	3.33	330.3%
55	53	99	64.35	82.4%
56	21	48	24.00	87.5%
57	10	31	9.30	107.5%
58	5	21	4.20	119.0%
59	7	14	2.80	250.0%
<b>Totals</b>	<b>140</b>	<b>814</b>	<b>138.66</b>	<b>101.0%</b>

**APPENDIX – DETAILED EXPERIENCE ANALYSIS  
RETIREMENT**

---

**2011-2012 Experience**

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
50	2	33	2.31	86.6%
51	1	36	2.16	46.3%
52	2	26	1.56	128.2%
53	4	33	1.98	202.0%
54	5	29	0.87	574.7%
55	18	27	17.55	102.6%
56	3	11	5.50	54.5%
57	2	9	2.70	74.1%
58	1	2	0.40	250.0%
59	1	2	0.40	250.0%
<b>Totals</b>	<b>39</b>	<b>208</b>	<b>35.43</b>	<b>110.1%</b>

**2012-2013 Experience**

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
50	-	29	2.03	0.0%
51	1	31	1.86	53.8%
52	2	35	2.10	95.2%
53	3	24	1.44	208.3%
54	2	29	0.87	229.9%
55	12	24	15.60	76.9%
56	4	9	4.50	88.9%
57	1	8	2.40	41.7%
58	-	7	1.40	0.0%
59	-	1	0.20	0.0%
<b>Totals</b>	<b>25</b>	<b>197</b>	<b>32.40</b>	<b>77.2%</b>

**2013-2014 Experience**

**APPENDIX – DETAILED EXPERIENCE ANALYSIS  
RETIREMENT**

---

**2013-2014 Experience**

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
50	5	29	2.03	246.3%
51	-	30	1.80	0.0%
52	1	30	1.80	55.6%
53	1	33	1.98	50.5%
54	-	21	0.63	0.0%
55	10	27	17.55	57.0%
56	3	11	5.50	54.5%
57	1	6	1.80	55.6%
58	4	7	1.40	285.7%
59	3	7	1.40	214.3%
<b>Totals</b>	<b>28</b>	<b>201</b>	<b>35.89</b>	<b>78.0%</b>

**2014-2015 Experience**

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
50	5	37	2.59	193.1%
51	3	24	1.44	208.3%
52	2	31	1.86	107.5%
53	1	29	1.74	57.5%
54	4	32	0.96	416.7%
55	13	21	13.65	95.2%
56	11	17	8.50	129.4%
57	6	8	2.40	250.0%
58	-	5	1.00	0.0%
59	3	4	0.80	375.0%
<b>Totals</b>	<b>48</b>	<b>208</b>	<b>34.94</b>	<b>137.4%</b>

**APPENDIX – DETAILED EXPERIENCE ANALYSIS  
TERMINATIONS, SERVICE <3 YEARS**

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**2011-2015 Experience**

Year	Males				Females				Total			
	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
1	10	106	5.30	188.7%	2	16	0.80	250.0%	12	122	6.10	196.7%
2	4	107	2.14	186.9%	-	10	0.20	0.0%	4	117	2.34	170.9%
3	1	102	2.04	49.0%	-	12	0.24	0.0%	1	114	2.28	43.9%
<b>Totals</b>	<b>15</b>	<b>315</b>	<b>9.48</b>	<b>158.2%</b>	<b>2</b>	<b>38</b>	<b>1.24</b>	<b>161.3%</b>	<b>17</b>	<b>353</b>	<b>10.72</b>	<b>158.6%</b>

**APPENDIX – DETAILED EXPERIENCE ANALYSIS  
TERMINATIONS, SERVICE <3 YEARS**

**2011-2012 Experience**

Year	Males				Females				Total			
	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
1	2	30	1.50	133.3%	1	5	0.25	400.0%	3	35	1.75	171.4%
2	2	10	0.20	1000.0%	-	-	-	N/A	2	10	0.20	1000.0%
3	-	43	0.86	0.0%	-	5	0.10	0.0%	-	48	0.96	0.0%
<b>Totals</b>	<b>4</b>	<b>83</b>	<b>2.56</b>	<b>156.3%</b>	<b>1</b>	<b>10</b>	<b>0.35</b>	<b>285.7%</b>	<b>5</b>	<b>93</b>	<b>2.91</b>	<b>171.8%</b>

