GRS Gabriel Roeder Smith & Company
Consultants & Actuaries

MISSOURI DEPARTMENT OF TRANSPORTATION AND HIGHWAY PATROL EMPLOYEES' RETIREMENT SYSTEM (MPERS)

5-YEAR EXPERIENCE STUDY
JULY 1, 2007 THROUGH JUNE 30, 2012

ACTUARIAL INVESTIGATION REPORT
JULY 1, 2007-JUNE 30, 2012

TABLE OF CONTENTS

Item	Pages
Cover Letter	1-2
Section A: Overview and Economic Assumptions	3-17
Section B: Summary of the Valuation Results	18
Section C: Withdrawal Experience	19-24
Section D: Disability Experience	25-27
Section E: Retirement Experience	28-37
Section F: Salary Increases	38-43
Section G: Mortality Experience	44-49
Section H: New Assumption Listing	50-56

GRS
Gabriel Roeder Smith & Company
Consultants & Actuaries
One Towne Square
Suite 800
Southfield, MI 48076-3723
248.799.9000 phone
248.799.9020 fax
www.gabrielroeder.com

February 19, 2013

The Retirement Board
Missouri Department of Transportation
and Highway Patrol Employees' Retirement System
1913 William Street
Jefferson City, Missouri 65102-1930

Ladies and Gentlemen:

Presented in this report are the results of an ***actuarial investigation of experience*** of the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS). The investigation was conducted for the purpose of updating the actuarial assumptions used in valuing MPERS actuarial liabilities and establishing employer contribution rates.

The investigation was based upon the member data furnished for annual actuarial valuations during the period ***July 1, 2007 to June 30, 2012***. We checked for internal and year-to-year consistency, but did not otherwise audit the data. We are not responsible for the accuracy or completeness of the data provided by MPERS staff.

The report presents specific recommendations with respect to non-economic assumptions and presents a range of potential choices for the economic assumptions. Non-economic activities (rates of turnover, retirement, etc.) tend to be generally stable and are subject to measurement by the actuary. Economic activities (inflation, investment return) tend to be unstable and are not really subject to direct measurement. We believe that the Board should select the economic assumptions from within ranges that the Board and the actuary deem reasonable.

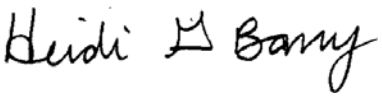
The investigation was carried out using generally accepted actuarial principles and techniques in accordance with standards of practice prescribed by the Actuarial Standards Board. We believe that the recommended actuarial assumptions that are the result of this investigation form a reasonable basis for computing future contributions and measuring funding progress for the Missouri Department of Transportation and Highway Patrol Employees' Retirement System.

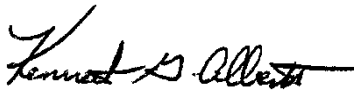
Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as: plan experience differing from that anticipated by the economic and demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. Due to the limited scope of the actuary's assignment, the actuary did not perform an analysis of the potential range of such future measurements.

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. 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.

Heidi Barry is a Member of the American Academy of Actuaries (MAAA) and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Respectfully submitted,





Heidi G. Barry, ASA, MAAA

Kenneth G. Alberts

HGB/KGA:dj

SECTION A

OVERVIEW AND ECONOMIC ASSUMPTIONS

The five-year period (July 1, 2007 to June 30, 2012) covered by this experience study provided sufficient data to form a basis for recommending changes in many of the assumptions used in the actuarial valuations of the Missouri Department of Transportation and Highway Patrol Employees' Retirement System. The recommended actuarial assumptions resulting from this experience study are summarized below:

- A spread between investment return and wage inflation between 4.25% and 4.5%. We estimated the effect with assumed wage inflation at 3.25%, 3.5% and 3.75% and assumed investment return at 7.50%, 7.75% and 8.25%.

- Non-Uniformed

Description	General Direction of Long-Term Cost Change	General Direction of Short-Term Employer Contribution Change
Increase the rates of age-based withdrawal (5 or more years of service) for males and maintain the rates for females	Lower	Lower
Increase the rates of serviced-based withdrawal (less than 5 years of service)	Lower	Higher*
Increase the rates of disability	Higher	Higher
Adjust rates of normal retirement toward experience (overall increase for males and overall offsetting changes for females)	Higher	Higher
Decrease rates of early (reduced) retirement	Lower	Lower
Decrease rates of post-retirement mortality for males; Increase for females	Higher	Higher
Decrease rates of pre-retirement mortality	Lower	Lower
Decrease the rates of age-based merit and seniority pay increases (age-based).	Lower	Lower
Decrease rates of service-based merit and seniority increases	Lower	Higher*

- Uniformed

Description	General Direction of Long-Term Cost Change	General Direction of Short-Term Employer Contribution Change
Decrease the rates of age-based withdrawal (5 or more years of service)	Higher	Higher
Decrease the rates of serviced-based withdrawal	Higher	Lower*
Maintain current rates of disability	Neutral	Neutral
Decrease rates of normal retirement	Lower	Lower
Decrease rates of post-retirement mortality for males; Increase for females	Higher	Higher
Decrease rates of pre-retirement mortality	Lower	Lower
Decrease the rates of age-based merit and seniority pay increases (age-based).	Lower	Lower
Add service-based merit and seniority increases	N/A	N/A

* *Note that the change in the short term contributions can move in a different direction then the change in the long term cost, in certain circumstances. This can happen if rates (such as rates of termination and pay) are lowered for periods early in members careers, but most of the current active members are currently past those periods.*

Results based upon the recommended demographic assumptions and the range of economic assumptions we are recommending for consideration are shown in Section B.

INTRODUCTION

Each year, as of June 30, the liabilities of the Missouri Department of Transportation and Highway Patrol Employees' Retirement 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 participants.
- Rates of **disability** among active participants.
- Patterns of **salary increases** to active participants.
- Rates of **retirement** among active participants.
- Rates of **mortality** among active participants, 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. A poor initial choice of assumptions or continued use of outdated assumptions can lead to:

- Understated costs resulting in either an inability to pay benefits when due, or sharp increases in required contributions at some point in the future;

- Overstated costs resulting in either benefit levels that are kept below the level that could be supported by the computed rate or an unnecessarily large burden on the current generation of participants, employers and taxpayers.

A single set of assumptions will not be suitable indefinitely. Conditions change, and our understanding of conditions (whether or not they are changing) also changes.

In recognition of this, Missouri statutes require that assumptions used to value the liabilities of the Missouri Department of Transportation and Highway Patrol Employees' Retirement System be studied in-depth every five years. The package of assumptions is then adjusted to reflect basic experience trends -- but not random year-to-year fluctuations. Actuarial assumptions were last revised following the June 30, 2009 regular actuarial valuation.

SUMMARY OF DECREMENT ASSUMPTIONS

Background: In general, recent patterns of non-economic activity (rates of withdrawal, disability, death, retirement, and merit and seniority pay increases) tend to be reliable predictors of future experience. However, past activity will also contain anomalies (or special circumstances) that cannot be assumed to replicate in the future. The actuary attempts to identify and remove these anomalies before creating recommended rates. The goal is to identify long-term trends in activity and move the rates toward those trends as a result of the periodic investigations. In establishing our recommendations, we have considered the results of the prior study, as well as the observed trends from this study.

Experience was studied separately for Uniformed members and Non-Uniformed members. For the Non-Uniformed members, the experience was further broken down between male and female members. Male and female experience was studied in aggregate for the Uniformed group since it is over 95% male.

Our first step was to look at liability gains and losses over the measurement period. The table below suggests that the current set of assumptions has generated small liability gains over all during the measurement period. Therefore we should expect that recommended demographic changes will be small and generally in the direction of lowering long-term costs.

Liability Gain/(Loss) for Year	Non-Uniform	Uniform	Total	Percent of Beginning of Year Liability
2011/2012	$ 53,916,881	$ 7,972,662	$ 61,889,543	1.9%
2010/2011	79,999,087	15,016,173	95,015,260	2.9%
2009/2010	15,222,020	5,917,167	21,139,187	0.7%
2008/2009	(3,694,456)	7,930,782	4,236,326	0.1%
2007/2008	(11,130,449)	(19,840,263)	(30,970,712)	-1.1%
Total	$134,313,083	$ 16,996,521	$ 151,309,604	

Rates of Withdrawals: Withdrawals from service were studied separately for members with less than five years of service and members with five or more years of service. Actuarial experience was below expectations for Uniformed members and above expectations for Non-Uniformed members. The rates were adjusted to more closely track experience.

SUMMARY OF DECREMENT ASSUMPTIONS (CONCLUDED)

Disability: Observed rates of disability are slightly lower than assumed for Uniformed members and above expectations for Non-Uniformed members. We do not recommend a change in the rates for Uniformed members. The recommended rates were increased for Non-Uniformed members to more closely track experience.

Normal Retirement: Actuarial experience was below expectations for Uniformed members and Non-Uniformed females and above expectations for Non-Uniformed males. Rates were adjusted accordingly to more closely track experience.

Early Retirement: Experience indicated fewer early retirements than assumed. The recommended rates were adjusted accordingly.

Mortality: Retired life mortality was lower than assumed for males and higher than assumed for females. Observed mortality for MPERS was substantially different during this experience study than the previous experience study. This, compared with the size of the study group, called into question the credibility of the data. We believe that it is unlikely that MPERS post retirement mortality experience would differ significantly from MOSERS. Since MOSERS recently completed a study, we are recommending the use of the base table (rates before setbacks) that was adopted as a result of the MOSERS experience study. We have recommended different setbacks to recognize the minor differences in MPERS pre-retirement job conditions, compared with MOSERS and to give a small amount of credibility to MPERS observed mortality.

Pay Increase Rate (Merit and Longevity Portion) was analyzed to see if the correlation with service was stronger than the correlation with age. For Uniformed members, a service based assumption for the first two years of service has been added. Age based rates were adjusted for experience. For Non-Uniformed members, we continue to associate assumed pay increases with both age and service. The recommended rates were adjusted downward for experience for Uniformed and Non-Uniformed members.

Complete listings of all assumptions begin on page 51.

SUMMARY OF DECREMENT EXPERIENCE

Decrement Risk Area	Actual	Expected	
		Present	Proposed
Withdrawal - Total			
Uniform	83	104	95
Non-Uniform			
Male	1,383	1,176	1,267
Female	532	401	421
Withdrawal - Service 5 & Up			
Uniform	50	60	54
Non-Uniform			
Male	536	400	465
Female	276	191	191
Disability			
Uniform	3	4	4
Non-Uniform			
Male	84	76	82
Female	36	34	38
Normal Retirement			
Uniform	108	131	119
Non-Uniform			
Male	874	833	856
Female	247	265	265
Early Retirement			
Non-Uniform			
Male	65	93	81
Female	28	37	34
Mortality - Retired Lives			
Healthy Lives			
Male	626	786	644
Female	53	43	47
Mortality - Active Lives			
Male	21	40	28
Female	2	5	4
Mortality - Disabled Lives			
Male	13	26	26
Female	4	6	6

DATA RECONCILIATION

Uniformed Members

Valuation Year	Active Members Beginning of Year	Retired	Disabled	Died	Vested Terminated	Non-Vested Terminated	New	Active Members End of Year
2008	1,054	17	0	0	4	7	44	1,070
2009	1,070	26	0	1	9	5	54	1,083
2010	1,083	15	0	1	7	6	51	1,105
2011	1,105	22	1	1	3	12	147	1,213
2012	1,213	28	2	0	6	24	62	1,215
2013	1,215							
5-year	1,054	108	3	3	29	54	358	1,215
Expected		131	4	4	60	44		

Non-Uniformed Members

Valuation Year	Active Members Beginning of Year	Retired	Disabled	Died	Vested Terminated	Non-Vested Terminated	New	Active Members End of Year
2008	7,586	230	21	3	150	272	619	7,529
2009	7,529	225	15	2	103	205	722	7,701
2010	7,701	204	22	8	93	334	312	7,352
2011	7,352	235	34	7	108	153	203	7,018
2012	7,018	320	28	0	247	250	70	6,243
2013	6,243							
5-year	7,586	1,214	120	20	701	1,214	1,926	6,243
Expected		1,228	110	41	591	986		

ECONOMIC ASSUMPTIONS

Economic assumptions include **long-term rates of investment return** (net after expenses) and **wage inflation** (the across-the-board portion of salary increases). Technically, ASOP 27 considers all pay increases to be economic. However, for convenience, we treat the portion of pay increases related to merit and longevity as demographic. Unlike demographic activities, economic activities do not lend themselves to analysis solely on the basis of internal historical patterns because returns are more affected by external forces; namely inflation and general productivity changes which defy accurate long-term prediction. Estimates of economic activities are generally selected on the basis of the expectations in an inflation-free environment and then both are increased by some provision for long-term inflation.

If inflation and/or productivity increases are higher than expected, it will probably result in both actual rates of salary increases and investment return which exceed the assumed rates. Salaries increasing faster than expected produce unexpected liabilities. Investment return exceeding the assumed rates (whether due to manager performance, change in the mix of assets, or general market conditions) results in unanticipated assets. To the extent that inflation, productivity, and other factors have about the same effect on both sides of the balance sheet, these additional assets and liabilities can offset one another over the long-term for a well funded plan.

The present experience period includes investment results that are most unusual by long-term standards. While information from the present experience period may be considered in developing new assumptions, long-term historical patterns must necessarily play a much larger role.

Price Inflation. Economic assumptions are based on a building block process that begins with Price Inflation. The best estimate range for Price Inflation is developed using historical data and future expectations. CPI-U averaged over 3.7% during the last 60 years. However, as the table on the next page shows, inflation has steadily come down over more recent periods. Currently, there are two thoughts regarding future inflation that are predominant in the industry. The first thought is that inflation has been steadily decreasing and that a return to the high inflation rates of the late 1970's is unlikely. The second thought is that the federal spending that has occurred since the downturn in 2008/2009 will eventually cause higher rates of inflation than the country is currently experiencing. The 2012 Annual Report for the Trustees of the Social Security Administration assumes an average CPI increase of 2.8% over the next 75 years. The current valuation price inflation assumption is 3.25%. We therefore believe that a reasonable range for price inflation is between 2.5% and 3.5%. We have shown cost estimates based on 2.75%, 3.00% and the current 3.25% price inflation.

Wage inflation. The long-term rate of increase in National Average Earnings over the last 60 years has been 4.6%, which is higher than the current MPERS wage inflation assumption of 3.75%. However, over the short term, the increase in national average earnings has been lower. The table below shows the increase in national average earnings for different periods ending in 2012.

Length of Period Ending in 2012	Increase in Consumers' Price Index	Increase in National Average Earnings	Real Wage Growth (Earnings Growth above CPI)
60 years	3.7%	4.6%	0.9%
30 years	2.9%	3.8%	0.9%
20 years	2.4%	3.4%	1.0%
10 years	2.4%	3.0%	0.6%
5 years	1.8%	2.0%	0.2%

The creation of a wage inflation assumption starts with a price inflation assumption and then adds additional growth for real wage growth. Over the measurement period (last 5 years) real wage growth has been historically low (0.2%). Over longer periods (as shown above), the average real wage growth experience in the national average earnings has been between 0.5% and 1.0%. Based on this information and a 2.5% to 3.5% range for price inflation, we believe a reasonable range for the rate of wage inflation is 3.0% to 4.5%. We have therefore shown cost estimates based on 3.25%, 3.50% and 3.75% (the current wage inflation assumption).

ECONOMIC ASSUMPTIONS

Investment Return. Actuaries are required to comply with Actuarial Standard of Practice No. 27 (ASOP 27) in setting economic assumptions for retirement plans, including the assumed investment return rate.

In a public retirement system like MPERS, it is ultimately the Retirement Board's responsibility, as fiduciaries, to set the actuarial assumptions used in the actuarial valuations. It is the actuary's duty to provide the Board with information needed to make those decisions, and to make recommendations to the Board. Although the Board is the ultimate decision-making body, we are still bound by ASOP 27 in providing advice or recommendations to the Board.

The standard requires the actuary to identify the components of each assumption, to evaluate relevant data, and to set a best-estimate range. Then the actuary selects a point within this best-estimate range. Alternatively, the actuary may simply set the assumption without specifying a best-estimate range. All economic assumptions are required to be consistent with one another.

The best-estimate range is "the narrowest range within which the actuary reasonably anticipates that the actual results, compounded over the measurement period, are more likely than not to fall." For example, if the best-estimate range for the investment return assumption is from 5% to 9%, we must believe that just over half the time the actual rate of return in the future will be within this range.

Real Return. The allocation of assets within the universe of investment options will significantly impact the overall performance. Therefore, it is meaningful to identify the range of expected returns based on the fund's targeted allocation of investments and an overall set of capital market assumptions.

The allocation of assets within the universe of investment options will significantly impact the average performance of the fund. When considering the investment return assumption, the range of expected returns based on the target allocation of assets among various classes is important to consider. Below is a table with the Systems' estimated current target asset class weighting.

