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September 12, 2012

Ms. Jeanne Kopek, Assistant Director
State of Connecticut
Office of the State Comptroller
Retirement Services Division
55 Elm Street
Hartford, CT 06106

Dear Ms. Kopek:

Enclosed is the "Connecticut State Employees Retirement System Experience Investigation for the Four-Year Period Ending June 30, 2011". The investigation includes the economic and demographic experience for the Connecticut State Employees Retirement System (SERS).

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

Sincerely,

Thomas J. Cavanaugh, FSA, FCA, MAAA, EA
Chief Executive Officer

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

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

TJC/kc

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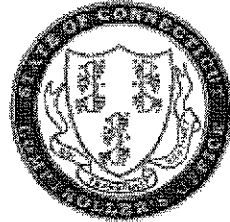
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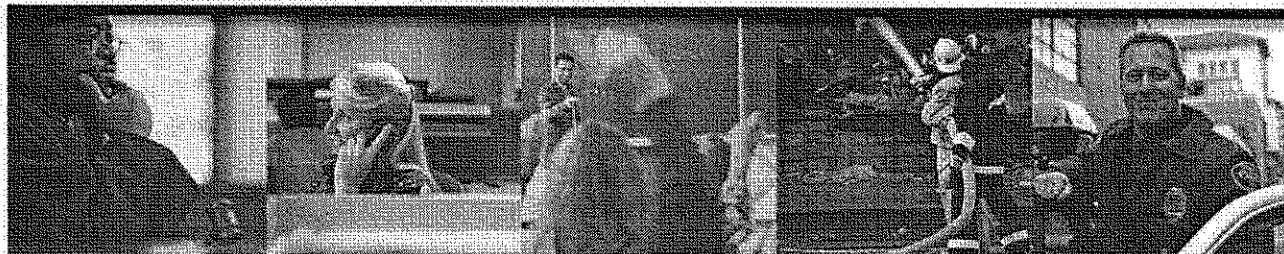
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**CONNECTICUT STATE EMPLOYEES
RETIREMENT SYSTEM**

**EXPERIENCE INVESTIGATION FOR THE
FOUR-YEAR PERIOD ENDING JUNE 30, 2011**





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September 12, 2012

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

Members of the Commission:

We are pleased to submit the results of an investigation of the economic and demographic experience for the Connecticut State Employees Retirement System (SERS). The purpose of the investigation was to assess the reasonability of the actuarial assumptions for the System. This investigation covers the four-year period from July 1, 2007 to June 30, 2011. As a result of the investigation, it is recommended that revised tables be adopted by the Board for future use.

The investigation of the experience of members of the System includes all active and retired members as well as beneficiaries of deceased members. In some instances, the experience was investigated separately for males and females since different tables are used for each of these groups.

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

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

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

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Members of the Commission
September 12, 2012

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

Respectfully submitted,

Handwritten signature of Thomas J. Cavanaugh in cursive.

Thomas J. Cavanaugh, FSA, FCA, MAAA, EA
Chief Executive Officer

Handwritten signature of John J. Garrett in cursive.

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

Handwritten signature of Edward J. Koebel in cursive.

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

TJC:kc



TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
I	Executive Summary	1
II	Economic Assumptions	3
III	Demographic Assumptions	16
	Rates of Withdrawal	17
	Rates of Disability Retirement	27
	Rates of Service Retirement	30
	Rates of Mortality	34
	Rates of Salary Increase	40
	Other Assumptions and Methods	41
 <u>Appendix</u>		
A	Historical June CPI (U) Index	43
B	Capital Market Assumptions and Asset Allocation	44
C	Social Security Administration Wage Index	46
D	Recommended Rates	47



Section I: Executive Summary

Section I Executive Summary

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

Economic Assumption Changes

The table below lists the three primary economic assumptions used in the actuarial valuations and their current and proposed rates. We present two recommendations which vary by the rate of price inflation assumed. We find either recommendation to be reasonable for the Committee's consideration.

Item	Current	Recommendation #1	Recommendation #2
Price Inflation	3.00%	3.00%	2.75%
Investment Return	8.25%	8.25%	8.00%
Wage Inflation	4.00%	4.00%	3.75%

Recommended Demographic Assumption Changes

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

Assumption	Changes
Withdrawal	Recommend change to current assumption
Disability Retirement	Recommend change to current assumption
Service Retirement	No changes
Mortality	Recommend change to current assumption
Salary Scale	No changes



Section I: Executive Summary

Financial Impact

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

Impact on Principal Valuation Results			
	Valuation Results 2011	Recommended Assumptions #1	Recommended Assumptions #2
Unfunded Accrued Liability	\$11,003,960,062	\$11,909,732,107	\$12,213,653,513
Funding Ratio	47.9%	45.9%	45.3%
Employer Annual Required Contribution Rate(ARC)			
Normal	7.14%	7.28%	7.38%
Accrued Liability	<u>21.72</u>	<u>23.81</u>	<u>24.54</u>
Total	28.86%	31.09%	31.92%
Amortization Period (in years)	20	20	20



Section II: Economic Assumptions

Section II Economic Assumptions

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

- Price Inflation
- Investment Return
- Wage Inflation

The Actuarial Standards Board has issued Actuarial Standard of Practice (ASOP) No. 27, "Selection of Economic Assumptions for Measuring Pension Obligations", which provides guidance to actuaries in selecting economic assumptions for measuring obligations under defined benefit plans. As noted in ASOP No. 27, because no one knows what the future holds, the best an actuary can do is to use professional judgment to estimate possible future economic outcomes based on a mixture of past experience and future expectations. These estimates therefore are best stated as a range utilizing the actuary's professional judgment. In setting the range and the single point within that range to use, the actuary should consider a number of factors, including the purpose and nature of the measurement, and appropriate recent and long-term historical economic data. However, the standard explicitly advises the actuary not to give undue weight to recent experience.

Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with every other economic assumption over the measurement period.

In our opinion, the economic assumptions recommended in this report have been developed in accordance with ASOP No. 27. The following table shows our recommendations followed by detailed discussions of each assumption.

Item	Current	Recommendation #1	Recommendation #2
Price Inflation	3.00%	3.00%	2.75%
Real Rate of Return	<u>5.25</u>	<u>5.25</u>	<u>5.25</u>
Investment Return	8.25%	8.25%	8.00%
Price Inflation	3.00%	3.00%	2.75%
Real Wage Growth	<u>1.00</u>	<u>1.00</u>	<u>1.00</u>
Wage Inflation	4.00%	4.00%	3.75%



Section II: Economic Assumptions

Price Inflation

Background: As can be seen from the table on the previous page, assumed price inflation is used as the basis for both the investment return assumption and the wage inflation assumption. These latter two assumptions will be discussed in detail in the following sections.

It is important that the price inflation assumption be consistently applied throughout the economic assumptions utilized in an actuarial valuation. This is called for in ASOP No. 27 and is also required to meet the parameters for determining pension liabilities and expense under Governmental Accounting Standards Board (GASB) Statements No. 25 and 27.

The current price inflation assumption is 3.00% per year.

Past Experience: The Consumer Price Index, US City Average, All Urban Consumers, CPI (U), has been used as the basis for reviewing historical levels of price inflation. The table below provides historical annualized rates and annual standard deviation of the CPI-U over periods ending June 30th.

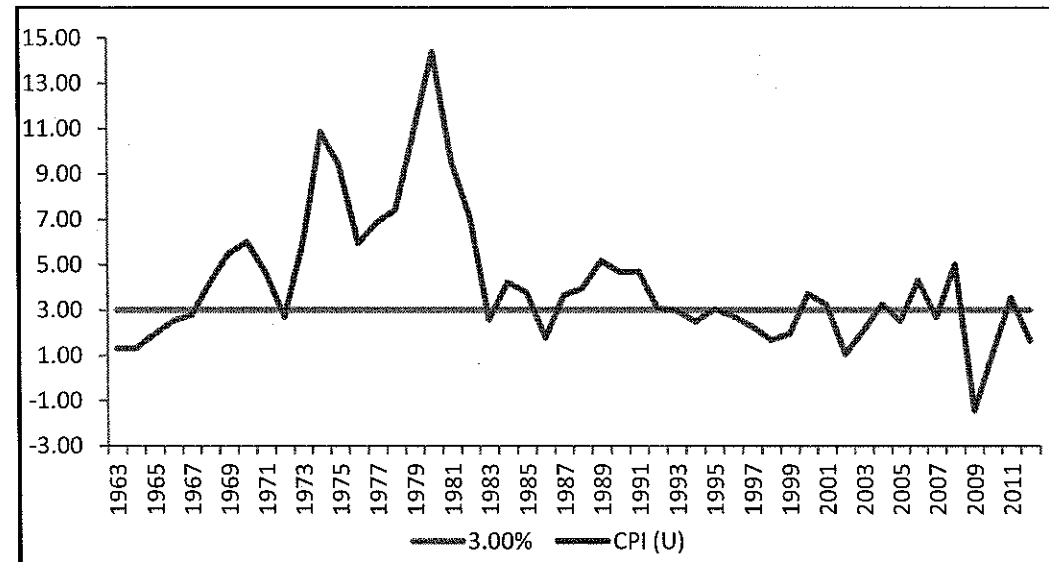
Period	Number of Years	Annualized Rate of Inflation	Annual Standard Deviation
1926 - 2012	86	3.00%	4.20%
1952 - 2012	60	3.66	2.91
1962 - 2012	50	4.14	2.92
1972 - 2012	40	4.36	3.14
1982 - 2012	30	2.91	1.39
1992 - 2012	20	2.49	1.37
2002 - 2012	10	2.46	1.82

The following graph illustrates the historical levels of price inflation measured as of June 30th of each of the last 50 years and compared to the current 3.00% annual rate currently assumed.



Section II: Economic Assumptions

Annual Rate of CPI (U) Increases



Over shorter historical periods, the average annual rate of increase in the CPI-U has been below 3.00%. The period of high inflation from 1973 to 1982 has a significant impact on the averages over periods which include these rates. Further, the average rate of 3.00% over the entire 86-year period is close to the average rate of 2.91% for the prior 30 years (1982 to 2012) but the volatility of the annual rates in the more recent years has been markedly lower as indicated by the significantly lower annual standard deviations. Many experts attribute the lower average annual rates and lower volatility to the increased efforts of the Federal Reserve since the early 1980's to stabilize price inflation. As the Fed's efforts to promote stability in price inflation are expected to continue, we give greater weight to the 30-year historical period in our analysis.

Additional information to consider in formulating this assumption is obtained from measuring the spread on Treasury Inflation Protected Securities (TIPS) and from the prevailing economic forecasts. The spread between the nominal yield on treasury securities (bonds) and the inflation indexed yield on TIPS of the same maturity is referred to as the "breakeven rate of inflation" and represents the bond market's expectation of inflation over the period to maturity. The table below provides the calculation of the breakeven rate of inflation as of June 30, 2012.