**2012-2013 Experience**

Year	Males				Females				Total			
	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
1	-	3	0.15	0.0%	1	3	0.15	666.7%	1	6	0.30	333.3%
2	1	32	0.64	156.3%	-	5	0.10	0.0%	1	37	0.74	135.1%
3	-	8	0.16	0.0%	-	-	-	N/A	-	8	0.16	0.0%
<b>Totals</b>	<b>1</b>	<b>43</b>	<b>0.95</b>	<b>105.3%</b>	<b>1</b>	<b>8</b>	<b>0.25</b>	<b>400.0%</b>	<b>2</b>	<b>51</b>	<b>1.20</b>	<b>166.7%</b>



**APPENDIX – DETAILED EXPERIENCE ANALYSIS**  
**TERMINATIONS, SERVICE <3 YEARS**

**2013-2014 Experience**

Year	Males				Females				Total			
	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
1	3	32	1.60	187.5%	-	3	0.15	0.0%	3	35	1.75	171.4%
2	-	24	0.48	0.0%	-	2	0.04	0.0%	-	26	0.52	0.0%
3	1	29	0.58	172.4%	-	5	0.10	0.0%	1	34	0.68	147.1%
<b>Totals</b>	<b>4</b>	<b>85</b>	<b>2.66</b>	<b>150.4%</b>	<b>-</b>	<b>10</b>	<b>0.29</b>	<b>0.0%</b>	<b>4</b>	<b>95</b>	<b>2.95</b>	<b>135.6%</b>

**2014-2015 Experience**

Year	Males				Females				Total			
	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
1	5	41	2.05	243.9%	-	5	0.25	0.0%	5	46	2.30	217.4%
2	1	41	0.82	122.0%	-	3	0.06	0.0%	1	44	0.88	113.6%
3	-	22	0.44	0.0%	-	2	0.04	0.0%	-	24	0.48	0.0%
<b>Totals</b>	<b>6</b>	<b>104</b>	<b>3.31</b>	<b>181.3%</b>	<b>-</b>	<b>10</b>	<b>0.35</b>	<b>0.0%</b>	<b>6</b>	<b>114</b>	<b>3.66</b>	<b>163.9%</b>

**APPENDIX – DETAILED EXPERIENCE ANALYSIS  
TERMINATIONS, SERVICE >3 YEARS**

2011-2015 Experience, Service >3 Years

Age Group	Males				Females				Total			
	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
Under 25	-	-	-	N/A	-	-	-	N/A	-	-	-	N/A
25-29	-	106	0.98	0.0%	1	10	0.09	1094.1%	1	116	1.07	93.2%
30-34	4	250	1.61	248.6%	1	40	0.26	380.1%	5	290	1.87	267.1%
35-39	6	508	2.10	285.2%	-	56	0.23	0.0%	6	564	2.34	256.9%
40-44	3	582	2.33	128.5%	1	82	0.33	304.9%	4	664	2.66	150.3%
45-49	4	515	1.85	216.2%	-	62	0.22	0.0%	4	577	2.07	193.4%
<b>Totals</b>	<b>17</b>	<b>1,961</b>	<b>8.88</b>	<b>191.5%</b>	<b>3</b>	<b>250</b>	<b>1.13</b>	<b>265.0%</b>	<b>20</b>	<b>2,211</b>	<b>10.01</b>	<b>199.8%</b>

## APPENDIX – DETAILED EXPERIENCE ANALYSIS TERMINATIONS, SERVICE >3 YEARS

### 2011-2012 Experience, Service >3 Years

Age Group	Males				Females				Total			
	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
Under 25	-	-	-	N/A	-	-	-	N/A	-	-	-	N/A
25-29	-	19	0.18	0.0%	-	2	0.02	0.0%	-	21	0.20	0.0%
30-34	-	72	0.46	0.0%	-	9	0.06	0.0%	-	81	0.52	0.0%
35-39	1	139	0.58	172.4%	-	14	0.06	0.0%	1	153	0.64	156.2%
40-44	-	138	0.56	0.0%	-	21	0.08	0.0%	-	159	0.64	0.0%
45-49	-	125	0.45	0.0%	-	19	0.06	0.0%	-	144	0.51	0.0%
<b>Totals</b>	<b>1</b>	<b>493</b>	<b>2.23</b>	<b>44.8%</b>	<b>-</b>	<b>65</b>	<b>0.29</b>	<b>0.0%</b>	<b>1</b>	<b>558</b>	<b>2.52</b>	<b>39.7%</b>