Investment Asset Allocation
as of December 31, 2012

Asset Class	Target Weight
Global Equity	30.0%
Fixed Income	25.0%
Private Equity	15.0%
Hedge Funds	15.0%
Real Estate	10.0%
Real Assets	5.0%
Total	100.0%

Because GRS is a benefits consulting firm and does not provide investment advice, we reviewed capital market assumptions developed and published by eight independent investment consulting firms.

These investment consulting firms periodically issue reports that describe their capital market assumptions, that is, their estimates of expected returns, volatility, and correlations. While these assumptions are developed based upon historical analysis, many of these firms also incorporate forward looking adjustments to better reflect near-term expectations. The estimates for core investments (i.e., fixed income, equities, and real estate) are generally based on anticipated returns produced by passive index funds.

Given the plan's current target asset allocation and the capital market assumptions from the investment consultants, the table below provides the 25th, 50th, and 75th percentiles of the 20-year geometric average of the expected nominal return, net of expenses, as well as the probability of exceeding the current 8.25% assumption and alternate assumptions of 7.75% and 7.5%.

Investment Consultant	Investment Consultant Expected Nominal Return	Investment Consultant Inflation Assumption	Expected Real Return (2)–(3)	Actuary Inflation Assumption	Expected Nominal Return (4)+(5)	Plan Incurred Expense Assumption	Expected Nominal Return Net of Expenses (6)-(7)	Standard Deviation of Expected Return (1-Year)
1	6.85%	2.50%	4.35%	3.00%	7.35%	0.00%	7.35%	11.60%
2	7.36%	3.00%	4.36%	3.00%	7.36%	0.00%	7.36%	10.70%
3	7.88%	3.26%	4.62%	3.00%	7.62%	0.00%	7.62%	13.70%
4	7.06%	2.40%	4.66%	3.00%	7.66%	0.00%	7.66%	9.10%
5	7.38%	2.50%	4.88%	3.00%	7.88%	0.00%	7.88%	10.70%
6	7.65%	2.50%	5.15%	3.00%	8.15%	0.00%	8.15%	14.40%
7	7.88%	2.50%	5.38%	3.00%	8.38%	0.00%	8.38%	11.70%
8	7.94%	2.16%	5.78%	3.00%	8.78%	0.00%	8.78%	10.70%
Average	**7.50%**	**2.60%**	**4.90%**	**3.00%**	**7.90%**	**0.00%**	**7.90%**	**11.58%**

3.0% Price Inflation

Investment Consultant	Distribution of 20-Year Average Geometric Net Nominal Return			Probability of Exceeding		
	25th	50th	75th	8.25%	7.75%	7.50%
1	4.98%	6.70%	8.46%	27.6%	34.3%	37.9%
2	5.22%	6.81%	8.43%	27.4%	34.7%	38.6%
3	4.72%	6.74%	8.80%	31.0%	37.0%	40.1%
4	5.92%	7.27%	8.64%	31.5%	40.7%	45.5%
5	5.75%	7.34%	8.95%	35.1%	43.1%	47.3%
6	5.05%	7.17%	9.34%	36.8%	42.8%	45.9%
7	6.01%	7.74%	9.50%	42.2%	49.9%	53.7%
8	6.66%	8.24%	9.86%	49.9%	58.3%	62.4%
Average	**5.54%**	**7.25%**	**9.00%**	**35.2%**	**42.6%**	**46.4%**

As the analysis shows, with a 3.0% price inflation assumption, there is a 50% likelihood that the 20-year average net nominal return will be between 5.54% and 9.00%. This becomes the best-estimate range under ASOP 27. The average results of all eight firms indicate there is about a 35%, 43% and 46% chance that the plan will produce an average return that exceeds 8.25%, 7.75% and 7.5%, respectively, over the next 20 years.

The current investment assumption is 8.25%. Based on our capital market assumption model the Retirement System has a 35% chance of meeting or exceeding 8.25% over a 20-year period. We recommend lowering to an assumption that is closer to the 50th percentile.

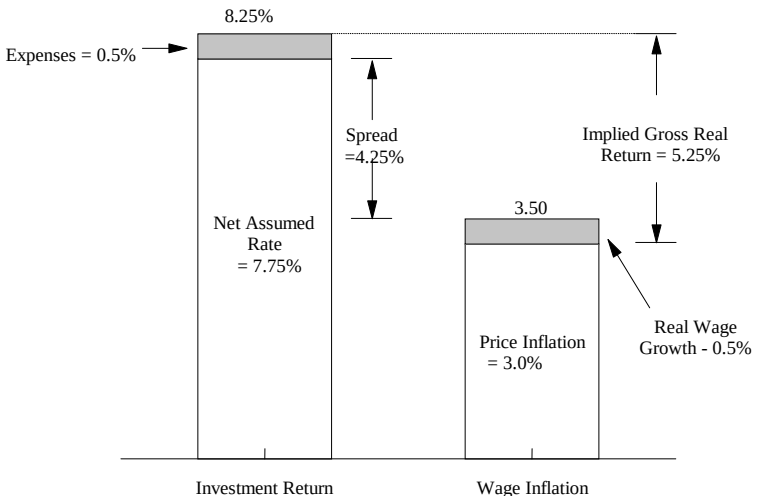
In summary, our recommended range of economic assumptions for the System are as follows:

	Current	Alternates		
		(1)	(2)	(3)
Investment Return	8.25%	7.75%	7.75%	7.50%
Price Inflation	3.25%	3.00%	2.75%	2.75%
Spread (over Price)	5.00%	4.75%	5.00%	4.75%
Wage Inflation	3.75%	3.50%	3.25%	3.25%
Spread (over Wage)	4.50%	4.25%	4.50%	4.25%
Real Wage Growth	0.50%	0.50%	0.50%	0.50%

We recommend Alternate 1. Valuation results, incorporating the proposed demographic assumptions with current and alternate economic assumptions are shown in Section B.

Resulting Spread. The combination of 7.75% assumed return and 3.50% assumed rate of payroll growth results in an assumed "spread" of 4.25% (7.75% - 3.50% = 4.25%). Spreads for balanced portfolios have actually averaged more than 5.0% over the last 30 years (please see page 16). However, there were several periods during that time where the spread was actually negative. We therefore believe that a reasonable range for the assumed spread is between 3.0% and 5.5%. However, given MPERS funded status, we do not recommend the higher end of this range for MPERS.

The relationship between economic assumptions based on a 4.25% spread is illustrated below. We suggest that the investment consultant be asked for advice before the Board makes its final decision on economic assumptions.



Investment Return and Inflation: Past and Future

Inflation Distortions

Inflation's impact on investment return is not uniform from year to year. A common expectation for Real Investment Return (the portion of Total Return remaining after Price Inflation) is in the area of 3.0% to 5.5% annually.

Over the last 30 years, Real Return exceeded that range on average. However, for parts of the period it was actually negative. It is very difficult to maintain a long-term portfolio allocation during periods of negative real return.

Annual Investment Return (including Income) expressed as REAL RETURN (Remainder after Price Inflation)

No. Years Ended December	Inflation (CPI)	Cash Equiv. (T Bills)	Bonds (Long Term) US Treasury	Bonds (Long Term) Corporate (Sol. Bro.)	Stocks (S & P 500)	Real Return for Sample Fund A	Real Return for Sample Fund B	Real Return for Sample Fund C
1/2007	4.1	0.6	5.6	(1.4)	1.3	1.7	1.5	1.2
1/2008	0.1	1.5	25.8	8.7	(37.1)	(0.6)	(11.5)	(20.1)
1/2009	2.7	(2.5)	(17.1)	0.3	23.2	1.7	8.0	13.1
1/2010	1.5	(1.4)	8.5	10.7	13.4	9.7	10.4	11.0
1/2011	3.0	(2.9)	24.5	14.6	(0.9)	11.2	7.1	3.8
5/1980	9.2	(1.3)	(6.9)	(6.2)	4.3	(2.6)	(0.4)	1.3
5/1985	4.8	5.2	11.5	12.3	9.4	10.7	10.2	9.8
5/1990	4.1	2.6	6.4	6.1	8.6	6.7	7.2	7.6
5/1995	2.8	1.5	10.0	9.1	13.4	10.0	10.8	11.3
5/2000	2.5	2.6	4.9	3.2	15.4	7.7	10.0	11.7
5/2005	2.5	(0.4)	5.1	6.6	(2.0)	3.4	2.0	0.7
5/2010	2.2	0.0	3.3	3.6	0.1	3.1	2.6	2.0
5/2011	2.3	(1.0)	8.2	6.4	(2.5)	4.6	2.7	1.1
30/2012	**2.9**	**1.4**	**7.0**	**6.9**	**7.9**	**7.1**	**7.4**	**7.5**

Sample Funds (only three of many reasonable samples)

	A	B	C
Cash: T-Bills	10 %	10 %	10 %
Bonds: US	30	20	10
Bonds: Corp	30	20	15
Stock	30	50	65

For many pension plans, Benefit Increases after Retirement have fallen short of keeping up with inflation. The retired life group has been hurt more than the active life group. The investment return necessary for the indexing of benefits after retirement probably cannot be realized during a period of high inflation.

Changes in Economic Assumptions within an Economic Environment of Inflation

There is powerful motivation to increase the assumed Investment Return used in actuarial calculations, with or without a related increase in Employee Pay Base, because such an assumption change decreases computed contributions. A contribution rate decrease (i) offers relief for employer budget problems and/or (ii) offers a "no cost" way to provide benefit increases.

The wisdom of Investment Return assumed for the future can be determined only by future events. Will the investment record of the next 30 years be the same as the last 30 Years? Will it be like the 5-year period ended in 1980? Better? Worse? What will happen when "Baby Boomers" swell the retired population?

Load[#] for unused sick leave: Currently Normal and Early retirement benefits for Closed and Year 2000 Plans are increased by 3.0% for Uniformed members and 2.6% for Non-Uniformed members to account for the inclusion of unused sick leave in the calculation of Average Pay. The table below is based on the members who have retired over the last 5 years:

Member Group	Number	Average Service	Average Unused Sick Leave*	Ratio
Uniformed	119	31.7 yrs.	0.96 yrs.	3.04%
MoDOT	1,216	25.8 yrs.	0.62 yrs.	2.41%
Civilian Patrol	207	24.0 yrs.	0.54 yrs.	2.24%

** Based on crediting 1 month of service for every 168 hours of unused sick leave.*

This review supports continued use of the current loads for Non-Uniformed and Uniformed members of the Closed and Year 2000 Plans at the current assumption (2.6% for Non-Uniformed members and 3% for Uniformed members). Year 2011 Tier Normal and Early retirement benefits are increased by 1.5% for Uniformed members and 1.0% for Non-Uniformed members to account for the inclusion of unused sick leave in the calculation of Average Pay. We recommend that the loads be continued until sufficient experience emerges to study this group in detail.

Optional forms of payment: Reduction factors for the Y2k plan are codified in the statute. Factors for the closed plan are adopted by the Board. We reviewed these factors and find them to be actuarially equivalent within reasonable tolerances, based on the current economic assumptions. These factors will get reviewed one final time after the Board formally adopts a new set of economic assumptions and a load may be added, if warranted. Such a load is not expected to be greater than 1% -2% for the alternate economic assumptions included in this study.

Load[#] for end of career increases in compensation: There is currently no load for this activity. In past experience studies, it was determined that this activity does not occur with any frequency that would merit modeling in the valuation.

 # For valuation purposes, a load is a factor that is used to increase liabilities and/or normal cost to account for activity that is not otherwise directly modeled.

SECTION B

SUMMARY OF THE VALUATION RESULTS

SUMMARY OF VALUATION RESULTS

The table below describes hypothetical valuation results at June 30, 2012 with new and old decrement assumptions with indicated spreads. The rate changes are illustrative only since contribution rates have already been set based upon the actual June 30, 2012 valuation results.

	Present Decrement and Present Economic Assumptions	Proposed Decrement Assumptions and			
		Present Economic	Economic Alt. 1	Economic Alt. 2	Economic Alt. 3
Economic Assumptions					
Investment Return	8.25 %	8.25 %	7.75 %	7.75 %	7.50 %
Wage Inflation	3.75 %	3.75 %	3.50 %	3.25 %	3.25 %
Spread on Wages	4.50 %	4.50 %	4.25 %	4.50 %	4.25 %
Price Inflation	3.25 %	3.25 %	3.00 %	2.75 %	2.75 %
COLA	2.60 %	2.60 %	2.40 %	2.20 %	2.20 %
Non-Uniformed Group Contributions for					
Normal Cost	11.07 %	10.56 %	11.48 %	10.98 %	11.72 %
Unfunded Actuarial Accrued Liability	41.75 %	43.64 %	45.78 %	44.97 %	46.47 %
Disability Insurance	0.53 %	0.53 %	0.53 %	0.53 %	0.53 %
Administrative Expenses	0.90 %	0.90 %	0.90 %	0.90 %	0.90 %
Total Computed Employer Contribution	**54.25 %**	**55.63 %**	**58.69 %**	**57.38 %**	**59.62 %**
Uniformed Group Contributions for					
Normal Cost	17.34 %	15.93 %	17.44 %	16.67 %	17.85 %
Unfunded Actuarial Accrued Liability	36.46 %	38.34 %	41.73 %	41.34 %	43.29 %
Disability Insurance	0.53 %	0.53 %	0.53 %	0.53 %	0.53 %
Administrative Expenses	0.90 %	0.90 %	0.90 %	0.90 %	0.90 %
Total Computed Employer Contribution	**55.23 %**	**55.70 %**	**60.60 %**	**59.44 %**	**62.57 %**
MPERS Funded Status	**46.3 %**	**45.5 %**	**43.7 %**	**44.4 %**	**43.2 %**
MPERS Combined Employer Contribution Rate	**54.44 %**	**55.64 %**	**59.12 %**	**57.84 %**	**60.26 %**
Projected Dollar Contributions	**184,188,191**	**188,141,844**	**199,569,980**	**194,915,741**	**203,152,356**

New assumptions will be first used in the June 30, 2013 actuarial valuations, at which time experience gains or losses incurred during 2012/2013 will also be recognized. Consequently, no rate changes are recommended at this time.

SECTION C

WITHDRAWAL EXPERIENCE

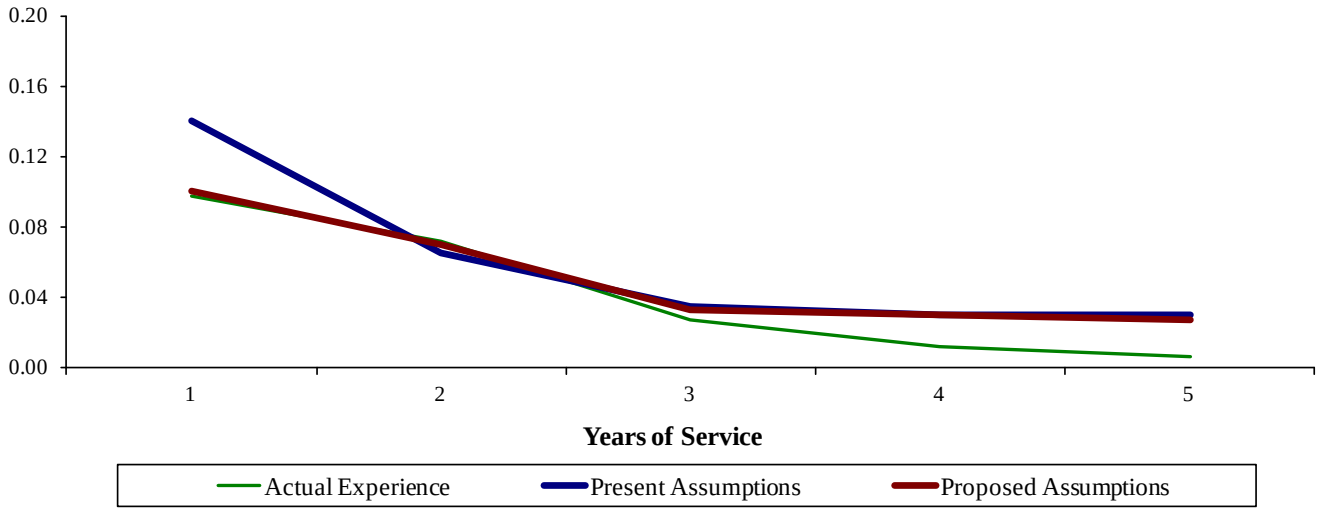
UNIFORMED MEMBERS
SERVICE-BASED WITHDRAWAL EXPERIENCE

There were 33 withdrawals and 841 years of exposure included in the service-based withdrawal investigation. Withdrawals are separations from active member status for a reason other than disability, death, or retirement.