Years to Maturity	Nominal Bond Yield	TIPS Yield	Breakeven Rate of Inflation
10	1.67%	-0.46%	2.13%
20	2.38	0.15	2.23
30	2.76	0.56	2.20

The bond market's expectation for the rate of inflation over the next 30 years is 2.20% which is lower than long term historical average rate. Additionally, based upon information contained in



Section II: Economic Assumptions

the "Survey of Professional Forecasters" for the second quarter of 2012 as published by the Philadelphia Federal Reserve Bank, the mean expected annual rate of inflation for the ten years beginning July 1, 2012 is 2.48%. Although 10 years of future expectation is too short of a period for the basis of our inflation assumption, the information does provide additional evidence that the consensus expectations of these experts are for significantly lower rates of inflation than the historical average for the near term future.

A most recent survey of large public plans, the *Public Fund Survey*, which is jointly sponsored by the National Association of State Retirement Administrators and the National Council on Teacher Retirement, shows that the median inflation assumption decreased from last year's results by 0.25% to 3.25% and the most common rate for this assumption among these plans is 3.00%. This reflects the updates through December of 2011 of the fiscal year 2010 survey results.

Recommendation: It is difficult to predict the annual rate of inflation. Current economic forecasts and the bond market suggest lower inflation over the next ten to thirty years which is a shorter time period than appropriate for our purposes. In the 2012 OASDI Trustees Report, the Chief Actuary for Social Security bases the 75 year cost projections on an intermediate inflation assumption of 2.8% with a range of 1.8% to 3.8%. We determine a reasonable range of 2.0% - 4.0% and note that the current rate of inflation assumption of 3.00% is at the mid-point of the range. We find that a reduction in the inflation assumption of 0.25% is an equally reasonable assumption which recognizes the lower than historical inflation outlook of both the bond market and professional forecasters.

Price Inflation Assumption	
Current	3.00%
Reasonable Range	2.00% - 4.00%
Recommendation #1	3.00%
Recommendation #2	2.75%

Assumed Cost-of-Living Adjustment (COLA)

The current Cost-of-Living Adjustment (COLA) assumption is based on the following table:

Group	Rate
Pre July 1, 1980 Retirees	3.60%
July 1, 1980 – June 30, 1997 Retirees	3.00%
July 1, 1997 – October 1, 2011 Retirees	2.70%
Post October 1, 2011 Retirees	2.50%



Section II: Economic Assumptions

For those retiring after June 30, 1997 (but before October 2, 2011) and who have not irrevocably elected the fixed rate COLA, the rate of increase is the 60% of the increase in Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W) up to 6% and 75% of the increase above a 6% rate of increase with the resulting COLA rate being no less than 2.5% or greater than 6%. The current COLA assumption for this pre October 2, 2011 variable COLA group is 2.7% which represents approximately the 75th percentile of the historic COLA rates based on the CPI-W.

Those retiring on or after October 2, 2011, the formula is similar but the minimum adjustment is 2.0% and the maximum is 7.5%. The current COLA assumption for this post October 1, 2011 variable COLA group is 2.5% which again represents approximately the 75th percentile of historic COLA rates based on the CPI-W. Under the lower inflation recommendation there is a corresponding decrease to the COLA assumption. Below are our recommendations.

Post 7/1/1997 to Pre 10/2/2011 Variable COLA Assumption	
Current	2.7%
Recommendation #1	2.7%
Recommendation #2	2.6%
Post 10/1/2011 Variable COLA Assumption	
Current	2.5%
Recommendation #1	2.5%
Recommendation #2	2.3%



Section II: Economic Assumptions

Rate of Investment Return

Background: The assumed rate of investment return is one of the most significant assumptions in the annual actuarial valuation process as it is used to discount the expected benefit payments for all active, inactive and retired members of the divisions. Minor changes in this assumption can have a major impact on valuation results. The investment return assumption should reflect the asset allocation target for the funds set by the Board of Trustees.

The current assumption is 8.25%, consisting of a price inflation assumption of 3.00% and a real rate of return assumption of 5.25%. The return is net of expenses.

Past Experience: The assets for the System are valued using a widely accepted asset-smoothing methodology that fully recognizes the expected investment income and also recognizes 1/5th of each year's investment gain or loss (the difference between actual and expected investment income). The recent experience over the last ten years is shown in the table below:

Year Ending 6/30	Actuarial Value	Market Value
2002	5.84%	-6.61%
2003	5.08	1.91
2004	6.74	15.20
2005	7.37	10.45
2006	8.03	11.01
2007	9.80	17.11
2008	6.76	-4.80
2009	2.60	-18.62
2010	2.57	13.45
2011	3.74	21.39
Average	5.83%	5.32%

Historical returns over such a short time period are not credible for the purpose of setting the long-term assumed future rate of return. In determining the reasonable range for this assumption we first look at long-term historical returns of broad market indices. We focus on the returns of stocks and high-quality bonds because they are two major asset classes of typical allocations and have significant amounts of associated historical data.

Historical Analysis: Utilizing the historical real rates of return of the S&P 500 and the Intermediate Government Bond Index for the last 85 years and as contained in the latest data from Ibbotson, we determine the historical compound average annual rate of return of common



Section II: Economic Assumptions

asset allocations of large retirement funds (40% stocks/60% bonds to 70% stocks/30% bonds). On this basis the initial reasonable range for expected real rates of return is from 4.55% to 5.77%. We then add the historical inflation rate of 3.00% to the reasonable range of real returns. This yields an initial reasonable range for the long-term investment rate of return assumption of 7.55% to 8.77% based upon historical returns of the broad market indices under common allocations of stocks and bonds.

We next include in our analysis information concerning the future expectation for this assumption. In assessing the future expectation of investment returns, we prefer to analyze the capital market assumptions of the investment professionals assisting the State in determining its investment policies and asset allocations.