### 2012-2013 Experience, Service >3 Years

Age Group	Males				Females				Total			
	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
Under 25	-	-	-	N/A	-	-	-	N/A	-	-	-	N/A
25-29	-	31	0.29	0.0%	-	4	0.04	0.0%	-	35	0.33	0.0%
30-34	2	66	0.42	476.2%	-	10	0.07	0.0%	2	76	0.49	411.0%
35-39	-	132	0.54	0.0%	-	14	0.06	0.0%	-	146	0.60	0.0%
40-44	2	147	0.58	344.8%	-	21	0.08	0.0%	2	168	0.66	301.2%
45-49	-	134	0.49	0.0%	-	15	0.05	0.0%	-	149	0.54	0.0%
<b>Totals</b>	<b>4</b>	<b>510</b>	<b>2.32</b>	<b>172.1%</b>	<b>-</b>	<b>64</b>	<b>0.30</b>	<b>0.0%</b>	<b>4</b>	<b>574</b>	<b>2.62</b>	<b>152.5%</b>

**APPENDIX – DETAILED EXPERIENCE ANALYSIS  
TERMINATIONS, SERVICE >3 YEARS**

**2013-2014 Experience, Service >3 Years**

Age Group	Males				Females				Total			
	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
Under 25	-	-	-	N/A	-	-	-	N/A	-	-	-	N/A
25-29	-	27	0.25	0.0%	1	3	0.03	3745.3%	1	30	0.28	360.1%
30-34	2	58	0.38	527.7%	-	9	0.06	0.0%	2	67	0.44	456.9%
35-39	-	119	0.49	0.0%	-	15	0.06	0.0%	-	134	0.55	0.0%
40-44	1	150	0.60	165.6%	-	20	0.08	0.0%	1	170	0.68	146.2%
45-49	2	132	0.46	434.8%	-	14	0.05	0.0%	2	146	0.51	393.7%
<b>Totals</b>	<b>5</b>	<b>486</b>	<b>2.18</b>	<b>228.9%</b>	<b>1</b>	<b>61</b>	<b>0.27</b>	<b>363.9%</b>	<b>6</b>	<b>547</b>	<b>2.46</b>	<b>244.0%</b>

**2014-2015 Experience, Service >3 Years**

Age Group	Males				Females				Total			
	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
Under 25	-	-	-	N/A	-	-	-	N/A	-	-	-	N/A
25-29	-	29	0.26	0.0%	-	1	0.01	0.0%	-	30	0.27	0.0%
30-34	-	54	0.35	0.0%	1	12	0.08	1295.3%	1	66	0.43	234.1%
35-39	5	118	0.49	1020.4%	-	13	0.05	0.0%	5	131	0.54	921.3%
40-44	-	147	0.59	0.0%	1	20	0.08	1250.0%	1	167	0.67	149.3%
45-49	2	124	0.45	444.4%	-	14	0.05	0.0%	2	138	0.50	398.4%
<b>Totals</b>	<b>7</b>	<b>472</b>	<b>2.14</b>	<b>327.1%</b>	<b>2</b>	<b>60</b>	<b>0.27</b>	<b>739.1%</b>	<b>9</b>	<b>532</b>	<b>2.41</b>	<b>373.4%</b>

**APPENDIX – DETAILED EXPERIENCE ANALYSIS  
DISABILITY RETIREMENTS**

**2011-2015 Experience**

Age Group	Males				Females				Total			
	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected
Under 20	-	-	-	N/A	-	-	-	N/A	-	-	-	N/A
20-24	-	20	0.01	0.0%	-	4	0.00	0.0%	-	24	0.01	0.0%
25-29	-	225	0.13	0.0%	-	22	0.01	0.0%	-	247	0.14	0.0%
30-34	-	339	0.25	0.0%	-	49	0.04	109.9%	-	388	0.28	109.9%
35-39	1	551	0.60	165.9%	-	65	0.07	0.0%	1	616	0.67	148.9%
40-44	1	600	1.05	95.1%	1	86	0.15	646.4%	2	686	1.21	165.8%
45-49	4	527	1.56	256.2%	1	62	0.19	535.3%	5	589	1.75	286.0%
50-54	2	542	2.80	71.5%	1	69	0.35	289.2%	3	611	3.14	95.4%
<b>Totals</b>	<b>8</b>	<b>2,804</b>	<b>6.40</b>	<b>125.0%</b>	<b>3</b>	<b>357</b>	<b>0.81</b>	<b>372.1%</b>	<b>11</b>	<b>3,161</b>	<b>7.20</b>	<b>152.7%</b>