WITHDRAWALS WITH LESS THAN 5 YEARS OF SERVICE

Years of Service	Life Years Exposure	Number of Withdrawals			Withdrawal Rates		
		Actual Experience	Expected			Expected	
			Present	Proposed	Actual	Present	Proposed
1	92	9	13	9	0.0978	0.1400	0.1000
2	224	16	15	16	0.0714	0.0650	0.0700
3	185	5	6	6	0.0270	0.0350	0.0325
4	170	2	5	5	0.0118	0.0300	0.0300
5	170	1	5	5	0.0059	0.0300	0.0275
Totals	841	33	44	41	0.0392	0.0523	0.0488

RATES OF WITHDRAWALS WITH LESS THAN 5 YEARS OF SERVICE



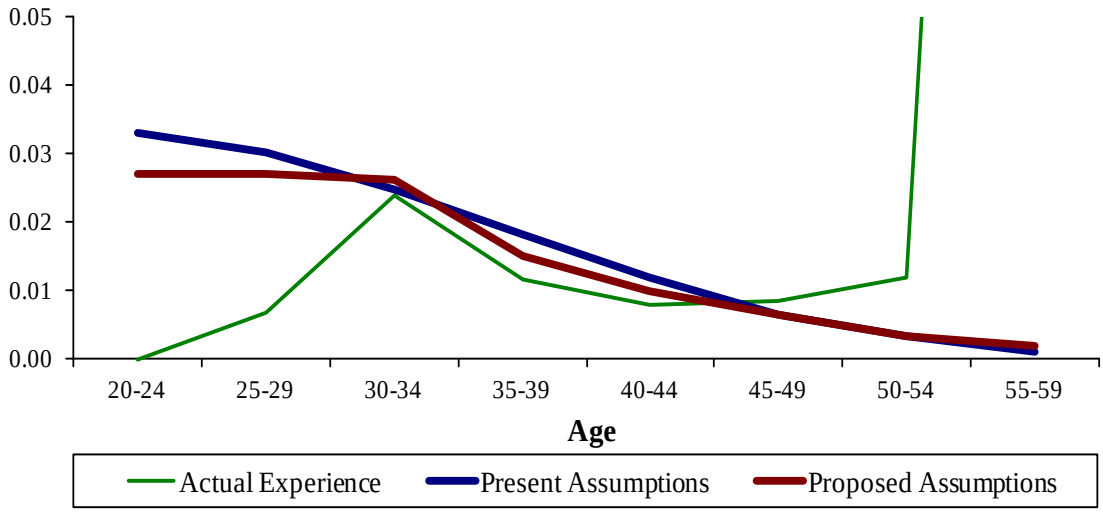
UNIFORMED MEMBERS
AGE-BASED WITHDRAWAL EXPERIENCE

There were 50 withdrawals and 4,183 years of exposure included in the age-based withdrawal investigation. Withdrawals are separations from active member status for a reason other than disability, death, or retirement. The analysis warranted a decrease in rates over the current table.

WITHDRAWALS WITH 5 OR MORE YEARS OF SERVICE

Age	Life Years Exposure	Number of Withdrawals			Withdrawal Rates		
		Actual Experience	Expected			Expected	
			Present	Proposed	Actual	Present	Proposed
20-24	1	-	-	-	0.0000	0.0330	0.0270
25-29	148	1	4	4	0.0068	0.0303	0.0270
30-34	629	15	15	16	0.0238	0.0248	0.0261
35-39	1,110	13	20	17	0.0117	0.0182	0.0152
40-44	1,149	9	14	11	0.0078	0.0121	0.0098
45-49	813	7	6	5	0.0086	0.0066	0.0065
50-54	331	4	1	1	0.0121	0.0033	0.0033
55-59	3	1	-	-	0.3333	0.0011	0.0019
Totals	4,183	50	60	54	0.0120	0.0143	0.0129

RATES OF WITHDRAWALS WITH 5 OR MORE YEARS OF SERVICE



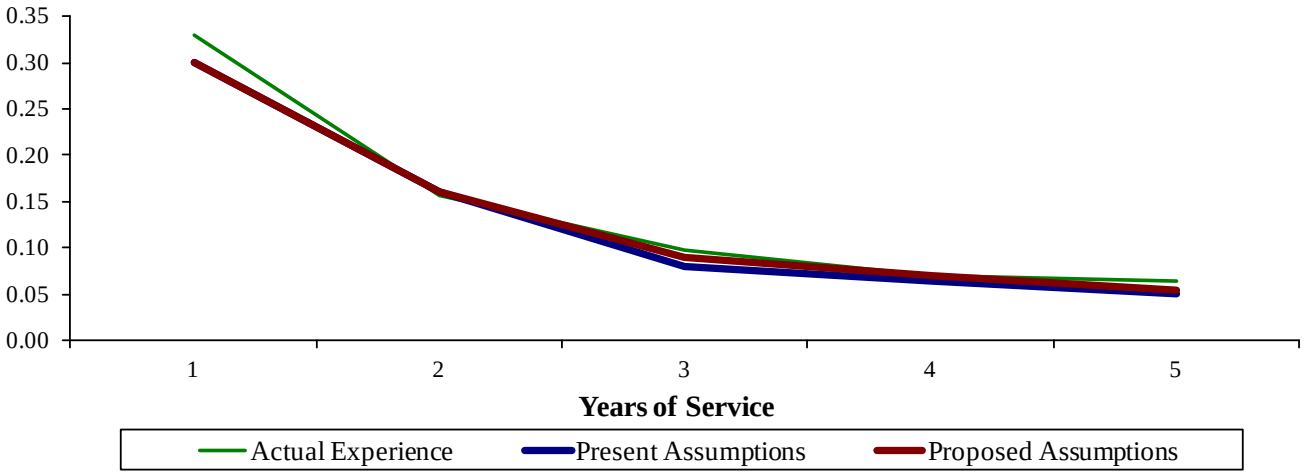
NON-UNIFORMED MALES
SERVICE-BASED WITHDRAWAL EXPERIENCE

There were 847 withdrawals and 6,305 years of exposure included in the male service-based withdrawal investigation. Withdrawals are separations from active member status for a reason other than disability, death, or retirement.

WITHDRAWALS WITH LESS THAN 5 YEARS OF SERVICE

Years of Service	Life Years Exposure	Number of Withdrawals			Withdrawal Rates		
		Actual Experience	Expected			Expected	
			Present	Proposed	Actual	Present	Proposed
1	958	315	287	287	0.3288	0.3000	0.3000
2	1,481	232	237	237	0.1567	0.1600	0.1600
3	1,297	127	104	117	0.0979	0.0800	0.0900
4	1,324	94	86	93	0.0710	0.0650	0.0700
5	1,245	79	62	68	0.0635	0.0500	0.0550
Totals	6,305	847	776	802	0.1343	0.1231	0.1272

RATES OF WITHDRAWALS WITH LESS THAN 5 YEARS OF SERVICE



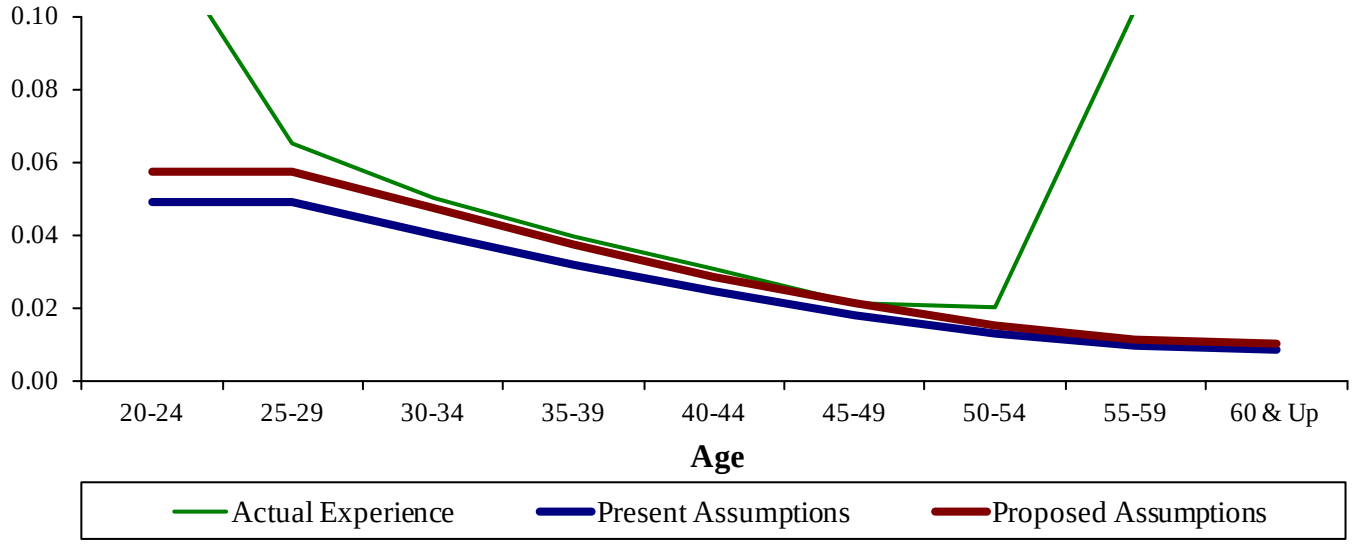
NON-UNIFORMED MALES
AGE-BASED WITHDRAWAL EXPERIENCE

There were 536 withdrawals and 16,419 years of exposure included in the male age-based withdrawal investigation. Withdrawals are separations from active member status for a reason other than disability, death, or retirement.

WITHDRAWALS WITH 5 OR MORE YEARS OF SERVICE

Age	Life Years Exposure	Number of Withdrawals			Withdrawal Rates		
		Actual Experience	Expected			Expected	
			Present	Proposed	Actual	Present	Proposed
20-24	8	1	-	-	0.1250	0.0493	0.0575
25-29	675	44	32	37	0.0652	0.0493	0.0575
30-34	1,922	96	77	90	0.0499	0.0404	0.0472
35-39	2,588	103	83	96	0.0398	0.0321	0.0375
40-44	3,301	101	81	94	0.0306	0.0246	0.0287
45-49	4,389	93	80	93	0.0212	0.0182	0.0213
50-54	3,270	66	44	52	0.0202	0.0133	0.0155
55-59	236	24	3	3	0.1017	0.0100	0.0116
60 & Up	30	8	-	-	0.2667	0.0086	0.0101
Totals	16,419	536	400	465	0.0326	0.0244	0.0283

RATES OF WITHDRAWALS WITH 5 OR MORE YEARS OF SERVICE



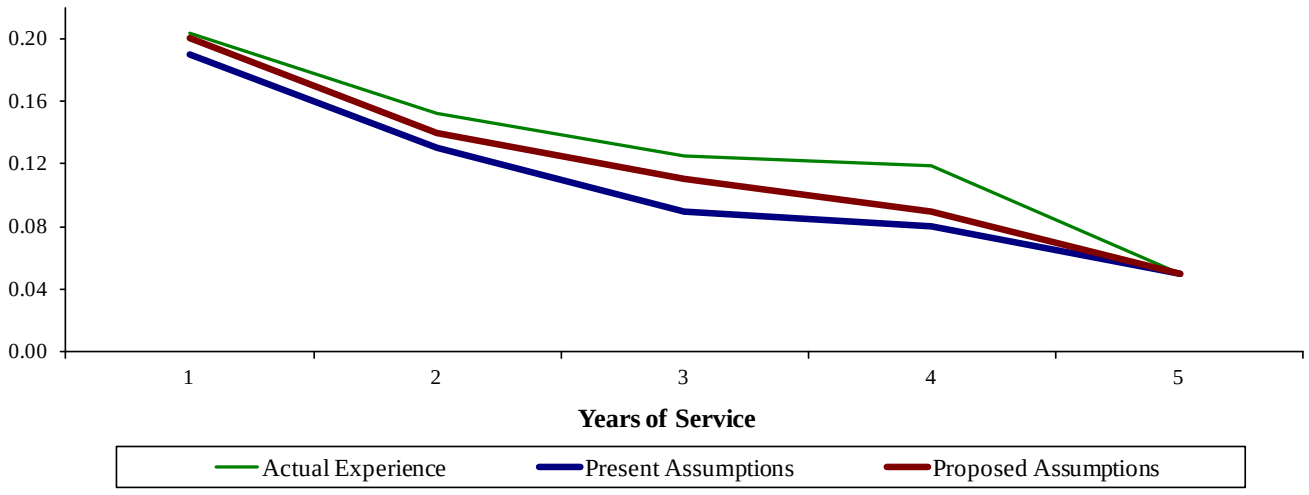
NON-UNIFORMED FEMALES
SERVICE-BASED WITHDRAWAL EXPERIENCE

There were 256 withdrawals and 2,035 years of exposure included in the female service-based withdrawal investigation. Withdrawals are separations from active member status for a reason other than disability, death, or retirement.

WITHDRAWALS WITH LESS THAN 5 YEARS OF SERVICE

Years of Service	Life Years Exposure	Number of Withdrawals			Withdrawal Rates		
		Actual Experience	Expected			Expected	
			Present	Proposed	Actual	Present	Proposed
1	261	53	50	52	0.2031	0.1900	0.2000
2	506	77	66	71	0.1522	0.1300	0.1400
3	440	55	40	48	0.1250	0.0900	0.1100
4	429	51	34	39	0.1189	0.0800	0.0900
5	399	20	20	20	0.0501	0.0500	0.0500
Totals	2,035	256	210	230	0.1258	0.1032	0.1130

RATES OF WITHDRAWALS WITH LESS THAN 5 YEARS OF SERVICE



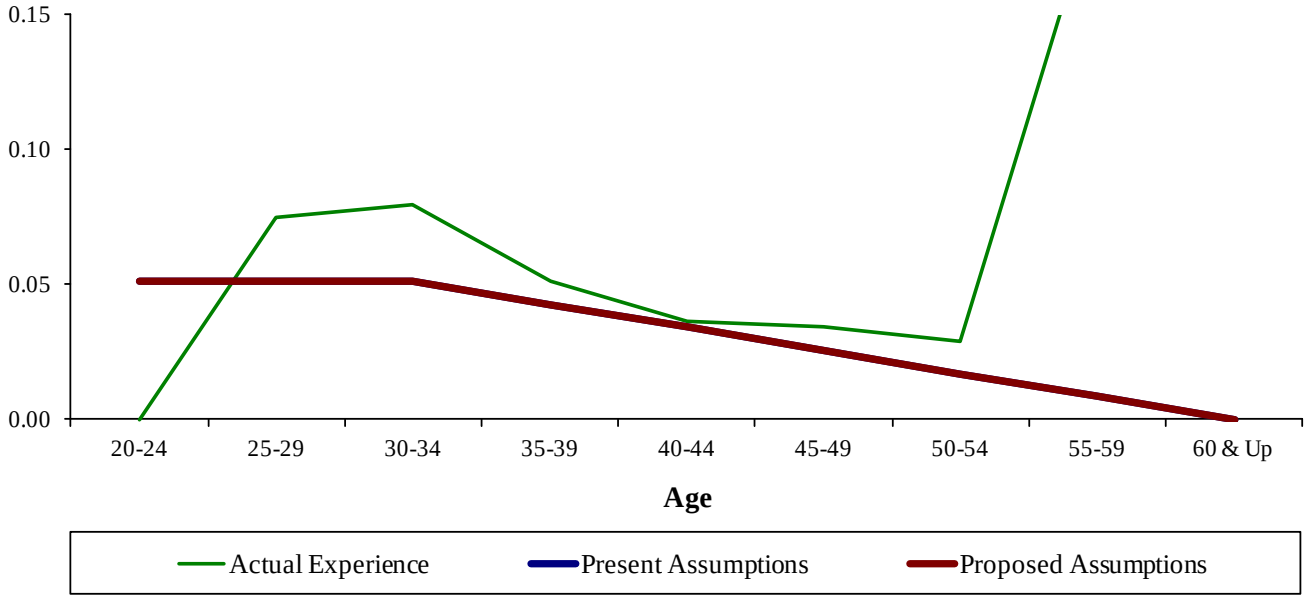
NON-UNIFORMED FEMALES
AGE-BASED WITHDRAWAL EXPERIENCE

There were 276 withdrawals and 6,071 years of exposure included in the female age-based withdrawal investigation. Withdrawals are separations from active member status for a reason other than disability, death, or retirement.