Future Expectation Analysis: The long-term capital market assumptions and current target asset allocation as provided to us by the State Treasurer's Office are shown in Appendix B. Using statistical methods, we determine that based on the assumptions for expected returns and volatility and using the target allocation among the asset classes, the median compound average rate of return is 8.24% and utilizes an assumed 2.10% annual rate of inflation (resulting in a median 6.14% real rate of return expectation).

The current Actuarial Standards of Practice prescribe that a reasonable range for this assumption would be between the 25th and 75th percentile of long-term expected returns. Our analysis, presented in the table below, produces a reasonable range for the long-term investment return assumption, net of investment related expenses, between 7.03% and 9.46% as shown in the table below:

Time Span In Years	Mean Return	Standard Deviation	Expected Returns by Percentile				
			5 th	25 th	50 th	75 th	95 th
1	8.99%	12.88%	-10.81%	-0.02%	8.24%	17.19%	31.37%
5	8.39	5.71	-0.74	4.47	8.24	12.15	18.03
10	8.32	4.03	1.81	5.56	8.24	10.99	15.08
20	8.28	2.85	3.65	6.34	8.24	10.18	13.03
30	8.27	2.33	4.48	6.68	8.24	9.82	12.14
50	8.26	1.80	5.32	7.03	8.24	9.46	11.25

Based on this analysis, there is 50% likelihood that the average net return will be 8.24% or more over a 50-year period. It can be inferred that the current 8.25% return assumption would have a slightly below 50% likelihood.

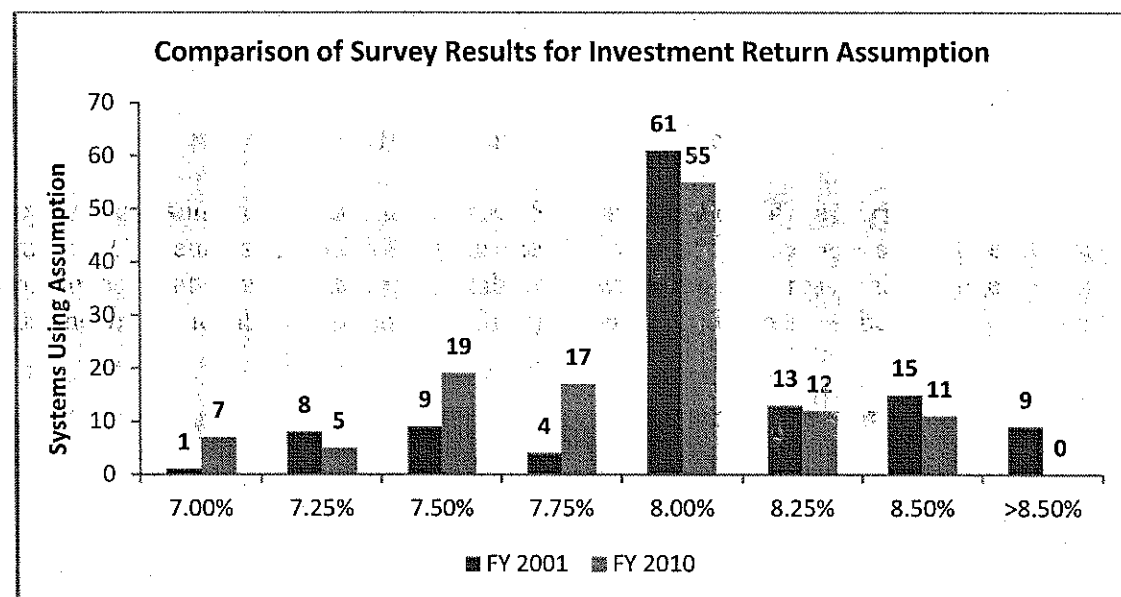
It is important to note that capital market assumptions vary significantly from consultant to consultant and from year to year. Further, a consultant's long-term assumptions may vary significantly from the same consultants short-term assumptions for the same effective date. In



Section II: Economic Assumptions

this case we received the long-term assumptions (30-year) of the investment consultant where we more commonly are provided the assumptions for a forecast period of not more than 10 years. Based upon our review of several investment consultants' assumptions, we note that under assumptions applicable for a shorter forecast period, we would expect that the median investment return produced would be materially less, typically between 7.5% and 8.0%.

Review of the *Public Fund Survey* finds that as of the December 2011 update to the fiscal year 2010 results, 8.00% remains the median rate for this assumption. From the table above, an 8.00% average annual return over the 50 year period ranks at 44th percentile. In other words there is approximately a 56% likelihood that the long term average rate of return will be at least 8.00%. Further review of the latest survey results with historical results shows a clear shift in this assumption to lower assumed rates of return since the fiscal year 2001 survey as shown in the chart below:



Recommendation: The analysis of both the long-term historical and long-term future expectation produces consistent results. We are recommending a range for the investment return assumption based upon the equal weighting of the historical reasonable range of 7.6% to 8.8% with the 25th to 75th percentile of future expected returns over the 50 year time span from the table above (7.0% to 9.5%). This results in a reasonable range for long-term rates of return of 7.3% to 9.1%. The mid-point of this range is 8.2%. The current assumption of 8.25% is well within the reasonable range but slightly higher than the midpoint. This assumption is composed of a 5.25% assumed real rate of return and a 3.00% assumed rate of inflation. Under the 2.75% assumed rate of inflation, the assumed rate of investment return is 8.00% utilizing the same 5.25% real return assumption. This second recommendation is provided for the Committee's consideration of an assumption which is slightly below the midpoint of the reasonable range. Our analysis is summarized in the tables below:



Section II: Economic Assumptions

Investment Rate of Return Assumption	
Current	8.25%
Reasonable Range	7.3% - 9.1%
Recommendation #1	8.25%
Recommendation #2	8.00%