## APPENDIX – DETAILED EXPERIENCE ANALYSIS DISABILITY RETIREMENTS

### 2011-2012 Experience

Age Group	Males				Females				Total			
	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected
Under 20	-	-	-	N/A	-	-	-	N/A	-	-	-	N/A
20-24	-	6	0.00	0.0%	-	-	-	N/A	-	6	0.00	0.0%
25-29	-	54	0.03	0.0%	-	7	0.00	0.0%	-	61	0.03	0.0%
30-34	-	90	0.07	0.0%	-	12	0.01	0.0%	-	102	0.07	109.9%
35-39	-	151	0.17	0.0%	-	15	0.02	0.0%	-	166	0.18	0.0%
40-44	-	144	0.25	0.0%	-	22	0.04	0.0%	-	166	0.29	0.0%
45-49	1	129	0.39	257.9%	-	19	0.06	0.0%	1	148	0.45	224.1%
50-54	-	143	0.74	0.0%	-	15	0.07	0.0%	-	158	0.81	0.0%
<b>Totals</b>	<b>1</b>	<b>717</b>	<b>1.65</b>	<b>60.8%</b>	<b>-</b>	<b>90</b>	<b>0.20</b>	<b>0.0%</b>	<b>1</b>	<b>807</b>	<b>1.84</b>	<b>54.2%</b>

### 2012-2013 Experience

Age Group	Males				Females				Total			
	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected
Under 20	-	-	-	N/A	-	-	-	N/A	-	-	-	N/A
20-24	-	-	-	N/A	-	-	-	N/A	-	-	-	N/A
25-29	-	47	0.03	0.0%	-	8	0.00	0.0%	-	55	0.03	0.0%
30-34	-	82	0.06	0.0%	-	12	0.01	0.0%	-	94	0.07	109.9%
35-39	-	138	0.15	0.0%	-	16	0.02	0.0%	-	154	0.17	0.0%
40-44	-	148	0.26	0.0%	-	21	0.04	0.0%	-	169	0.30	0.0%
45-49	1	134	0.40	251.2%	-	15	0.05	0.0%	1	149	0.44	225.5%
50-54	1	132	0.68	146.5%	-	18	0.09	0.0%	1	150	0.77	129.9%
<b>Totals</b>	<b>2</b>	<b>681</b>	<b>1.58</b>	<b>127.0%</b>	<b>-</b>	<b>90</b>	<b>0.20</b>	<b>0.0%</b>	<b>2</b>	<b>771</b>	<b>1.78</b>	<b>112.6%</b>

## APPENDIX – DETAILED EXPERIENCE ANALYSIS DISABILITY RETIREMENTS

### 2013-2014 Experience

Age Group	Males				Females				Total			
	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected
Under 20	-	-	-	N/A	-	-	-	N/A	-	-	-	N/A
20-24	-	6	0.00	0.0%	-	1	0.00	0.0%	-	7	0.00	0.0%
25-29	-	61	0.04	0.0%	-	4	0.00	0.0%	-	65	0.04	0.0%
30-34	-	83	0.06	0.0%	-	12	0.01	0.0%	-	95	0.07	109.9%
35-39	1	130	0.14	703.2%	-	19	0.02	0.0%	1	149	0.16	615.0%
40-44	-	153	0.27	0.0%	-	21	0.04	0.0%	-	174	0.31	0.0%
45-49	2	135	0.40	497.8%	1	14	0.04	2314.8%	3	149	0.45	674.2%
50-54	-	127	0.65	0.0%	-	18	0.09	0.0%	-	145	0.74	0.0%
<b>Totals</b>	<b>3</b>	<b>695</b>	<b>1.56</b>	<b>192.0%</b>	<b>1</b>	<b>89</b>	<b>0.20</b>	<b>489.0%</b>	<b>4</b>	<b>784</b>	<b>1.77</b>	<b>226.4%</b>

### 2014-2015 Experience

Age Group	Males				Females				Total			
	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected
Under 20	-	-	-	N/A	-	-	-	N/A	-	-	-	N/A
20-24	-	8	0.00	0.0%	-	3	0.00	0.0%	-	11	0.01	0.0%
25-29	-	63	0.04	0.0%	-	3	0.00	0.0%	-	66	0.04	0.0%
30-34	-	84	0.06	0.0%	-	13	0.01	0.0%	-	97	0.07	109.9%
35-39	-	132	0.14	0.0%	-	15	0.02	0.0%	-	147	0.16	0.0%
40-44	1	155	0.27	366.0%	1	22	0.04	2493.8%	2	177	0.31	638.4%
45-49	-	129	0.37	0.0%	-	14	0.04	0.0%	-	143	0.41	0.0%
50-54	1	140	0.72	138.2%	1	18	0.09	1068.4%	2	158	0.82	244.7%
<b>Totals</b>	<b>2</b>	<b>711</b>	<b>1.62</b>	<b>123.8%</b>	<b>2</b>	<b>88</b>	<b>0.20</b>	<b>986.7%</b>	<b>4</b>	<b>799</b>	<b>1.82</b>	<b>220.0%</b>