WITHDRAWALS WITH 5 OR MORE YEARS OF SERVICE

Age	Life Years Exposure	Number of Withdrawals			Withdrawal Rates		
		Actual Experience	Expected			Expected	
			Present	Proposed	Actual	Present	Proposed
20-24	4	-	-	-	0.0000	0.0510	0.0510
25-29	214	16	11	11	0.0748	0.0510	0.0510
30-34	641	51	32	32	0.0796	0.0510	0.0510
35-39	951	49	40	40	0.0515	0.0425	0.0425
40-44	1,341	49	45	45	0.0365	0.0340	0.0340
45-49	1,617	56	41	41	0.0346	0.0255	0.0255
50-54	1,216	35	21	21	0.0288	0.0170	0.0170
55-59	87	17	1	1	0.1954	0.0085	0.0085
60 & Up	4	3	-	-	0.7500	0.0000	0.0000
Totals	6,071	276	191	191	0.0455	0.0315	0.0315

RATES OF WITHDRAWALS WITH 5 OR MORE YEARS OF SERVICE



SECTION D

DISABILITY EXPERIENCE

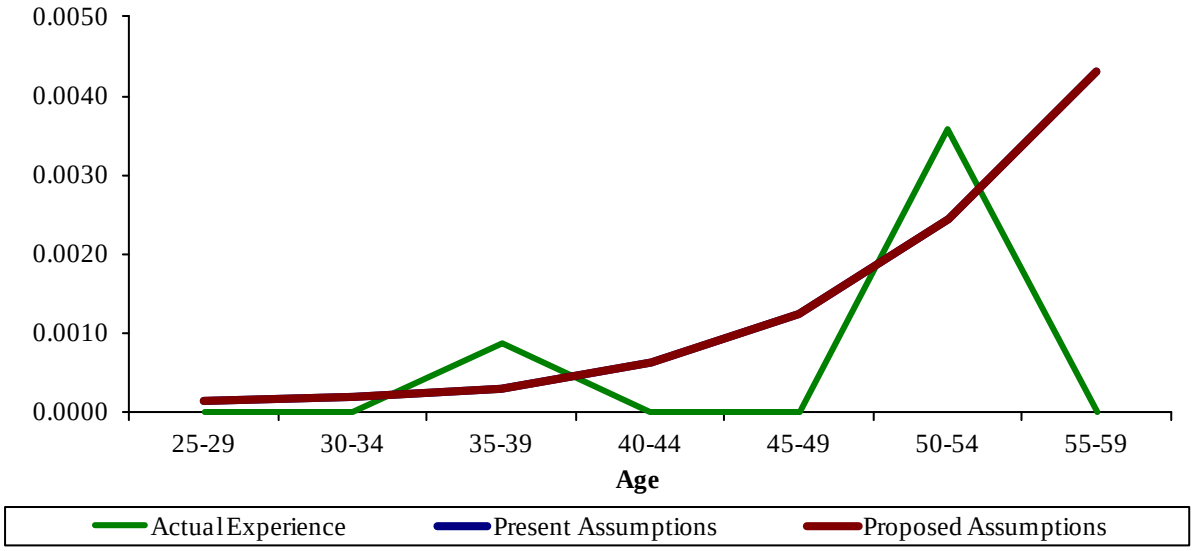
UNIFORMED MEMBERS
DISABILITY EXPERIENCE

There were 3 disability benefit claims reported for the 5-year period and 5,356 years of exposure.

DISABLED UNIFORMED MEMBERS

Age	Life Years Exposure	Number of Disabilities			Disability Rates		
		Actual Experience	Expected			Expected	
			Present	Proposed	Actual	Present	Proposed
25-29	581	-	-	-	0.0000	0.0002	0.0002
30-34	789	-	-	-	0.0000	0.0002	0.0002
35-39	1,165	1	-	-	0.0009	0.0003	0.0003
40-44	1,170	-	1	1	0.0000	0.0006	0.0006
45-49	821	-	1	1	0.0000	0.0012	0.0012
50-54	557	2	1	1	0.0036	0.0024	0.0024
55-59	273	-	1	1	0.0000	0.0043	0.0043
Totals	5,356	3	4	4	0.0006	0.0007	0.0007

RATES OF UNIFORMED MEMBERS DISABILITIES



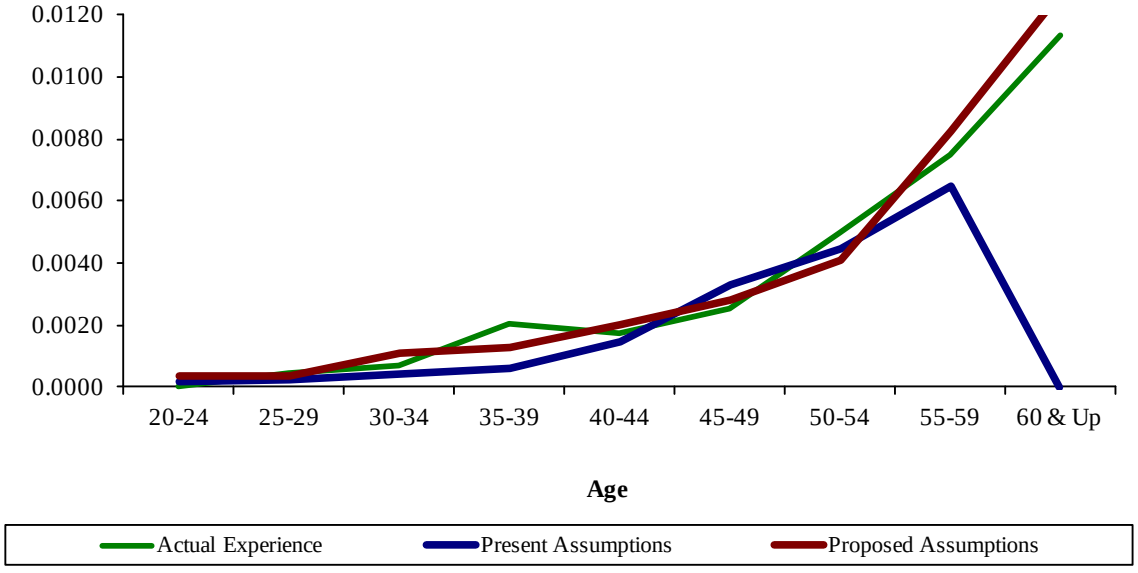
NON-UNIFORMED MALES
DISABILITY EXPERIENCE

There were 84 disability benefit claims reported for the 5-year period and 26,614 years of exposure.

DISABLED NON-UNIFORMED MALES

Age	Life Years Exposure	Number of Disabilities			Disability Rates		
		Actual Experience	Expected			Expected	
			Present	Proposed	Actual	Present	Proposed
20-24	565	-	-	-	0.0000	0.0002	0.0004
25-29	2,139	1	1	1	0.0005	0.0003	0.0004
30-34	2,852	2	1	3	0.0007	0.0004	0.0011
35-39	3,407	7	2	5	0.0021	0.0006	0.0013
40-44	4,083	7	6	8	0.0017	0.0015	0.0020
45-49	5,104	13	17	14	0.0025	0.0033	0.0028
50-54	4,825	24	22	20	0.0050	0.0044	0.0041
55-59	2,934	22	19	23	0.0075	0.0064	0.0082
60 & Up	705	8	8	8	0.0113	0.0000	0.0126
Totals	26,614	84	76	82	0.0032	0.0029	0.0031

RATES OF NON-UNIFORMED MALES DISABILITIES



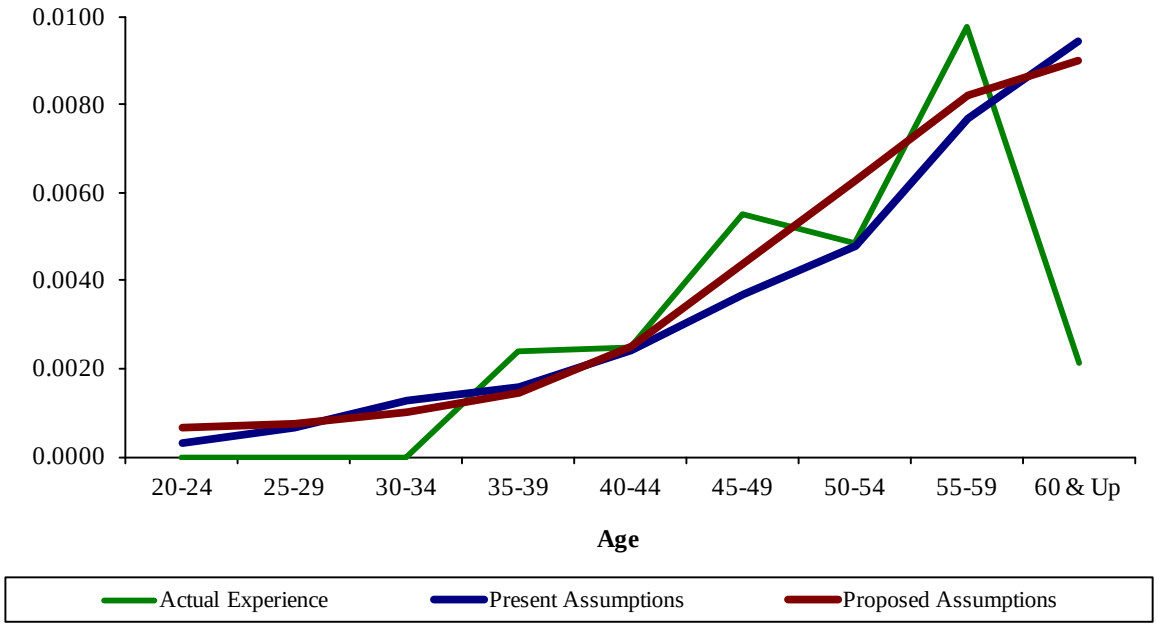
NON-UNIFORMED FEMALES
DISABILITY EXPERIENCE

There were 36 disability benefit claims reported for the 5-year period and 9,652 years of exposure.

DISABLED NON-UNIFORMED FEMALES

Age	Life Years Exposure	Number of Disabilities			Disability Rates		
		Actual Experience	Expected			Expected	
			Present	Proposed	Actual	Present	Proposed
20-24	148	-	-	-	0.0000	0.0003	0.0006
25-29	690	-	-	1	0.0000	0.0006	0.0008
30-34	991	-	1	1	0.0000	0.0013	0.0010
35-39	1,256	3	2	2	0.0024	0.0016	0.0015
40-44	1,620	4	4	4	0.0025	0.0024	0.0025
45-49	1,809	10	7	8	0.0055	0.0037	0.0044
50-54	1,648	8	8	10	0.0049	0.0048	0.0063
55-59	1,021	10	8	8	0.0098	0.0077	0.0082
60 & Up	469	1	4	4	0.0021	0.0094	0.0090
Totals	9,652	36	34	38	0.0037	0.0035	0.0039

RATES OF NON-UNIFORMED FEMALES DISABILITIES



SECTION E

RETIREMENT EXPERIENCE

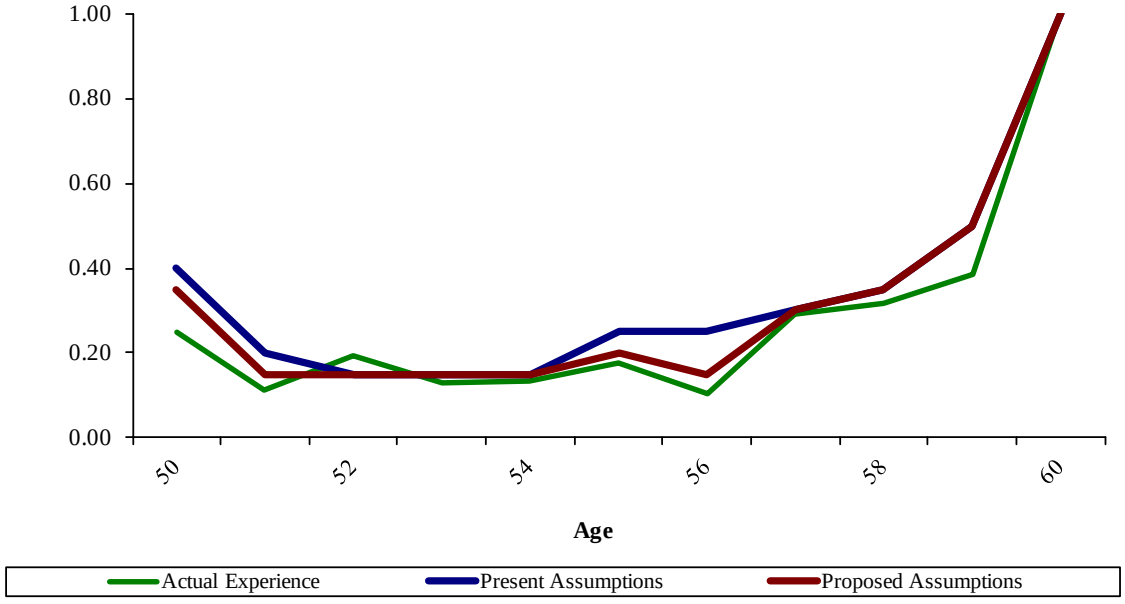
UNIFORMED MEMBERS
CLOSED AND YEAR 2000 PLANS
NORMAL RETIREMENT EXPERIENCE

There were 108 age and service unreduced retirements and 510 life years of exposure (exposure includes active members eligible for unreduced retirement) in the retirement investigation.

SUMMARY OF UNIFORMED AGE & SERVICE UNREDUCED RETIREMENT EXPERIENCE

Age	Life Years Exposure	Number of Retirements			Retirement Rates		
		Actual Experience	Expected			Expected	
			Present	Proposed	Actual	Present	Proposed
50	8	2	3	3	0.2500	0.4000	0.3500
51	27	3	5	4	0.1111	0.2000	0.1500
52	62	12	9	9	0.1935	0.1500	0.1500
53	62	8	9	9	0.1290	0.1500	0.1500
54	67	9	10	10	0.1343	0.1500	0.1500
55	85	15	21	17	0.1765	0.2500	0.2000
56	66	7	17	10	0.1061	0.2500	0.1500
57	55	16	17	17	0.2909	0.3000	0.3000
58	38	12	13	13	0.3158	0.3500	0.3500
59	26	10	13	13	0.3846	0.5000	0.5000
60	14	14	14	14	1.0000	1.0000	1.0000
Totals	510	108	131	119	0.2118	0.2569	0.2333

RATES OF UNREDUCED RETIREMENT EXPERIENCE FOR UNIFORMED MEMBERS



UNIFORMED MEMBERS
2011 TIER PLAN
NORMAL RETIREMENT EXPERIENCE

The data for 2011 Tier plan members is insufficient for retirement purposes. The present rates appear generally reasonable and we recommend their continued use.

SUMMARY OF UNIFORMED AGE & SERVICE
UNREDUCED RETIREMENT ASSUMPTION

Age	Retirement Rates	
	Present	Proposed
55	0.3000	0.3000
56	0.3000	0.3000
57	0.3000	0.3000
58	0.3000	0.3000
59	0.3000	0.3000
60	0.3000	0.3000
61	0.3000	0.3000
62	0.3000	0.3000
63	0.3000	0.3000
64	0.3000	0.3000
65	0.3000	0.3000
66	0.3000	0.3000
67	0.3000	0.3000
68	0.3000	0.3000
69	0.3000	0.3000
70	1.0000	1.0000

The present rates of retirement above were adjusted as follows: if a member's service is greater than or equal to 25 years, 20% is added to the rate of retirement.

NON-UNIFORMED MALES
CLOSED AND YEAR 2000 PLANS
NORMAL RETIREMENT EXPERIENCE

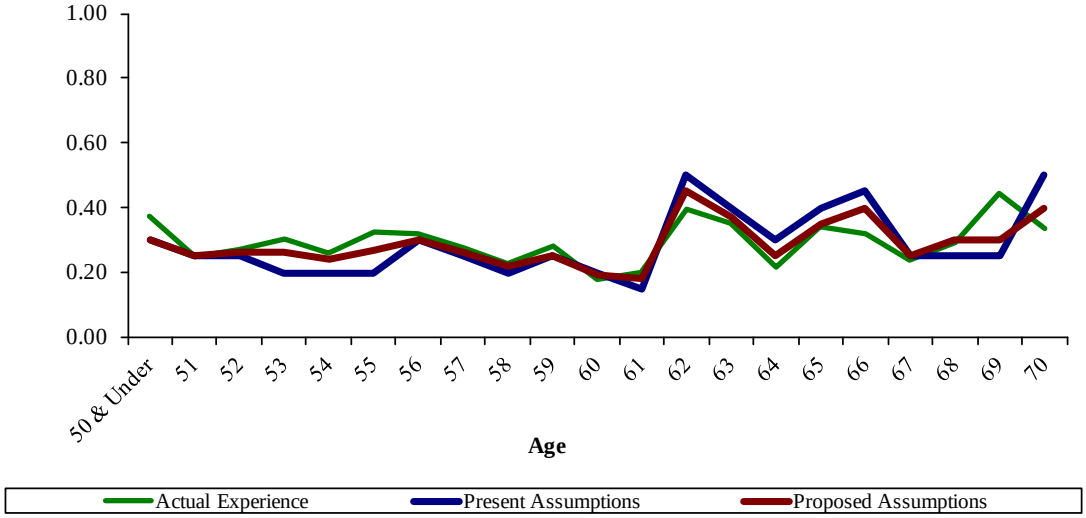
There were 874 age and service unreduced retirements and 3,090 life years of exposure (exposure includes active members eligible for unreduced retirement) in the male retirement investigation.