Impact on Principal Valuation Results			
	Valuation Results 2011	Recommended Assumptions #1 8.25%	Recommended Assumptions #2 8.00%
Unfunded Accrued Liability	\$11,093,960,062	\$11,909,732,107	\$12,213,653,513
Funding Ratio	47.9%	45.9%	45.3%
Employer Annual Required Contribution Rate(ARC)			
Normal	7.14%	7.28%	7.38%
Accrued Liability	<u>21.72</u>	<u>23.81</u>	<u>24.54</u>
Total	28.86%	31.09%	31.92%
Amortization Period (in years)	20	20	20



Section II: Economic Assumptions

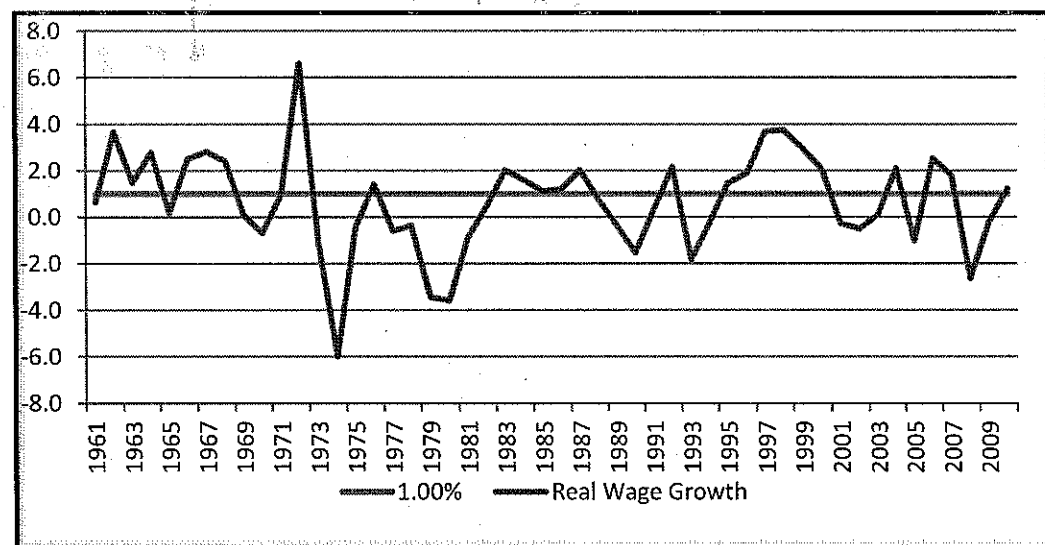
Wage Inflation

Background: The assumed future increases in salaries consist of an inflation component and a component for promotion and longevity, often called merit increases. The latter are generally age and or service related, and will be dealt with in the demographic assumption section of the report. Wage inflation normally is greater than price inflation as a reflection of the overall return on labor in the economy. The rate of wage inflation above inflation is called the real rate of wage inflation and is the focus of our analysis.

The current wage inflation assumption is 4.00%, and is composed of a 3.00% rate of inflation assumption and a 1.00% real rate of wage inflation.

Past Experience: The Social Security Administration publishes data on wage growth in the United States. Appendix C shows the last 50 calendar years' data. As with our analysis of inflation, we provide below wage inflation and a comparison with price inflation over various time periods. Currently this wage data is only available through calendar year 2010. We remove the rate of price inflation for each year from the data to result in the historical real rate of wage inflation. The graph below provides a comparison of the real wage inflation data as compared to the current 1.00% assumed rate.

Annual Real Rates of Wage Growth





Section II: Economic Assumptions

The table below provides the historical data as average annual rates over various periods.

Period	Wage Inflation	Price Inflation	Real Wage Growth
2000-2010	2.63%	2.34%	0.29%
1990-2000	4.34	2.66	1.68
1980-1990	5.33	4.48	0.85
1970-1980	7.30	8.05	(0.75)
1960-1970	4.44	2.94	1.50
1990-2010	3.48	2.50	0.98
1980-2010	4.09	3.16	0.93
1970-2010	4.88	4.36	0.52
1960-2010	4.80	4.07	0.73

As the analysis of the national wage growth data shows, the shorter-term historical average real rate (0.29% for latest 10 year period) is significantly lower than the longer-term average real rates. The rate of real wage inflation over the prior 20 and 30 year periods is 0.98% and 0.93% respectively. Over the longer term, 50 years, the rate is 0.73% but this period is impacted by the high inflation experienced over the period between 1970 and 1980. Similarly to our discussion of the inflation assumption, we prefer to emphasize the analysis based on post-1980 data in anticipation of the continuation of the Federal Reserves' proactive stance on stabilizing inflation.

Over the study period (7/1/2007 to 6/30/2011), the experience data exhibits an average "across the board" rate of wage increase of 2.97%. The rate of inflation experienced over the same period is 2.02% and results a real rate of wage inflation of 0.95% for the study period.

Recommendation: As with price inflation, we again look at the 2012 OASDI Trustees Report. The Chief Actuary for Social Security bases the 75 year cost projections on an ultimate national wage growth assumption 1.12% greater than the price inflation assumption of 2.8%. We concur in general with a range of .5% to 1.5%, and recommend continued use of a 1.00% per year real rate of wage growth which, when added to the recommended 3.00% and 2.75% price inflation rates, will result in the recommended rate of wage inflation assumption rates equal to 4.00% and 3.75%, respectively. Our findings are summarized in the table below.