**APPENDIX – DETAILED EXPERIENCE ANALYSIS  
POST-RETIREMENT MORTALITY**

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**2011-2015 Experience**

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
50-54	-	66	0.27	0.0%	55-59	-	21	0.06	0.0%
55-59	-	463	1.99	0.0%	60-64	-	42	0.19	0.0%
60-64	5	543	3.02	165.6%	65-69	1	27	0.19	526.3%
65-69	2	581	5.70	35.1%	70-74	-	24	0.29	0.0%
70-74	11	443	7.03	156.5%	75-79	-	6	0.11	0.0%
75-79	3	281	7.87	38.1%	80-84	-	-	-	N/A
80-84	10	230	12.18	82.1%	85-89	-	4	0.20	0.0%
85-89	17	151	14.02	121.3%	90-94	-	-	-	N/A
90-94	10	60	9.58	104.4%	95-99	-	-	-	N/A
95+	2	15	3.60	55.6%	100+	-	-	-	N/A
<b>Totals</b>	<b>60</b>	<b>2,833</b>	<b>65.26</b>	<b>91.9%</b>	<b>Totals</b>	<b>1</b>	<b>124</b>	<b>1.04</b>	<b>96.2%</b>



**APPENDIX – DETAILED EXPERIENCE ANALYSIS  
POST-RETIREMENT MORTALITY**

**2011-2012 Experience**

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
50-54	-	13	0.05	0.0%	50-54	-	4	0.01	0.0%
55-59	-	110	0.47	0.0%	55-59	-	9	0.04	0.0%
60-64	-	142	0.80	0.0%	60-64	1	5	0.04	2500.0%
65-69	1	144	1.43	69.9%	65-69	-	5	0.06	0.0%
70-74	1	94	1.51	66.2%	70-74	-	-	-	N/A
75-79	2	65	1.82	109.9%	75-79	-	-	-	N/A
80-84	1	58	3.06	32.7%	80-84	-	1	0.04	0.0%
85-89	3	35	3.30	90.9%	85-89	-	-	-	N/A
90-94	1	13	2.03	49.3%	90-94	-	-	-	N/A
95+	-	2	0.44	0.0%	95+	-	-	-	N/A
<b>Totals</b>	<b>9</b>	<b>676</b>	<b>14.91</b>	<b>60.4%</b>	<b>Totals</b>	<b>1</b>	<b>24</b>	<b>0.19</b>	<b>526.3%</b>

**2012-2013 Experience**

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
50-54	-	18	0.08	0.0%	50-54	-	4	0.01	0.0%
55-59	-	118	0.51	0.0%	55-59	-	9	0.04	0.0%
60-64	2	140	0.78	256.4%	60-64	-	4	0.03	0.0%
65-69	1	145	1.43	69.9%	65-69	-	5	0.06	0.0%
70-74	4	108	1.72	232.6%	70-74	-	1	0.02	0.0%
75-79	-	68	1.94	0.0%	75-79	-	-	-	N/A
80-84	2	57	3.07	65.1%	80-84	-	1	0.05	0.0%
85-89	5	36	3.37	148.4%	85-89	-	-	-	N/A
90-94	1	15	2.33	42.9%	90-94	-	-	-	N/A
95+	-	4	0.92	0.0%	95+	-	-	-	N/A
<b>Totals</b>	<b>15</b>	<b>709</b>	<b>16.15</b>	<b>92.9%</b>	<b>Totals</b>	<b>-</b>	<b>24</b>	<b>0.21</b>	<b>0.0%</b>