SUMMARY OF NON-UNIFORMED MALES AGE & SERVICE UNREDUCED RETIREMENT EXPERIENCE

		Number of Retirements			Retirement Rates		
			Expected			Expected	
Age	Life Years Exposure	Actual Experience	Present	Proposed	Actual	Present	Proposed
50 & Under	126	47	38	38	0.3730	0.3000	0.3000
51	178	44	45	45	0.2472	0.2500	0.2500
52	243	66	61	63	0.2716	0.2500	0.2600
53	244	74	49	63	0.3033	0.2000	0.2600
54	236	61	47	57	0.2585	0.2000	0.2400
55	238	77	48	64	0.3235	0.2000	0.2700
56	234	75	70	70	0.3205	0.3000	0.3000
57	211	58	53	55	0.2749	0.2500	0.2600
58	185	42	37	41	0.2270	0.2000	0.2200
59	180	51	45	45	0.2833	0.2500	0.2500
60	210	37	42	40	0.1762	0.2000	0.1900
61	185	37	28	33	0.2000	0.1500	0.1800
62	196	78	98	88	0.3980	0.5000	0.4500
63	122	43	49	45	0.3525	0.4000	0.3700
64	87	19	26	22	0.2184	0.3000	0.2500
65	76	26	30	27	0.3421	0.4000	0.3500
66	47	15	21	19	0.3191	0.4500	0.4000
67	25	6	6	6	0.2400	0.2500	0.2500
68	17	5	4	5	0.2941	0.2500	0.3000
69	9	4	2	3	0.4444	0.2500	0.3000
70	9	3	5	4	0.3333	0.5000	0.4000
71	7	-	4	4	0.0000	0.5000	0.5000
72	7	1	7	4	0.1429	1.0000	0.5000
73	7	2	7	4	0.2857	1.0000	0.5000
74	5	2	5	5	0.4000	1.0000	1.0000
75 & Over	6	1	6	6	0.1667	1.0000	1.0000
Totals	3,090	874	833	856	0.2828	0.2696	0.2770

NON-UNIFORMED MALES
CLOSED AND YEAR 2000 PLANS
NORMAL RETIREMENT EXPERIENCE

RATES OF UNREDUCED RETIREMENT EXPERIENCE FOR NON-UNIFORMED MALES



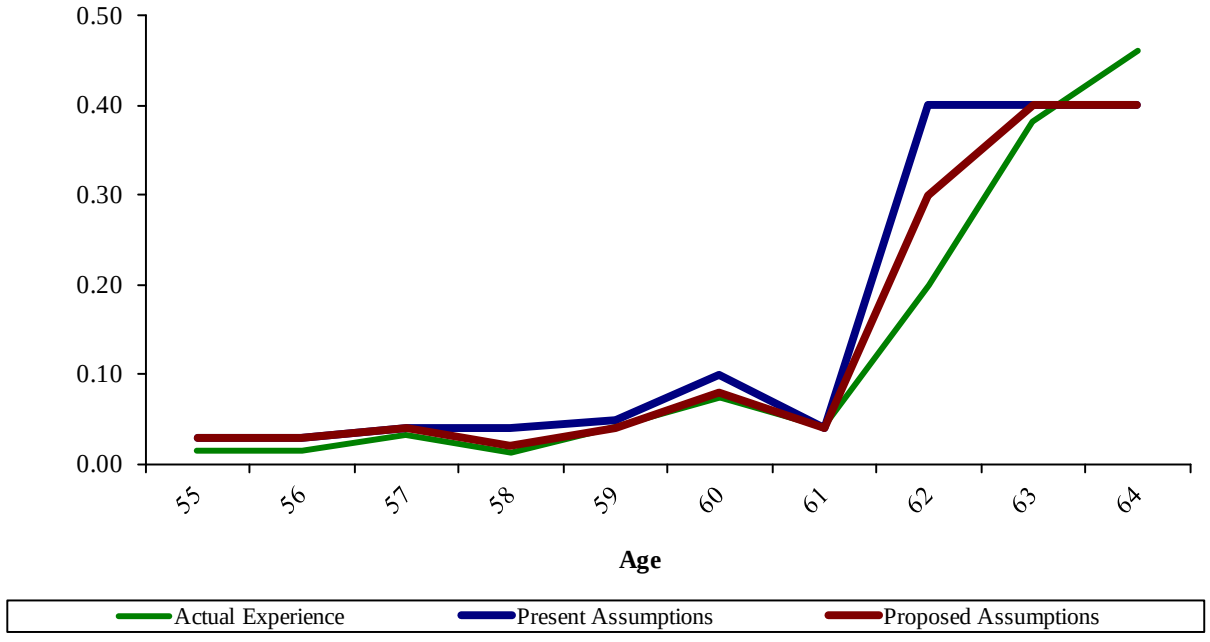
NON-UNIFORMED MALES
CLOSED AND YEAR 2000 PLANS
EARLY RETIREMENT EXPERIENCE

There were 65 age and service reduced retirements and 1,614 life years of exposure (exposure includes active members eligible for reduced retirement) in the male retirement investigation.

SUMMARY OF NON-UNIFORMED MALES AGE & SERVICE REDUCED RETIREMENT EXPERIENCE

Age	Life Years Exposure	Number of Retirements			Retirement Rates		
		Actual Experience	Expected			Expected	
			Present	Proposed	Actual	Present	Proposed
55	312	5	9	9	0.0160	0.0300	0.0300
56	252	4	8	8	0.0159	0.0300	0.0300
57	298	10	12	12	0.0336	0.0400	0.0400
58	249	3	10	5	0.0120	0.0400	0.0200
59	216	9	11	9	0.0417	0.0500	0.0400
60	121	9	12	10	0.0744	0.1000	0.0800
61	97	4	4	4	0.0412	0.0400	0.0400
62	35	7	14	11	0.2000	0.4000	0.3000
63	21	8	8	8	0.3810	0.4000	0.4000
64	13	6	5	5	0.4615	0.4000	0.4000
Totals	1,614	65	93	81	0.0403	0.0576	0.0502

RATES OF REDUCED RETIREMENT EXPERIENCE FOR NON-UNIFORMED MALES



NON-UNIFORMED FEMALES
CLOSED AND YEAR 2000 PLANS
NORMAL RETIREMENT EXPERIENCE

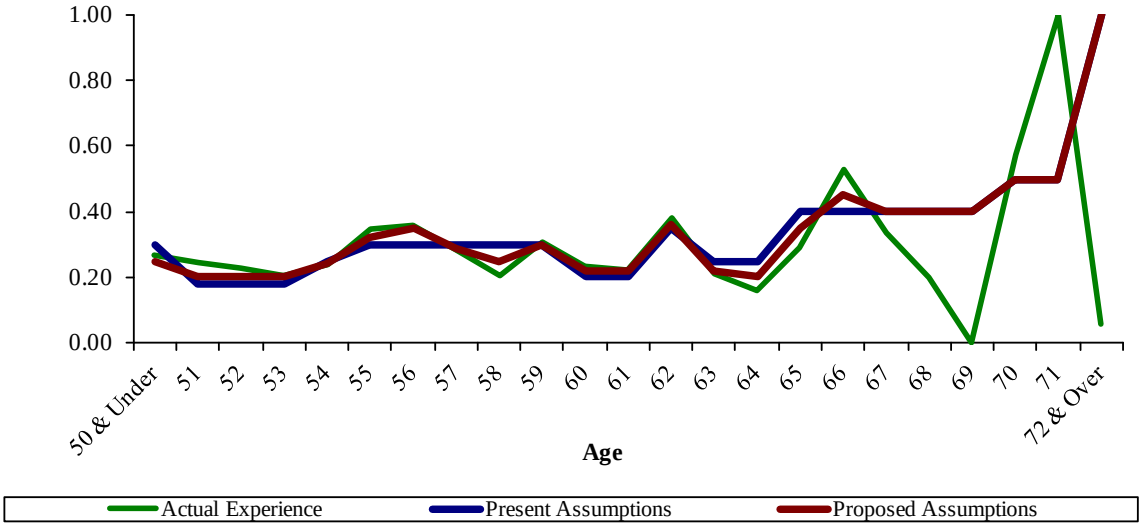
There were 247 age and service unreduced retirements and 929 life years of exposure (exposure includes active members eligible for unreduced retirement) in the female retirement investigation.

SUMMARY OF NON-UNIFORMED FEMALES AGE & SERVICE UNREDUCED RETIREMENT EXPERIENCE

		Number of Retirements			Retirement Rates		
	Life Years	Actual	Expected			Expected	
Age	Exposure	Experience	Present	Proposed	Actual	Present	Proposed
50 & Under	45	12	14	11	0.2667	0.3000	0.2500
51	53	13	10	11	0.2453	0.1800	0.2000
52	53	12	10	11	0.2264	0.1800	0.2000
53	59	12	11	12	0.2034	0.1800	0.2000
54	59	14	15	14	0.2373	0.2500	0.2400
55	55	19	17	18	0.3455	0.3000	0.3200
56	50	18	15	18	0.3600	0.3000	0.3500
57	46	13	14	13	0.2826	0.3000	0.2900
58	49	10	15	12	0.2041	0.3000	0.2500
59	52	16	16	16	0.3077	0.3000	0.3000
60	90	21	18	20	0.2333	0.2000	0.2200
61	72	16	14	16	0.2222	0.2000	0.2200
62	74	28	26	27	0.3784	0.3500	0.3600
63	47	10	12	10	0.2128	0.2500	0.2200
64	31	5	8	6	0.1613	0.2500	0.2000
65	31	9	12	11	0.2903	0.4000	0.3500
66	17	9	7	8	0.5294	0.4000	0.4500
67	9	3	4	4	0.3333	0.4000	0.4000
68	5	1	2	2	0.2000	0.4000	0.4000
69	6	-	2	2	0.0000	0.4000	0.4000
70	7	4	4	4	0.5714	0.5000	0.5000
71	1	1	1	1	1.0000	0.5000	0.5000
72 & Over	18	1	18	18	0.0556	1.0000	1.0000
Totals	929	247	265	265	0.2659	0.2853	0.2853

NON-UNIFORMED FEMALES
CLOSED AND YEAR 2000 PLANS
NORMAL RETIREMENT EXPERIENCE

RATES OF UNREDUCED RETIREMENT EXPERIENCE FOR NON-UNIFORMED FEMALES



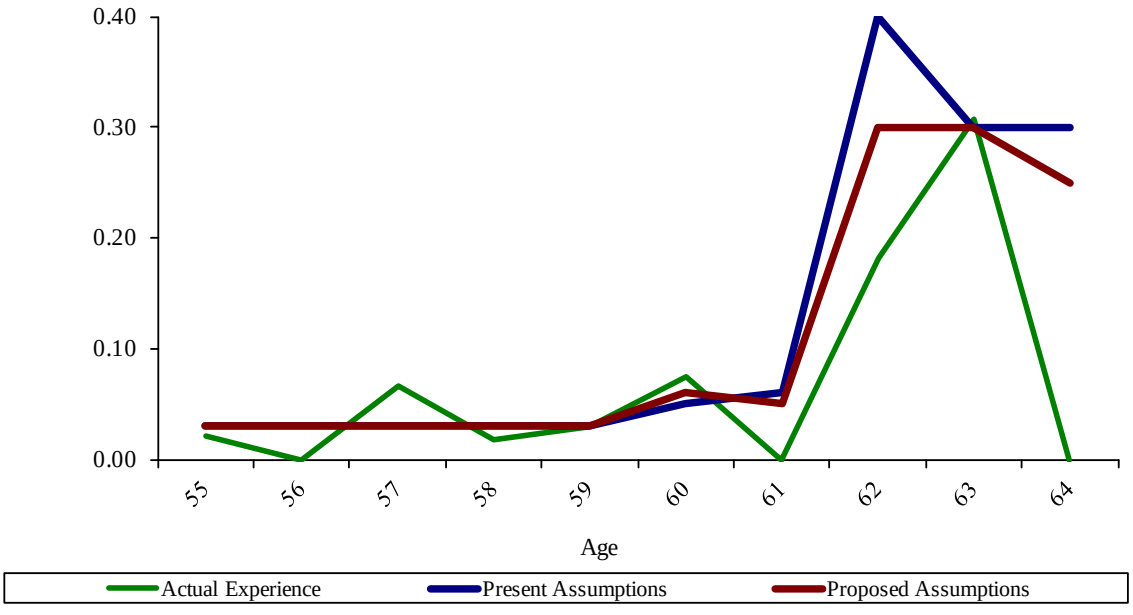
NON-UNIFORMED FEMALES
CLOSED AND YEAR 2000 PLANS
EARLY RETIREMENT EXPERIENCE

There were 28 age and service reduced retirements and 720 life years of exposure (exposure includes active members eligible for reduced retirement) in the female retirement investigation.

SUMMARY OF NON-UNIFORMED FEMALES AGE & SERVICE REDUCED RETIREMENT EXPERIENCE

Age	Life Years Exposure	Number of Retirements			Retirement Rates		
		Actual Experience	Expected			Expected	
			Present	Proposed	Actual	Present	Proposed
55	138	3	4	4	0.0217	0.0300	0.0300
56	112	-	3	3	0.0000	0.0300	0.0300
57	134	9	4	4	0.0672	0.0300	0.0300
58	113	2	3	3	0.0177	0.0300	0.0300
59	99	3	3	3	0.0303	0.0300	0.0300
60	40	3	2	2	0.0750	0.0500	0.0600
61	40	-	2	2	0.0000	0.0600	0.0500
62	22	4	9	7	0.1818	0.4000	0.3000
63	13	4	4	4	0.3077	0.3000	0.3000
64	9	-	3	2	0.0000	0.3000	0.2500
Totals	720	28	37	34	0.0389	0.0514	0.0472

RATES OF REDUCED RETIREMENT EXPERIENCE FOR NON-UNIFORMED FEMALES



NON-UNIFORMED MEMBERS
2011 TIER PLAN
NORMAL RETIREMENT EXPERIENCE

The data for 2011 Tier plan members is insufficient for retirement purposes. The present rates appear generally reasonable and we recommend their continued use.

SUMMARY OF NON-UNIFORMED AGE & SERVICE
UNREDUCED RETIREMENT ASSUMPTION

Age	Present		Proposed	
	Age & Service	Rule of 90	Age & Service	Rule of 90
55		0.3000		0.3000
56		0.3000		0.3000
57		0.3000		0.3000
58		0.3000		0.3000
59		0.3000		0.3000
60		0.3000		0.3000
61		0.3000		0.3000
62		0.3000		0.3000
63		0.3000		0.3000
64		0.3000		0.3000
65		0.3000		0.3000
66		0.3000		0.3000
67	0.5000	0.3000	0.5000	0.3000
68	0.5000	0.3000	0.5000	0.3000
69	0.5000	0.3000	0.5000	0.3000
70	1.0000	1.0000	1.0000	1.0000
71	1.0000	1.0000	1.0000	1.0000
72	1.0000	1.0000	1.0000	1.0000

The present rates of retirement above were adjusted as follows: if age plus service is greater than or equal to 90 years and a member's service is greater than or equal to 30 years, 20% is added to the rate of retirement.

NON-UNIFORMED MEMBERS
2011 TIER PLAN
EARLY RETIREMENT EXPERIENCE

The data for 2011 Tier plan members is insufficient for early retirement purposes. The present rates appear generally reasonable and we recommend their continued use.