Section II: Economic Assumptions

Wage Inflation Assumption		
Current	4.00%	
	Reasonable Range	
Real Wage Growth	0.50%	1.50%
Proposed Inflation	<u>2.75</u>	<u>3.00</u>
Total	3.25%	4.50%
Recommendation #1	4.00%	
Recommendation #2	3.75%	



Section II: Economic Assumptions

Payroll Growth Assumption

Background: The assumed future increases in the total payroll of active members is an assumption that only affects the amortization of the unfunded accrued liability and therefore the contribution amounts necessary to fully amortize the unfunded actuarial accrued liability over the specified amortization period.

The current assumption for the payroll growth assumption is 4.00% which is the assumed rate of wage inflation over the period (3.00% price inflation plus 1.00% real rate of wage increases).

Past Experience: Over the past 10 years, the total annual payroll of the System as shown in actuarial valuations has grown at an average annual rate of 1.4%. Over the past 19 years, the average annual rate of growth is 2.7%. It is important to note that the number of active participants has declined by over 11% since 2008 and is contributing to the lower than expected average rates of payroll increase.

Recommendation: The reasonable range for this assumption is typically between the rates of price inflation and the rate of wage inflation. The historical averages have been impacted by early retirement incentive programs as well as the effective date of the latest change in retirement eligibility under the 2011 SEBAC agreement. We prefer this assumption be the same as the assumed rate of wage inflation and recommend either keeping the current assumption of 4.00% or if the price inflation is lowered to 2.75%, then corresponding recommendation for the payroll growth assumptions is 3.75%.

Real Rate of Wage Increase Assumption	
Current	4.00%
Reasonable Range	3.00% to 4.00%
Recommendation #1	4.00%
Recommendation #2	3.75%



Section III: Demographic Assumptions

Section III Demographic Assumptions

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

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

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

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

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

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

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



Section III: Demographic Assumptions

RATES OF WITHDRAWAL

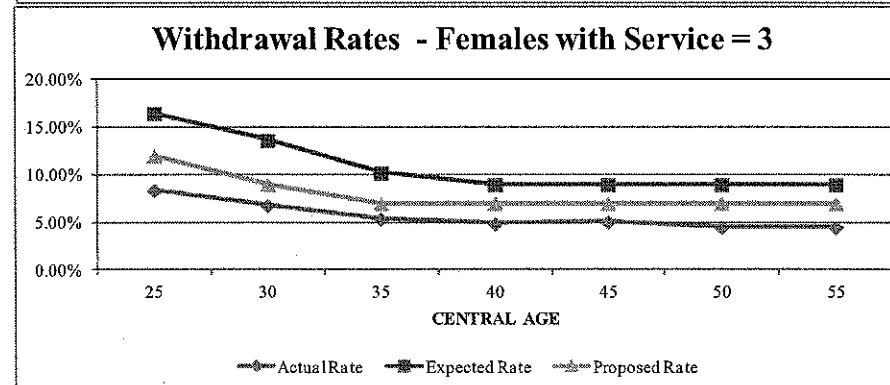
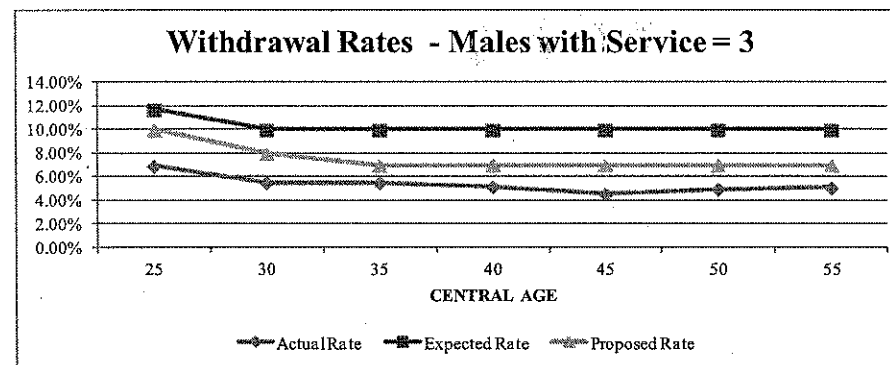
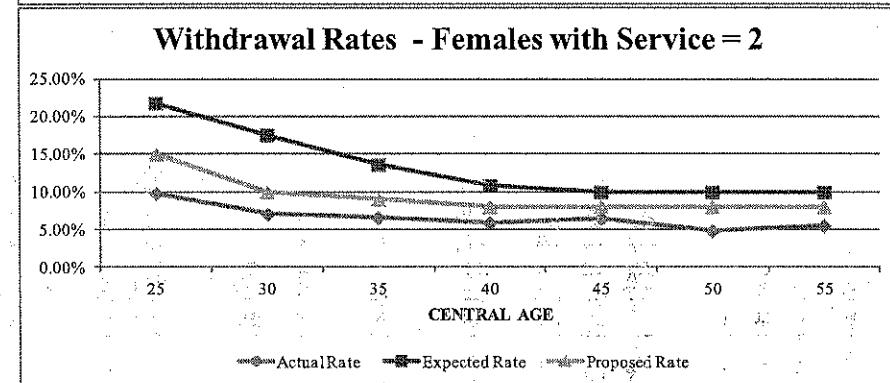
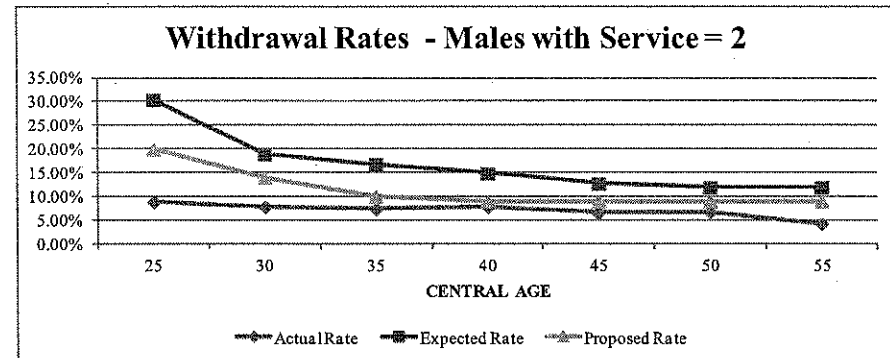
**COMPARISON OF ACTUAL AND EXPECTED WITHDRAWALS
FROM ACTIVE SERVICE
NON-HAZARDOUS**