**APPENDIX – DETAILED EXPERIENCE ANALYSIS  
POST-RETIREMENT MORTALITY**

**2013-2014 Experience**

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
50-54	-	19	0.08	0.0%	50-54	-	4	0.01	0.0%
55-59	-	114	0.49	0.0%	55-59	-	9	0.04	0.0%
60-64	1	134	0.74	135.1%	60-64	-	6	0.04	0.0%
65-69	-	145	1.41	0.0%	65-69	-	6	0.07	0.0%
70-74	4	119	1.88	212.8%	70-74	-	1	0.02	0.0%
75-79	1	72	2.02	49.5%	75-79	-	-	-	N/A
80-84	4	60	3.25	123.1%	80-84	-	1	0.05	0.0%
85-89	4	35	3.22	124.2%	85-89	-	-	-	N/A
90-94	6	18	2.89	207.6%	90-94	-	-	-	N/A
95+	1	5	1.21	82.6%	95+	-	-	-	N/A
<b>Totals</b>	<b>21</b>	<b>721</b>	<b>17.19</b>	<b>122.2%</b>	<b>Totals</b>	<b>-</b>	<b>27</b>	<b>0.23</b>	<b>0.0%</b>

**2014-2015 Experience**

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
50-54	-	16	0.06	0.0%	50-54	-	9	0.03	0.0%
55-59	-	121	0.52	0.0%	55-59	-	15	0.07	0.0%
60-64	2	127	0.70	285.7%	60-64	-	12	0.08	0.0%
65-69	-	147	1.43	0.0%	65-69	-	8	0.10	0.0%
70-74	2	122	1.92	104.2%	70-74	-	4	0.07	0.0%
75-79	-	76	2.09	0.0%	75-79	-	-	-	N/A
80-84	3	55	2.80	107.1%	80-84	-	1	0.06	0.0%
85-89	5	45	4.13	121.1%	85-89	-	-	-	N/A
90-94	2	14	2.33	85.8%	90-94	-	-	-	N/A
95+	1	4	1.03	97.1%	95+	-	-	-	N/A
<b>Totals</b>	<b>15</b>	<b>727</b>	<b>17.01</b>	<b>88.2%</b>	<b>Totals</b>	<b>-</b>	<b>49</b>	<b>0.41</b>	<b>0.0%</b>

**APPENDIX – DETAILED EXPERIENCE ANALYSIS  
DISABLED MORTALITY**

**2011-2015 Experience**

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
35-39	-	1	0.00	0.0%	35-39	-	-	-	N/A
45-49	-	11	0.01	0.0%	45-49	-	-	-	N/A
45-49	-	11	0.01	0.0%	45-49	-	5	0.01	0.0%
50-54	-	25	0.07	0.0%	50-54	-	8	0.02	0.0%
55-59	-	19	0.08	0.0%	55-59	-	7	0.03	0.0%
60-64	1	32	0.16	627.7%	60-64	-	7	0.04	0.0%
65-69	1	36	0.32	312.8%	65-69	-	-	-	N/A
70-74	-	17	0.24	0.0%	70-74	-	-	-	N/A
75-79	-	9	0.22	0.0%	75-79	-	-	-	N/A
80-84	1	7	0.36	281.1%	80-84	-	-	-	N/A
85-89	1	5	0.43	232.1%	85-89	-	-	-	N/A
>= 90	-	-	-	N/A	>= 90	-	-	-	N/A
<b>Totals</b>	<b>4</b>	<b>173</b>	<b>1.89</b>	<b>211.6%</b>	<b>Totals</b>	<b>-</b>	<b>27</b>	<b>0.10</b>	<b>0.0%</b>

## APPENDIX – DETAILED EXPERIENCE ANALYSIS DISABLED MORTALITY

### 2011-2012 Experience

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
35-39	-	-	-	N/A	35-39	-	-	-	N/A
45-49	-	3	0.00	0.0%	45-49	-	-	-	N/A
45-49	-	3	0.00	0.0%	45-49	-	2	0.00	0.0%
50-54	-	5	0.01	0.0%	50-54	-	1	0.00	0.0%
55-59	-	5	0.02	0.0%	55-59	-	2	0.01	0.0%
60-64	1	9	0.04	2273.2%	60-64	-	1	0.01	0.0%
65-69	-	10	0.09	0.0%	65-69	-	-	-	N/A
70-74	-	2	0.03	0.0%	70-74	-	-	-	N/A
75-79	-	2	0.04	0.0%	75-79	-	-	-	N/A
80-84	-	2	0.09	0.0%	80-84	-	-	-	N/A
85-89	-	1	0.08	0.0%	85-89	-	-	-	N/A
>= 90	-	-	-	N/A	>= 90	-	-	-	N/A
<b>Totals</b>	<b>1</b>	<b>42</b>	<b>0.40</b>	<b>247.8%</b>	<b>Totals</b>	<b>-</b>	<b>6</b>	<b>0.02</b>	<b>0.0%</b>