SUMMARY OF NON-UNIFORMED AGE & SERVICE
REDUCED RETIREMENT ASSUMPTION

Age	Retirement Rates	
	Present	Proposed
62	0.1000	0.1000
63	0.1000	0.1000
64	0.1000	0.1000
65	0.1000	0.1000
66	0.1000	0.1000

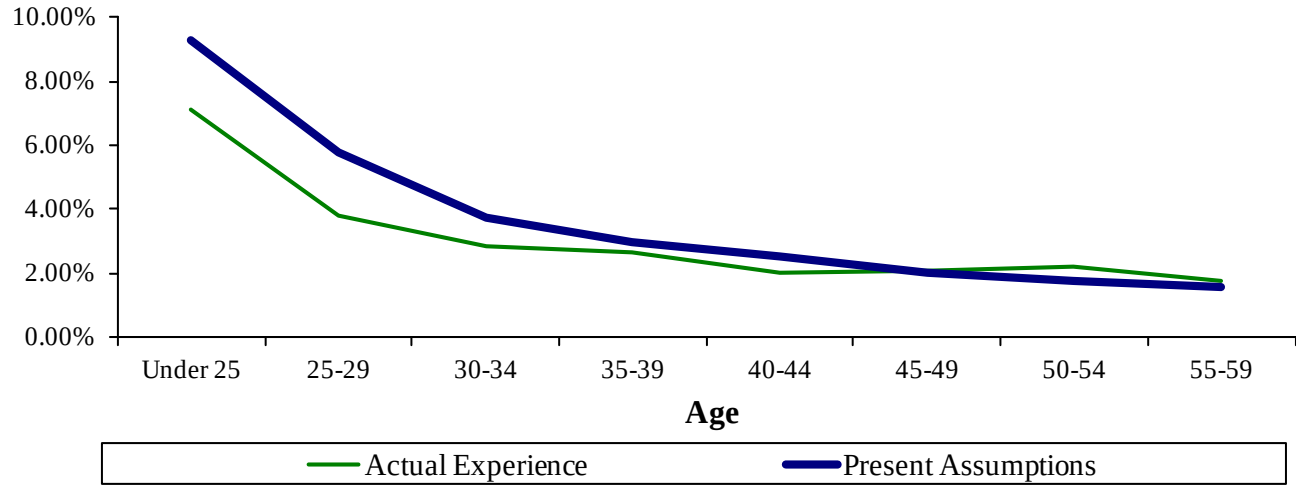
SECTION F

SALARY INCREASES

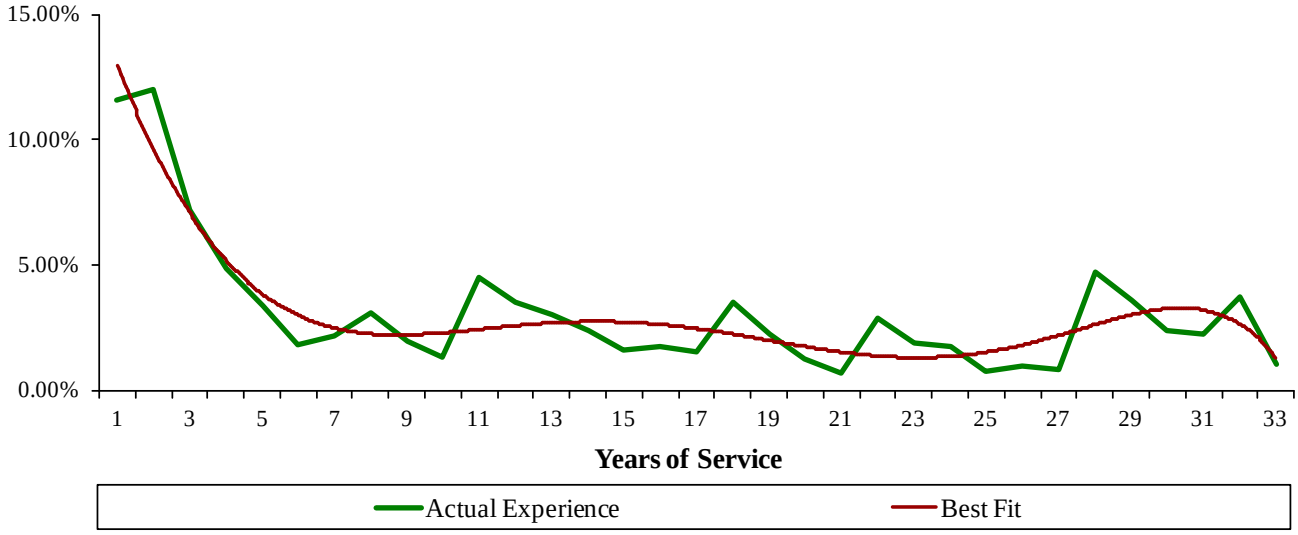
UNIFORMED MEMBERS
GROSS PAY INCREASE ASSUMPTIONS

The graphs shown below illustrate gross rates of salary increases for Uniformed Members, according to age and service respectively. They demonstrate that rates of salary increases are highly correlated with age. New rates (merit and longevity portion only) are shown on the following page.

GROSS SALARY INCREASES – CORRELATION BY AGE



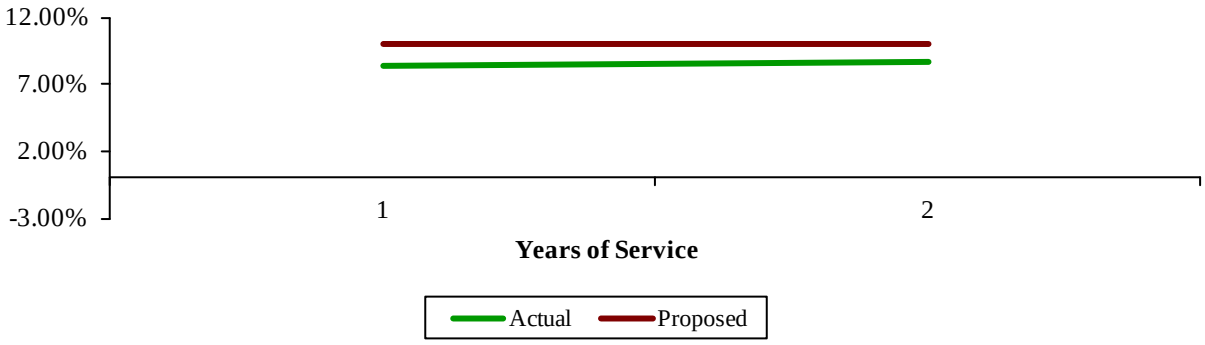
GROSS SALARY INCREASES – CORRELATION BY SERVICE



UNIFORMED MEMBERS
SERVICE-BASED MERIT & LONGEVITY PAY INCREASE ASSUMPTIONS

Service Index	Number	Actual	Proposed
1	83	8.35 %	10.00 %
2	208	8.74 %	10.00 %
Total	291		

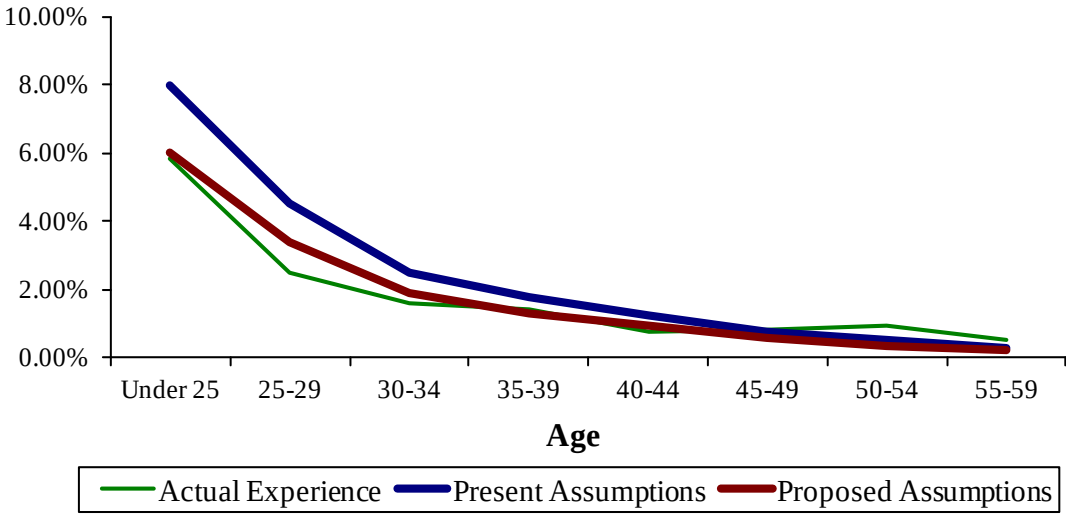
RATES OF SALARY INCREASES



UNIFORMED MEMBERS
AGE-BASED MERIT & LONGEVITY PAY INCREASE ASSUMPTIONS

Age Group Beginning of Year	Number	Actual	Expected	
			Present	Proposed
Under 25	57	5.86 %	8.00 %	6.00 %
25-29	481	2.52 %	4.50 %	3.38 %
30-34	772	1.57 %	2.50 %	1.88 %
35-39	1,172	1.40 %	1.75 %	1.31 %
40-44	1,120	0.77 %	1.25 %	0.94 %
45-49	771	0.83 %	0.75 %	0.56 %
50-54	502	0.95 %	0.50 %	0.38 %
55-59	172	0.52 %	0.30 %	0.23 %
Total	5,047			

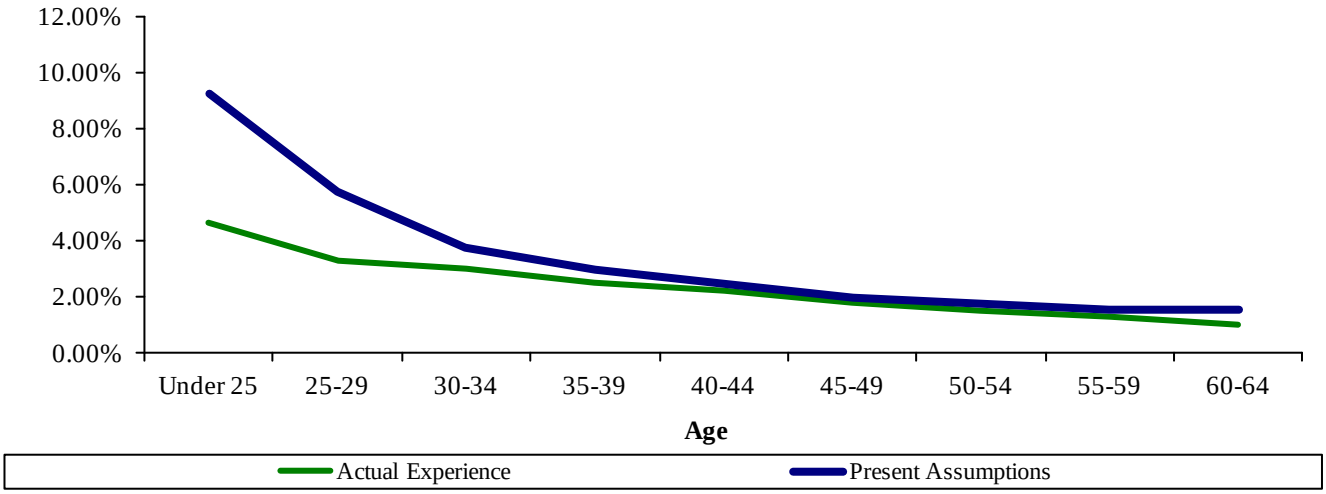
RATES OF SALARY INCREASES



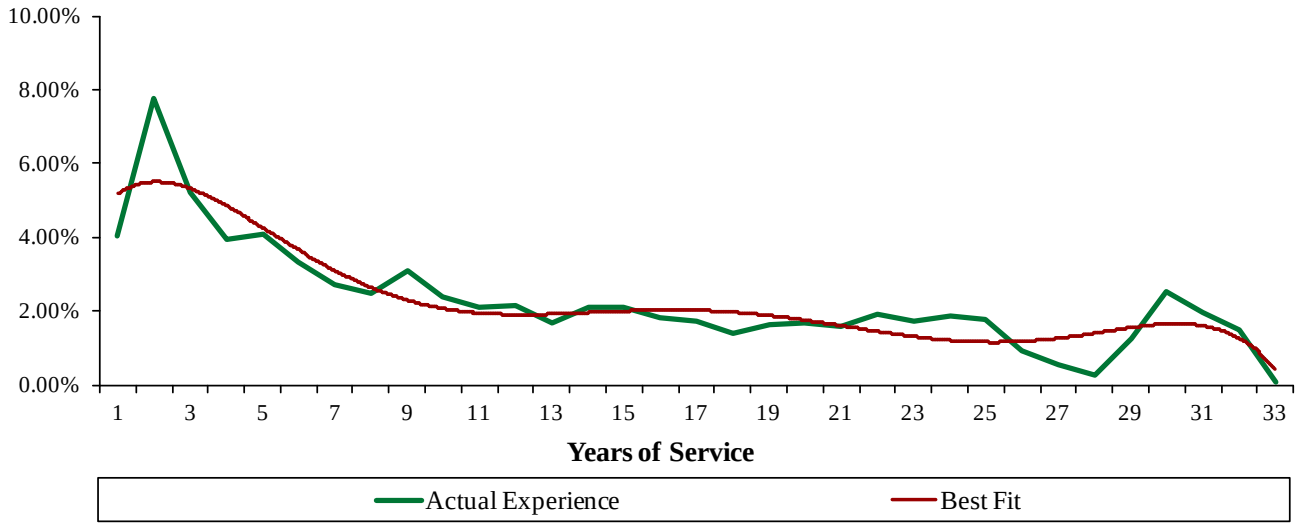
NON-UNIFORMED MEMBERS
GROSS PAY INCREASE ASSUMPTIONS

The graphs shown below illustrate rates of gross salary increases for Non-Uniformed Members, according to age and service respectively. They demonstrate that rates of salary increases are highly correlated with age. New rates (merit and longevity portion only) are shown on the following page.

GROSS SALARY INCREASES – CORRELATION BY AGE



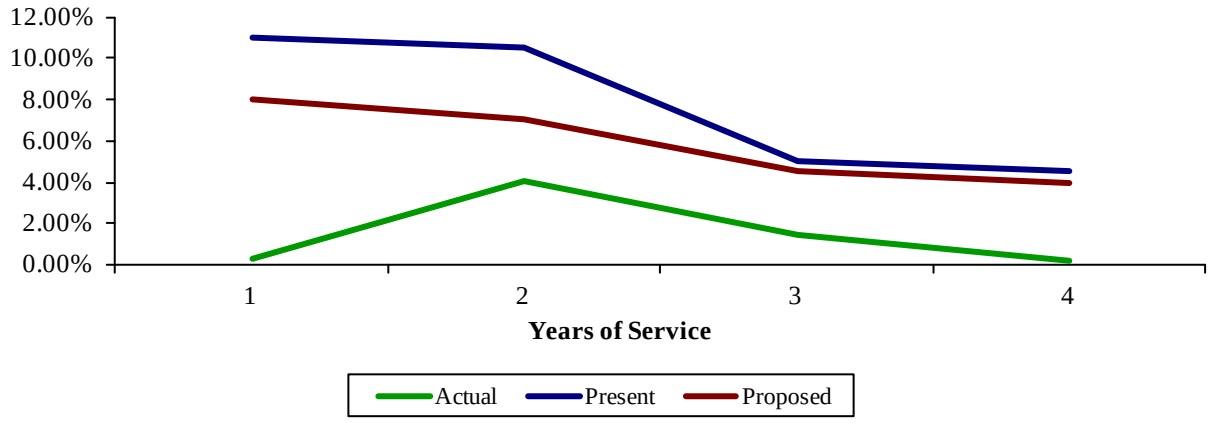
GROSS SALARY INCREASES – CORRELATION BY SERVICE



NON-UNIFORMED MEMBERS
SERVICE-BASED MERIT & LONGEVITY PAY INCREASE ASSUMPTIONS

Service Index	Number	Actual	Expected	
			Present	Proposed
1	849	0.30 %	11.00 %	8.00 %
2	1,675	4.02 %	10.50 %	7.00 %
3	1,548	1.45 %	5.00 %	4.50 %
4	1,600	0.22 %	4.50 %	4.00 %
Total	5,672			

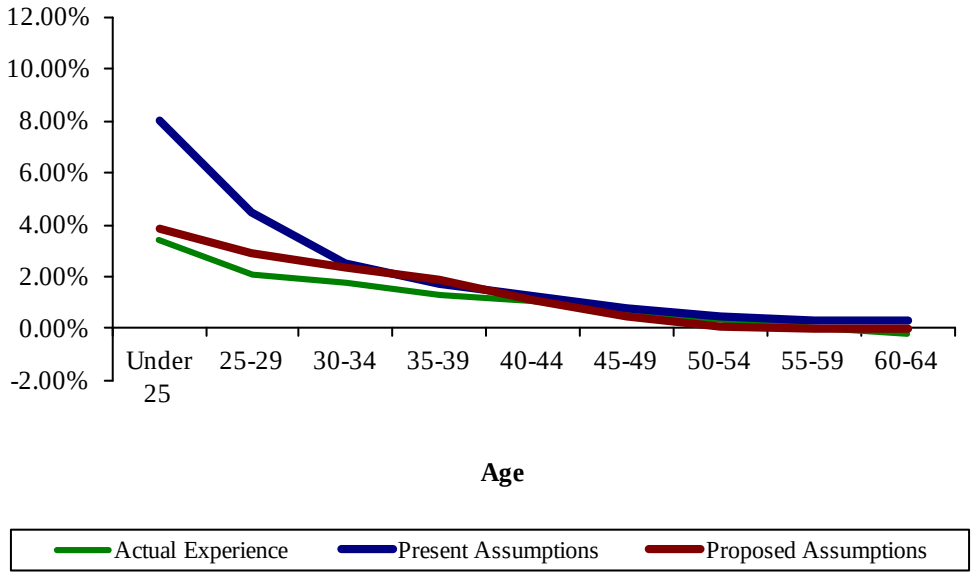
RATES OF SALARY INCREASES



NON-UNIFORMED MEMBERS
AGE-BASED MERIT & LONGEVITY PAY INCREASE ASSUMPTIONS

Age Group Beginning of Year	Number	Actual	Expected	
			Present	Proposed
Under 25	88	3.39 %	8.00 %	3.84 %
25-29	1,376	2.08 %	4.50 %	2.90 %
30-34	2,764	1.78 %	2.50 %	2.39 %
35-39	3,714	1.28 %	1.75 %	1.87 %
40-44	4,779	1.02 %	1.25 %	1.09 %
45-49	6,093	0.60 %	0.75 %	0.43 %
50-54	5,220	0.31 %	0.50 %	0.06 %
55-59	2,950	0.06 %	0.30 %	0.00 %
60-64	1,070	(0.21)%	0.30 %	0.00 %
65 & Over	179	(0.47)%	0.30 %	0.00 %
Total	28,233			

RATES OF SALARY INCREASES



SECTION G

MORTALITY EXPERIENCE

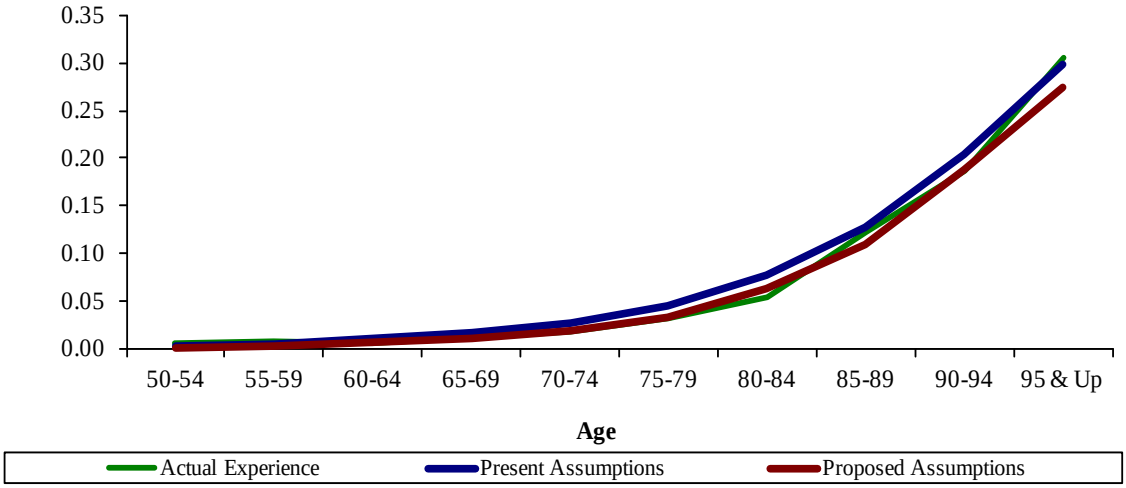
MALE RETIRED-LIFE MORTALITY EXPERIENCE
(NORMAL & EARLY RETIREMENT, ORIGINAL ANNUITANTS ONLY)

There were 626 retired member deaths reported for the 5-year period and 24,393 life years of exposure included in the male retired-life mortality investigation. There were less deaths than expected among retired males. Due to expected improvements in future life expectancy, we have reduced the rates of mortality.