CENTRAL AGE OF GROUP	NUMBER OF WITHDRAWALS					
	NONHAZARDOUS			NONHAZARDOUS		
	MALES		Ratio of Actual to Expected	FEMALES		Ratio of Actual to Expected
Actual	Expected	Actual		Expected		
20	476	487	0.977	361	308	1.172
25	506	724	0.699	522	820	0.637
30	376	545	0.690	545	871	0.626
35	288	496	0.581	452	735	0.615
40	336	564	0.596	488	724	0.674
45	385	634	0.607	548	742	0.739
50	420	587	0.716	571	674	0.847
55	342	416	0.822	408	414	0.986
TOTAL	3,129	4,453	0.703	3,895	5,288	0.737

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

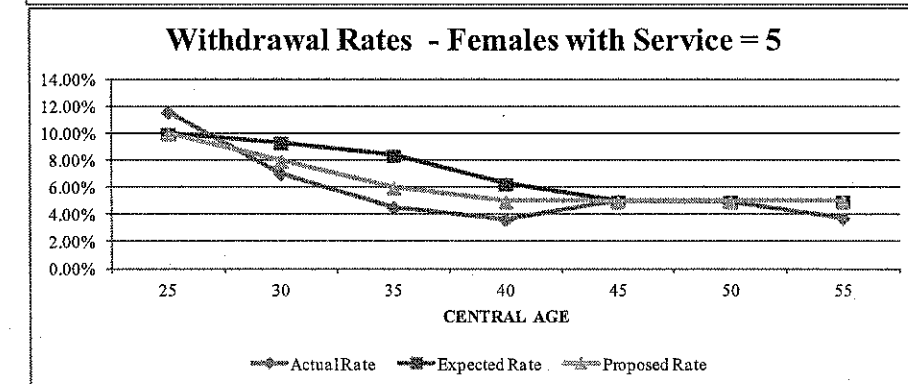
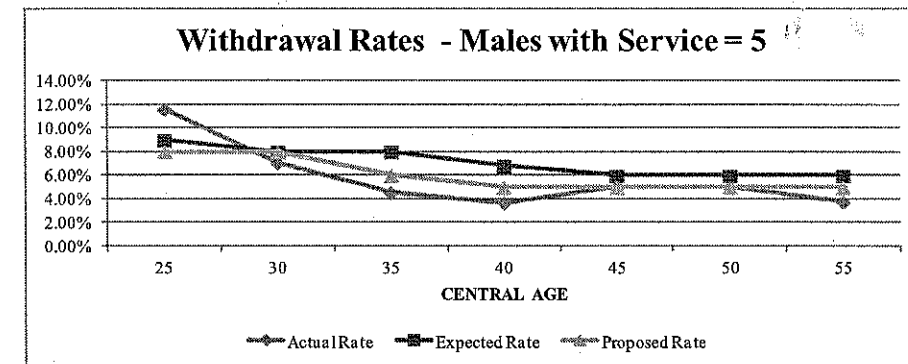
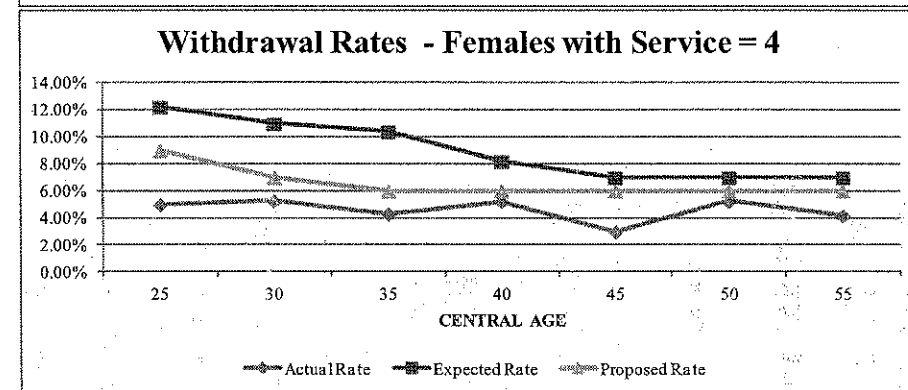
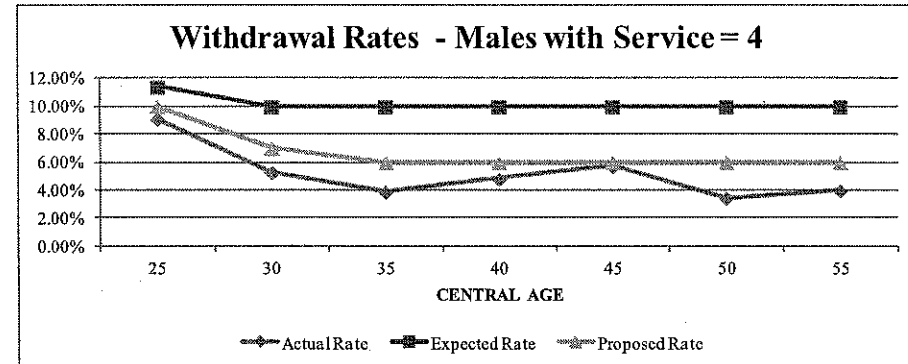