### 2012-2013 Experience

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
35-39	-	-	-	N/A	35-39	-	-	-	N/A
45-49	-	3	0.00	0.0%	45-49	-	-	-	N/A
45-49	-	3	0.00	0.0%	45-49	-	2	0.00	0.0%
50-54	-	5	0.01	0.0%	50-54	-	1	0.00	0.0%
55-59	-	5	0.02	0.0%	55-59	-	2	0.01	0.0%
60-64	-	7	0.03	0.0%	60-64	-	1	0.01	0.0%
65-69	1	10	0.09	1141.7%	65-69	-	-	-	N/A
70-74	-	4	0.05	0.0%	70-74	-	-	-	N/A
75-79	-	2	0.05	0.0%	75-79	-	-	-	N/A
80-84	-	2	0.10	0.0%	80-84	-	-	-	N/A
85-89	-	1	0.09	0.0%	85-89	-	-	-	N/A
>= 90	-	-	-	N/A	>= 90	-	-	-	N/A
<b>Totals</b>	<b>1</b>	<b>42</b>	<b>0.45</b>	<b>223.5%</b>	<b>Totals</b>	<b>-</b>	<b>6</b>	<b>0.02</b>	<b>0.0%</b>

## APPENDIX – DETAILED EXPERIENCE ANALYSIS DISABLED MORTALITY

### 2013-2014 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
35-39	-	-	-	N/A	35-39	-	-	-	N/A
45-49	-	3	0.00	0.0%	45-49	-	-	-	N/A
45-49	-	2	0.00	0.0%	45-49	-	-	-	N/A
50-54	-	7	0.02	0.0%	50-54	-	3	0.01	0.0%
55-59	-	5	0.02	0.0%	55-59	-	2	0.01	0.0%
60-64	-	8	0.04	0.0%	60-64	-	2	0.01	0.0%
65-69	-	7	0.06	0.0%	65-69	-	-	-	N/A
70-74	-	6	0.08	0.0%	70-74	-	-	-	N/A
75-79	-	2	0.05	0.0%	75-79	-	-	-	N/A
80-84	-	2	0.11	0.0%	80-84	-	-	-	N/A
85-89	-	1	0.10	0.0%	85-89	-	-	-	N/A
>= 90	-	-	-	N/A	>= 90	-	-	-	N/A
<b>Totals</b>	<b>-</b>	<b>43</b>	<b>0.49</b>	<b>0.0%</b>	<b>Totals</b>	<b>-</b>	<b>7</b>	<b>0.03</b>	<b>0.0%</b>

### 2014-2015 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
41-44	-	1	0.00	0.0%	41-44	-	-	-	N/A
45-49	-	2	0.00	0.0%	45-49	-	-	-	N/A
50-54	-	3	0.00	0.0%	50-54	-	1	0.00	0.0%
55-59	-	8	0.02	0.0%	55-59	-	3	0.01	0.0%
60-64	-	4	0.02	0.0%	60-64	-	1	0.00	0.0%
65-69	-	8	0.04	0.0%	65-69	-	3	0.02	0.0%
70-74	-	9	0.08	0.0%	70-74	-	-	-	N/A
75-79	-	5	0.07	0.0%	75-79	-	-	-	N/A
80-84	-	3	0.08	0.0%	80-84	-	-	-	N/A
85-89	1	1	0.06	1684.2%	85-89	-	-	-	N/A
90-94	1	2	0.17	574.4%	90-94	-	-	-	N/A
95+	-	-	-	N/A	95+	-	-	-	N/A
<b>Totals</b>	<b>2</b>	<b>46</b>	<b>0.56</b>	<b>359.7%</b>	<b>Totals</b>	<b>-</b>	<b>8</b>	<b>0.03</b>	<b>0.0%</b>

**APPENDIX – DETAILED EXPERIENCE ANALYSIS  
PRE-RETIREMENT MORTALITY**

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**2011-2015 Experience**

<b>Males</b>					<b>Females</b>				
<b>Age Group</b>	<b>Actual Deaths</b>	<b>Exposure</b>	<b>Expected Deaths</b>	<b>Actual/Expected</b>	<b>Age Group</b>	<b>Actual Deaths</b>	<b>Exposure</b>	<b>Expected Deaths</b>	<b>Actual/Expected</b>
Under 20	-	-	-	N/A	Under 20	-	-	-	N/A
20-24	-	20	0.01	0.0%	20-24	-	4	0.00	0.0%
25-29	-	225	0.08	0.0%	25-29	-	22	0.00	0.0%
30-34	-	339	0.14	0.0%	30-34	-	49	0.02	0.0%
35-39	-	551	0.37	0.0%	35-39	-	65	0.03	0.0%
40-44	-	600	0.55	0.0%	40-44	-	86	0.06	0.0%
45-49	1	527	0.69	145.7%	45-49	-	62	0.06	0.0%
50-54	-	542	0.95	0.0%	50-54	-	69	0.11	0.0%
<b>Totals</b>	<b>1</b>	<b>2,804</b>	<b>2.78</b>	<b>36.0%</b>	<b>Totals</b>	<b>-</b>	<b>357</b>	<b>0.27</b>	<b>0.0%</b>