SUMMARY OF MALE RETIRED LIVES MORTALITY EXPERIENCE

Age	Life Years Exposure	Post-Retirement Death			Post-Retirement Death Rates		
		Actual Experience	Expected			Expected	
			Present	Proposed	Actual	Present	Proposed
50-54	804	4	3	2	0.0050	0.0029	0.0018
55-59	2,929	21	17	10	0.0072	0.0053	0.0031
60-64	4,828	33	50	32	0.0068	0.0102	0.0060
65-69	4,831	61	82	59	0.0126	0.0170	0.0117
70-74	4,152	74	111	85	0.0178	0.0266	0.0193
75-79	3,280	108	149	118	0.0329	0.0455	0.0337
80-84	2,121	115	160	138	0.0542	0.0765	0.0623
85-89	1,045	128	130	120	0.1225	0.1269	0.1097
90-94	344	64	67	64	0.1860	0.2035	0.1874
95 & Up	59	18	17	16	0.3051	0.2976	0.2750
Totals	24,393	626	786	644	0.0257	0.0322	0.0264

RATES OF MALE RETIRED LIVES MORTALITY EXPERIENCE



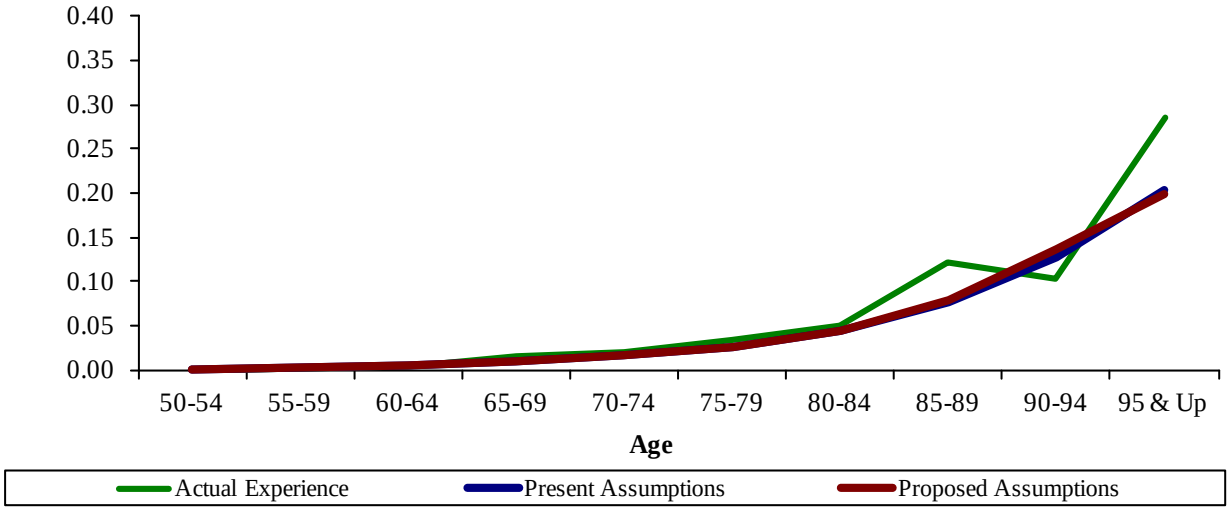
FEMALE RETIRED-LIFE MORTALITY EXPERIENCE (NORMAL & EARLY RETIREMENT, ORIGINAL ANNUITANTS ONLY)

There were 53 retired member deaths reported for the 5-year period and 2,827 life years of exposure included in the female retired-life mortality investigation. There were more deaths than expected among retired females. However, due to expected improvements in future life expectancy, we have reduced the rates of mortality.

SUMMARY OF FEMALE RETIRED LIVES MORTALITY EXPERIENCE

Age	Life Years Exposure	Post-Retirement Death			Post-Retirement Death Rates		
		Actual Experience	Expected			Expected	
			Present	Proposed	Actual	Present	Proposed
50-54	143	-	-	-	0.0000	0.0017	0.0014
55-59	508	1	2	2	0.0020	0.0029	0.0028
60-64	690	3	4	4	0.0043	0.0053	0.0054
65-69	569	9	6	6	0.0158	0.0102	0.0101
70-74	375	8	6	7	0.0213	0.0170	0.0169
75-79	265	9	7	8	0.0340	0.0266	0.0272
80-84	159	8	7	8	0.0503	0.0455	0.0454
85-89	82	10	6	7	0.1220	0.0765	0.0797
90-94	29	3	4	4	0.1034	0.1269	0.1378
95 & Up	7	2	1	1	0.2857	0.2035	0.1989
Totals	2,827	53	43	47	0.0187	0.0152	0.0166

RATES OF FEMALE RETIRED LIVES MORTALITY EXPERIENCE



MALE DEATH-IN-SERVICE EXPERIENCE

There were 21 active male deaths reported for the 5-year period and 26,300 life years of exposure included in the male active mortality investigation.

MALE DEATHS

Age	Life Years Exposure	Post-Retirement Death			Post-Retirement Death Rates		
		Actual Experience	Expected			Expected	
			Present	Proposed	Actual	Present	Proposed
Under 30	1,060	-	-	-	0.0000	0.0004	0.0002
30-34	2,670	-	1	1	0.0000	0.0005	0.0003
35-39	3,748	1	2	2	0.0003	0.0006	0.0005
40-44	4,495	6	3	3	0.0013	0.0008	0.0007
45-49	5,235	5	6	5	0.0010	0.0012	0.0009
50-54	4,895	2	9	6	0.0004	0.0020	0.0013
55-59	2,906	4	10	6	0.0014	0.0037	0.0022
60-64	1,117	2	7	4	0.0018	0.0071	0.0042
65 & Up	174	1	2	1	0.0057	0.0119	0.0082
Totals	26,300	21	40	28	0.0008	0.0015	0.0011

FEMALE DEATH-IN-SERVICE EXPERIENCE

There were 2 active female deaths reported for the 5-year period and 8,091 life years of exposure included in the female active mortality investigation.

FEMALE DEATHS

Age	Life Years Exposure	Post-Retirement Death			Post-Retirement Death Rates		
		Actual Experience	Expected			Expected	
			Present	Proposed	Actual	Present	Proposed
Under 30	283	-	-	-	0.0000	0.0002	0.0001
30-34	703	-	-	-	0.0000	0.0003	0.0001
35-39	1,029	-	-	-	0.0000	0.0003	0.0002
40-44	1,417	-	1	-	0.0000	0.0004	0.0003
45-49	1,674	-	1	1	0.0000	0.0006	0.0005
50-54	1,525	-	1	1	0.0000	0.0008	0.0007
55-59	939	2	1	1	0.0021	0.0014	0.0014
60-64	445	-	1	1	0.0000	0.0027	0.0027
65-69	68	-	-	-	0.0000	0.0051	0.0051
70 & Up	8	-	-	-	0.0000	0.0085	0.0084
Totals	8,091	2	5	4	0.0002	0.0006	0.0005

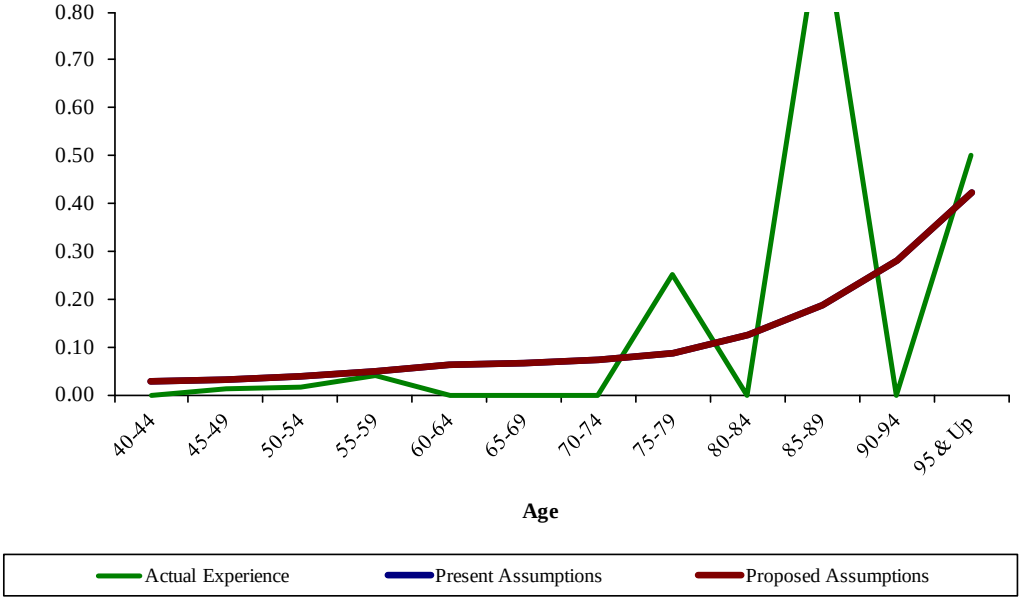
MALE DISABLED MORTALITY EXPERIENCE

There were 13 disabled retired male deaths reported for the 5-year period and 496 life years of exposure included in the male disabled mortality investigation.

MALE DEATHS

Age	Life Years Exposure	Post-Retirement Death			Post-Retirement Death Rates		
		Actual Experience	Expected			Expected	
			Present	Proposed	Actual	Present	Proposed
40-44	23	-	1	1	0.0000	0.0282	0.0282
45-49	90	1	3	3	0.0111	0.0323	0.0323
50-54	116	2	5	5	0.0172	0.0399	0.0399
55-59	125	5	6	6	0.0400	0.0504	0.0504
60-64	76	-	5	5	0.0000	0.0611	0.0611
65-69	27	-	2	2	0.0000	0.0662	0.0662
70-74	19	-	1	1	0.0000	0.0737	0.0737
75-79	8	2	1	1	0.2500	0.0863	0.0863
80-84	8	-	1	1	0.0000	0.1256	0.1256
85-89	2	2	-	-	1.0000	0.1881	0.1881
90-94	-	-	-	-	N/A	0.2823	0.2823
95 & Up	2	1	1	1	0.5000	0.4235	0.4235
Totals	496	13	26	26	0.0262	0.0524	0.0524

RATES OF MALE DISABLED LIVES MORTALITY EXPERIENCE



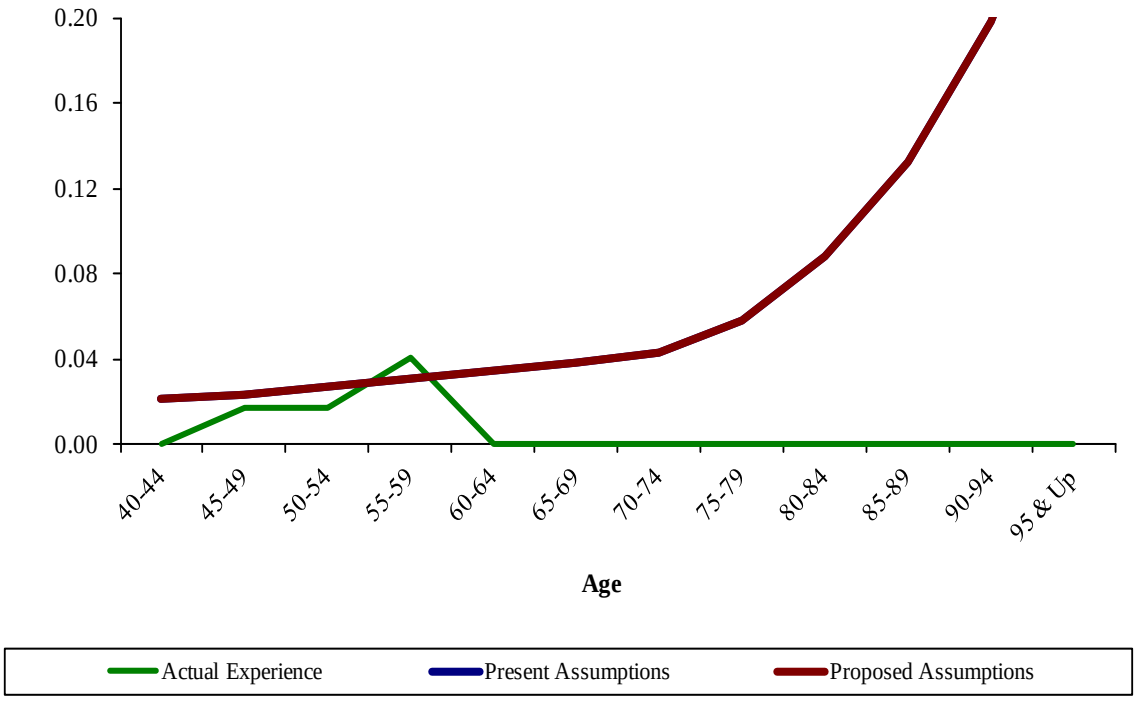
FEMALE DISABLED MORTALITY EXPERIENCE

There were 4 disabled retired female deaths reported for the 5-year period and 211 life years of exposure included in the female disabled mortality investigation.