**APPENDIX – DETAILED EXPERIENCE ANALYSIS  
PRE-RETIREMENT MORTALITY**

**2011-2012 Experience**

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
Under 20	-	-	-	N/A	Under 20	-	-	-	N/A
20-24	-	6	0.00	0.0%	20-24	-	-	-	N/A
25-29	-	54	0.02	0.0%	25-29	-	7	0.00	0.0%
30-34	-	90	0.04	0.0%	30-34	-	12	0.00	0.0%
35-39	-	151	0.10	0.0%	35-39	-	15	0.01	0.0%
40-44	-	144	0.13	0.0%	40-44	-	22	0.01	0.0%
45-49	1	129	0.17	589.8%	45-49	-	19	0.02	0.0%
50-54	-	143	0.25	0.0%	50-54	-	15	0.02	0.0%
<b>Totals</b>	<b>1</b>	<b>717</b>	<b>0.71</b>	<b>140.7%</b>	<b>Totals</b>	<b>-</b>	<b>90</b>	<b>0.07</b>	<b>0.0%</b>

**2012-2013 Experience**

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
Under 20	-	-	-	N/A	Under 20	-	-	-	N/A
20-24	-	-	-	N/A	20-24	-	-	-	N/A
25-29	-	47	0.02	0.0%	25-29	-	8	0.00	0.0%
30-34	-	82	0.03	0.0%	30-34	-	12	0.00	0.0%
35-39	-	138	0.09	0.0%	35-39	-	16	0.01	0.0%
40-44	-	148	0.13	0.0%	40-44	-	21	0.01	0.0%
45-49	-	134	0.17	0.0%	45-49	-	15	0.01	0.0%
50-54	-	132	0.23	0.0%	50-54	-	18	0.03	0.0%
<b>Totals</b>	<b>-</b>	<b>681</b>	<b>0.68</b>	<b>0.0%</b>	<b>Totals</b>	<b>-</b>	<b>90</b>	<b>0.07</b>	<b>0.0%</b>

**APPENDIX – DETAILED EXPERIENCE ANALYSIS  
PRE-RETIREMENT MORTALITY**

**2013-2014 Experience**

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
Under 20	-	-	-	N/A	Under 20	-	-	-	N/A
20-24	-	6	0.00	0.0%	20-24	-	1	0.00	0.0%
25-29	-	61	0.02	0.0%	25-29	-	4	0.00	0.0%
30-34	-	83	0.03	0.0%	30-34	-	12	0.00	0.0%
35-39	-	130	0.09	0.0%	35-39	-	19	0.01	0.0%
40-44	-	153	0.14	0.0%	40-44	-	21	0.01	0.0%
45-49	-	135	0.18	0.0%	45-49	-	14	0.01	0.0%
50-54	-	127	0.22	0.0%	50-54	-	18	0.03	0.0%
<b>Totals</b>	<b>-</b>	<b>695</b>	<b>0.68</b>	<b>0.0%</b>	<b>Totals</b>	<b>-</b>	<b>89</b>	<b>0.07</b>	<b>0.0%</b>

**2014-2015 Experience**

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
Under 20	-	-	-	N/A	Under 20	-	-	-	N/A
20-24	-	8	0.00	0.0%	20-24	-	3	0.00	0.0%
25-29	-	63	0.02	0.0%	25-29	-	3	0.00	0.0%
30-34	-	84	0.03	0.0%	30-34	-	13	0.00	0.0%
35-39	-	132	0.09	0.0%	35-39	-	15	0.01	0.0%
40-44	-	155	0.14	0.0%	40-44	-	22	0.01	0.0%
45-49	-	129	0.17	0.0%	45-49	-	14	0.01	0.0%
50-54	-	140	0.24	0.0%	50-54	-	18	0.03	0.0%
<b>Totals</b>	<b>-</b>	<b>711</b>	<b>0.70</b>	<b>0.0%</b>	<b>Totals</b>	<b>-</b>	<b>88</b>	<b>0.07</b>	<b>0.0%</b>