FEMALE DEATHS

Age	Life Years Exposure	Post-Retirement Death			Post-Retirement Death Rates		
		Actual Experience	Expected			Expected	
			Present	Proposed	Actual	Present	Proposed
40-44	32	-	1	1	0.0000	0.0213	0.0213
45-49	57	1	1	1	0.0175	0.0235	0.0235
50-54	59	1	2	2	0.0169	0.0272	0.0272
55-59	49	2	2	2	0.0408	0.0307	0.0307
60-64	11	-	-	-	0.0000	0.0347	0.0347
65-69	3	-	-	-	0.0000	0.0386	0.0386
70-74	-	-	-	-	N/A	0.0433	0.0433
75-79	-	-	-	-	N/A	0.0578	0.0578
80-84	-	-	-	-	N/A	0.0885	0.0885
85-89	-	-	-	-	N/A	0.1322	0.1322
90-94	-	-	-	-	N/A	0.1980	0.1980
95 & Up	-	-	-	-	N/A	0.2972	0.2972
Totals	211	4	6	6	0.0190	0.0284	0.0284

RATES OF FEMALE DISABLED LIVES MORTALITY EXPERIENCE



SECTION H

NEW ASSUMPTION LISTING

ACTUARIAL ASSUMPTIONS
BASED ON 2007-2012 EXPERIENCE STUDY
WITHDRAWAL RATES

		% of Active Participants Withdrawing			
		Uniformed Members		Non-Uniformed Members	
Age	Service	Male	Female	Male	Female
	0-1	10.0%	10.0%	30.0%	20.0%
	1-2	7.0%	7.0%	16.0%	14.0%
	2-3	3.3%	3.3%	9.0%	11.0%
	3-4	3.0%	3.0%	7.0%	9.0%
	4-5	2.8%	2.8%	5.5%	5.0%
30	5 & Up	2.7%	2.7%	5.1%	5.1%
31		2.7%	2.7%	4.9%	5.1%
32		2.6%	2.6%	4.7%	5.1%
33		2.4%	2.4%	4.5%	4.9%
34		2.1%	2.1%	4.3%	4.8%
35		1.9%	1.9%	4.1%	4.6%
36		1.7%	1.7%	3.9%	4.4%
37		1.5%	1.5%	3.7%	4.3%
38		1.4%	1.4%	3.6%	4.1%
39		1.2%	1.2%	3.4%	3.9%
40		1.1%	1.1%	3.2%	3.7%
41		1.1%	1.1%	3.0%	3.6%
42		1.0%	1.0%	2.9%	3.4%
43		0.9%	0.9%	2.7%	3.2%
44		0.9%	0.9%	2.6%	3.1%
45		0.8%	0.8%	2.4%	2.9%
46		0.7%	0.7%	2.3%	2.7%
47		0.7%	0.7%	2.1%	2.6%
48		0.6%	0.6%	2.0%	2.4%
49		0.5%	0.5%	1.9%	2.2%
50		0.5%	0.5%	1.8%	2.0%
51		0.4%	0.4%	1.7%	1.9%
52		0.3%	0.3%	1.5%	1.7%
53		0.3%	0.3%	1.5%	1.5%
54		0.3%	0.3%	1.4%	1.4%
55		0.2%	0.2%	1.3%	1.2%
56		0.2%	0.2%	1.2%	1.0%
57		0.2%	0.2%	1.2%	0.9%
58		0.2%	0.2%	1.1%	0.7%
59		0.2%	0.2%	1.1%	0.5%
60		0.2%	0.2%	1.0%	0.3%
Ref		851	851	852	853
		1272	1272	63	684
		100%	100%	70%	85%

ACTUARIAL ASSUMPTIONS
BASED ON 2007-2012 EXPERIENCE STUDY

DISABILITY RATES

	% of Active Participants Becoming Disabled			
	Uniformed Members		Non-Uniformed Members	
Age	Male	Female	Male	Female
20	0.00%	0.00%	0.00%	0.06%
21	0.00%	0.00%	0.00%	0.06%
22	0.00%	0.00%	0.04%	0.06%
23	0.00%	0.00%	0.04%	0.07%
24	0.00%	0.00%	0.04%	0.07%
25	0.01%	0.01%	0.04%	0.07%
26	0.01%	0.01%	0.04%	0.07%
27	0.02%	0.02%	0.04%	0.08%
28	0.02%	0.02%	0.07%	0.08%
29	0.02%	0.02%	0.09%	0.08%
30	0.02%	0.02%	0.09%	0.08%
31	0.02%	0.02%	0.11%	0.09%
32	0.02%	0.02%	0.11%	0.10%
33	0.02%	0.02%	0.11%	0.11%
34	0.02%	0.02%	0.11%	0.12%
35	0.02%	0.02%	0.13%	0.13%
36	0.02%	0.02%	0.13%	0.14%
37	0.03%	0.03%	0.13%	0.15%
38	0.03%	0.03%	0.15%	0.15%
39	0.04%	0.04%	0.17%	0.16%
40	0.05%	0.05%	0.17%	0.17%
41	0.06%	0.06%	0.18%	0.21%
42	0.06%	0.06%	0.20%	0.25%
43	0.07%	0.07%	0.21%	0.29%
44	0.08%	0.08%	0.22%	0.32%
45	0.09%	0.09%	0.23%	0.36%
46	0.11%	0.11%	0.26%	0.40%
47	0.12%	0.12%	0.28%	0.44%
48	0.14%	0.14%	0.30%	0.48%
49	0.16%	0.16%	0.31%	0.52%
50	0.19%	0.19%	0.33%	0.55%
51	0.22%	0.22%	0.37%	0.59%
52	0.24%	0.24%	0.41%	0.63%
53	0.28%	0.28%	0.46%	0.67%
54	0.31%	0.31%	0.54%	0.71%
55	0.35%	0.35%	0.62%	0.74%
56	0.39%	0.39%	0.72%	0.78%
57	0.43%	0.43%	0.82%	0.82%
58	0.48%	0.48%	0.93%	0.86%
59	0.52%	0.52%	1.02%	0.90%
60	0.58%	0.58%	1.12%	0.90%
61	0.63%	0.63%	1.20%	0.90%
62	0.70%	0.70%	1.26%	0.90%
63	0.77%	0.77%	1.28%	0.90%
64	0.77%	0.77%	1.28%	0.90%
65	0.00%	0.00%	0.00%	0.90%
66	0.00%	0.00%	0.00%	0.90%
67	0.00%	0.00%	0.00%	0.90%
68	0.00%	0.00%	0.00%	0.90%
69	0.00%	0.00%	0.00%	0.90%
70	0.00%	0.00%	0.00%	0.90%
71	0.00%	0.00%	0.00%	0.90%
72	0.00%	0.00%	0.00%	0.90%
Ref	19	19	186	517
Multiplier	75%	75%	80%	60%

ACTUARIAL ASSUMPTIONS
BASED ON 2007-2012 EXPERIENCE STUDY
SALARY SCALE – AGE BASED RATES

Age	% Merit Increases in Salaries Next Year	
	Uniformed Members	Non-Uniformed Members
20	6.0%	4.4%
21	6.0%	4.1%
22	6.0%	3.8%
23	5.5%	3.6%
24	4.9%	3.4%
25	4.2%	3.2%
26	3.5%	3.1%
27	3.4%	2.9%
28	3.1%	2.8%
29	2.8%	2.7%
30	2.5%	2.6%
31	2.2%	2.4%
32	1.9%	2.4%
33	1.8%	2.3%
34	1.7%	2.2%
35	1.5%	2.1%
36	1.4%	2.0%
37	1.3%	1.9%
38	1.2%	1.8%
39	1.2%	1.6%
40	1.1%	1.4%
41	1.0%	1.2%
42	0.9%	1.1%
43	0.9%	0.9%
44	0.8%	0.8%
45	0.7%	0.7%
46	0.6%	0.6%
47	0.6%	0.4%
48	0.5%	0.3%
49	0.5%	0.2%
50	0.5%	0.1%
51	0.4%	0.1%
52	0.4%	0.1%
53	0.3%	0.0%
54	0.3%	0.0%
55	0.3%	0.0%
56	0.3%	0.0%
57	0.2%	0.0%
58	0.2%	0.0%
59	0.2%	0.0%
60	0.2%	0.0%
61	0.2%	0.0%
62	0.2%	0.0%
63	0.2%	0.0%
64	0.2%	0.0%
65 & Over	0.2%	0.0%
Ref	403	11

ACTUARIAL ASSUMPTIONS
BASED ON 2007-2012 EXPERIENCE STUDY

SALARY SCALE – SERVICE BASED RATES

	% Merit Increases in Salaries Next Year	
Service Index	**Uniformed Members**	**Non-Uniformed Members**
1	10.0%	8.0%
2	10.0%	7.0%
3		4.5%
4		4.0%
Ref	518	519

ACTUARIAL ASSUMPTIONS
BASED ON 2007-2012 EXPERIENCE STUDY
NORMAL AND EARLY RETIREMENT PATTERN

	% of Active Participants Retiring								
	Closed and Year 2000 Plans					2011 Tier			
	Non-Uniformed Members				Uniformed	Non-Uniformed			Uniformed
	Male		Female			Normal		Early	
Age	Normal	Early	Normal	Early	Normal	Age & Service	Rule of 90		Normal
50	30%		25%		35%				
51	25%		20%		15%				
52	26%		20%		15%				
53	26%		20%		15%				
54	24%		24%		15%				
55	27%	3%	32%	3%	20%		30%		30%
56	30%	3%	35%	3%	15%		30%		30%
57	26%	4%	29%	3%	30%		30%		30%
58	22%	2%	25%	3%	35%		30%		30%
59	25%	4%	30%	3%	50%		30%		30%
60	19%	8%	22%	6%	100%		30%		30%
61	18%	4%	22%	5%	100%		30%		30%
62	45%	30%	36%	30%	100%		30%	10%	30%
63	37%	40%	22%	30%	100%		30%	10%	30%
64	25%	40%	20%	25%	100%		30%	10%	30%
65	35%		35%		100%		30%	10%	30%
66	40%		45%		100%		30%	10%	30%
67	25%		40%		100%	50%	30%		30%
68	30%		40%		100%	50%	30%		30%
69	30%		40%		100%	50%	30%		30%
70	40%		50%		100%	100%	100%		100%
71	50%		50%		100%	100%	100%		100%
72	50%		100%		100%	100%	100%		100%
73	50%		100%		100%	100%	100%		100%
74	100%		100%		100%	100%	100%		100%
Ref	2265	2267	2266	2268	2264	1873	1875	1262	1875
	50	55	50	55	50	67	55	62	55

ACTUARIAL ASSUMPTIONS
BASED ON 2007-2012 EXPERIENCE STUDY
RETIRED LIVES MORTALITY RATES

Age	% Dying Next Year	
	Male	Female
20	0.0244%	0.0149%
21	0.0254%	0.0148%
22	0.0267%	0.0146%
23	0.0278%	0.0147%
24	0.0293%	0.0152%
25	0.0305%	0.0158%
26	0.0320%	0.0165%
27	0.0343%	0.0176%
28	0.0353%	0.0184%
29	0.0363%	0.0194%
30	0.0380%	0.0204%
31	0.0410%	0.0225%
32	0.0461%	0.0270%
33	0.0519%	0.0308%
34	0.0582%	0.0341%
35	0.0648%	0.0370%
36	0.0713%	0.0398%
37	0.0776%	0.0424%
38	0.0834%	0.0449%
39	0.0876%	0.0477%
40	0.0912%	0.0509%
41	0.0949%	0.0554%
42	0.0988%	0.0608%
43	0.1035%	0.0669%
44	0.1088%	0.0736%
45	0.1152%	0.0808%
46	0.1223%	0.0868%
47	0.1290%	0.0930%
48	0.1362%	0.0992%
49	0.1437%	0.1072%
50	0.1516%	0.1159%
51	0.1599%	0.1274%
52	0.1802%	0.1431%
53	0.1930%	0.1610%
54	0.2111%	0.1819%
55	0.2313%	0.2064%
56	0.2666%	0.2389%
57	0.3141%	0.2806%
58	0.3567%	0.3210%
59	0.4074%	0.3621%
Ref	508 x 100%	509 x 100%
Set Back	1	1

Age	% Dying Next Year	
	Male	Female
60	0.4593%	0.4099%
61	0.5212%	0.4665%
62	0.6027%	0.5366%
63	0.6876%	0.6144%
64	0.7990%	0.7059%
65	0.9002%	0.7955%
66	1.0165%	0.8958%
67	1.1687%	1.0110%
68	1.3038%	1.1226%
69	1.4262%	1.2409%
70	1.5803%	1.3715%
71	1.7436%	1.5452%
72	1.9292%	1.6873%
73	2.1421%	1.8768%
74	2.3860%	2.0528%
75	2.6618%	2.2752%
76	3.0193%	2.4716%
77	3.3653%	2.7232%
78	3.8045%	3.0479%
79	4.2968%	3.3598%
80	4.8531%	3.7094%
81	5.4807%	4.1002%
82	6.2339%	4.5382%
83	7.0779%	5.0310%
84	7.8898%	5.5861%
85	8.9172%	6.2127%
86	9.8983%	7.0337%
87	10.9743%	7.9719%
88	12.3554%	9.0353%
89	13.8984%	10.0638%
90	15.3594%	11.3562%
91	17.2016%	12.5502%
92	18.7360%	13.7817%
93	20.6439%	15.0220%
94	22.2695%	16.5060%
95	23.8927%	17.7036%
96	25.9058%	18.8377%
97	27.4955%	19.8905%
98	29.0399%	21.1822%
99	31.0289%	22.0391%

Age	% Dying Next Year	
	Male	Female
100	32.4963%	22.7712%
101	33.9084%	23.3696%
102	35.8628%	24.4834%
103	37.1685%	25.4498%
104	38.3040%	26.6044%
105	39.2003%	27.9055%
106	39.7886%	29.3116%
107	40.0000%	30.7811%
108	40.0000%	32.2725%
109	40.0000%	33.7441%
110	40.0000%	35.1544%
111	40.0000%	36.4617%
112	40.0000%	37.6246%
113	40.0000%	38.6015%
114	40.0000%	39.3507%
115	40.0000%	39.8308%
116	40.0000%	40.0000%
117	40.0000%	40.0000%
118	40.0000%	40.0000%
119	100.0000%	40.0000%
120	100.0000%	100.0000%

ACTUARIAL ASSUMPTIONS
BASED ON 2007-2012 EXPERIENCE STUDY
DEATH-IN-SERVICE RATES

	% Dying Next Year	
Age	Male	Female
20	0.0171%	0.0075%
21	0.0178%	0.0074%
22	0.0187%	0.0073%
23	0.0195%	0.0074%
24	0.0205%	0.0076%
25	0.0214%	0.0079%
26	0.0224%	0.0083%
27	0.0240%	0.0088%
28	0.0247%	0.0092%
29	0.0254%	0.0097%
30	0.0266%	0.0102%
31	0.0287%	0.0113%
32	0.0323%	0.0135%
33	0.0363%	0.0154%
34	0.0407%	0.0171%
35	0.0454%	0.0185%
36	0.0499%	0.0199%
37	0.0543%	0.0212%
38	0.0584%	0.0225%
39	0.0613%	0.0239%
40	0.0638%	0.0255%
41	0.0664%	0.0277%
42	0.0692%	0.0304%
43	0.0725%	0.0335%
44	0.0762%	0.0368%
45	0.0806%	0.0404%
46	0.0856%	0.0434%
47	0.0903%	0.0465%
48	0.0953%	0.0496%
49	0.1006%	0.0536%
50	0.1061%	0.0580%
51	0.1119%	0.0637%
52	0.1261%	0.0716%
53	0.1351%	0.0805%
54	0.1478%	0.0910%
55	0.1619%	0.1032%
56	0.1866%	0.1195%
57	0.2199%	0.1403%
58	0.2497%	0.1605%
59	0.2852%	0.1811%
Ref	508 x 70%	509 x 50%
Set Back	1	1

	% Dying Next Year	
Age	Male	Female
60	0.3215%	0.2050%
61	0.3648%	0.2333%
62	0.4219%	0.2683%
63	0.4813%	0.3072%
64	0.5593%	0.3530%
65	0.6301%	0.3978%
66	0.7116%	0.4479%
67	0.8181%	0.5055%
68	0.9127%	0.5613%
69	0.9983%	0.6205%
70	1.1062%	0.6858%
71	1.2205%	0.7726%
72	1.3504%	0.8437%
73	1.4995%	0.9384%
74	1.6702%	1.0264%
75	1.8633%	1.1376%
76	2.1135%	1.2358%
77	2.3557%	1.3616%
78	2.6632%	1.5240%
79	3.0078%	1.6799%
80	3.3972%	1.8547%
81	3.8365%	2.0501%
82	4.3637%	2.2691%
83	4.9545%	2.5155%
84	5.5229%	2.7931%
85	6.2420%	3.1064%
86	6.9288%	3.5169%
87	7.6820%	3.9860%
88	8.6488%	4.5177%
89	9.7289%	5.0319%
90	10.7516%	5.6781%
91	12.0411%	6.2751%
92	13.1152%	6.8909%
93	14.4507%	7.5110%
94	15.5887%	8.2530%
95	16.7249%	8.8518%
96	18.1341%	9.4189%
97	19.2469%	9.9453%
98	20.3279%	10.5911%
99	21.7202%	11.0196%

	% Dying Next Year	
Age	Male	Female
100	22.7474%	11.3856%
101	23.7359%	11.6848%
102	25.1040%	12.2417%
103	26.0180%	12.7249%
104	26.8128%	13.3022%
105	27.4402%	13.9528%
106	27.8520%	14.6558%
107	28.0000%	15.3906%
108	28.0000%	16.1363%
109	28.0000%	16.8721%
110	28.0000%	17.5772%
111	28.0000%	18.2309%
112	28.0000%	18.8123%
113	28.0000%	19.3008%
114	28.0000%	19.6754%
115	28.0000%	19.9154%
116	28.0000%	20.0000%
117	28.0000%	20.0000%
118	28.0000%	20.0000%
119	100.0000%	20.0000%
120	100.0000%	100.0000%

GRS
Gabriel Roeder Smith & Company
Consultants & Actuaries
One Towne Square
Suite 800
Southfield, MI 48076-3723
248.799.9000 phone
248.799.9020 fax
www.gabrielroeder.com

February 19, 2013

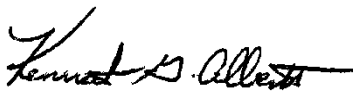
Mr. Scott Simon
Executive Director
Missouri Department of Transportation and
Highway Patrol Employees' Retirement System
1913 William Street
Jefferson City, MO 65109

Re: 2007 – 2012 MPERS Experience Study

Dear Scott:

Enclosed are 25 bound copies of the report and one 3-hole punched copy of the 2007 – 2012 MPERS Experience Study.

Sincerely,



Kenneth G. Alberts

KGA/dj
Enclosures

cc: Brian Murphy