Section III: Demographic Assumptions



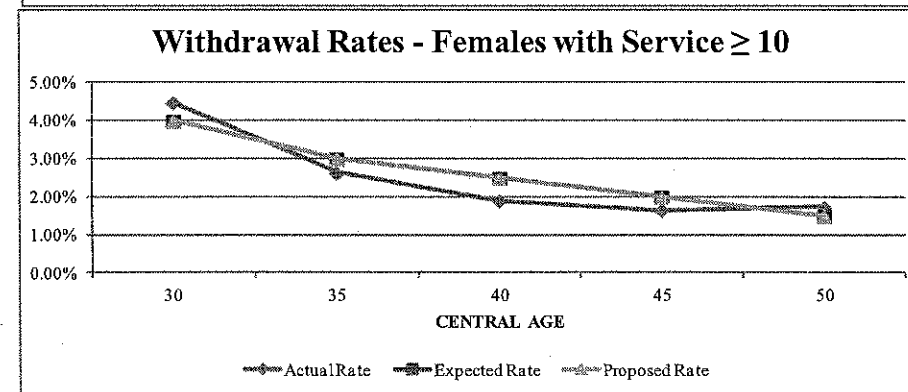
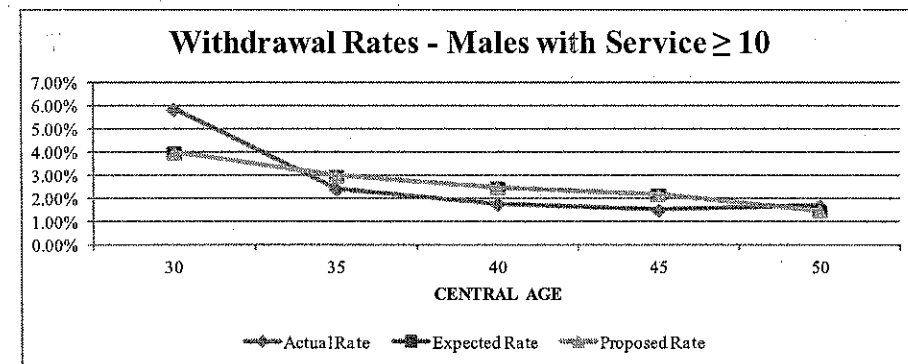
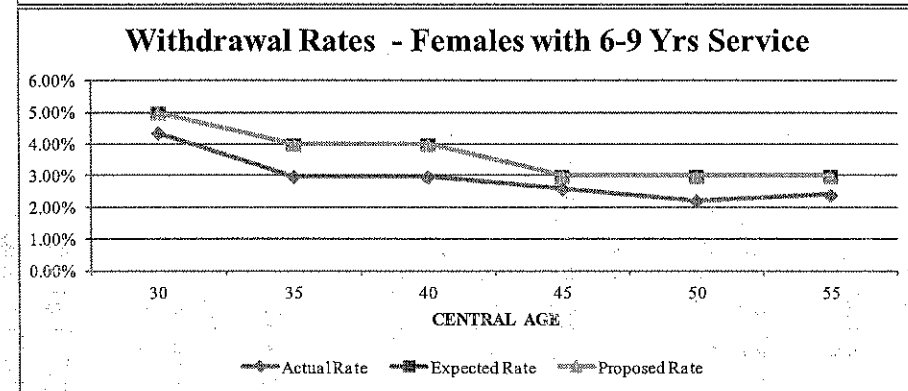
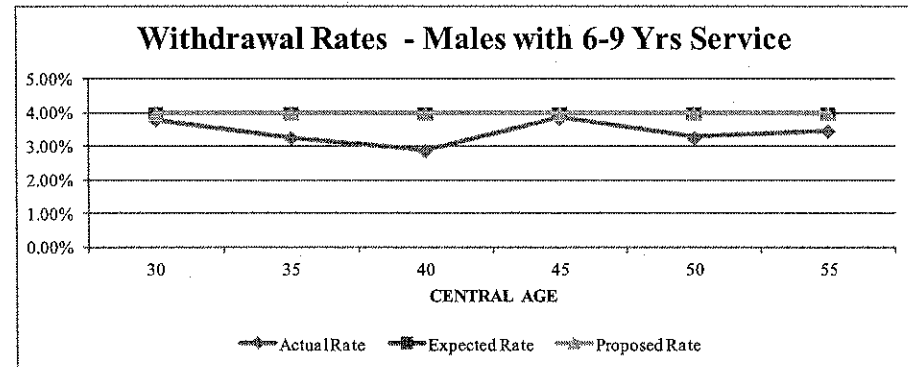


Section III: Demographic Assumptions





Section III: Demographic Assumptions





Section III: Demographic Assumptions

The rates of withdrawal adopted by the Board are used to determine the expected number of separations from active service which will occur as a result of resignation or dismissal. The preceding results indicate that the actual number of nonhazardous withdrawals that occurred during the study period were significantly less than expected at most age and service breakdowns except for the withdrawals that occurred below one year of service and those withdrawals with 5 or more years of service. In consideration of the recent economic conditions and labor markets, many public sector entities are experiencing lower withdrawal patterns in the early years of active service. While we do forecast this trend to continue in the near future, our proposed withdrawal rates do not apply full creditability to the actual experience but reflect slightly lower rates than the current assumptions for service bands 1-4 years.

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

COMPARATIVE RATES OF WITHDRAWAL FOR NONHAZARDOUS MEMBERS

AGE	PRESENT RATES OF WITHDRAWAL							
	Nonhazardous Males							
	Years of Service							
	0	1	2	3	4	5	6 to 9	10 & over
20	30.0 %	60.0 %	60.0 %	20.0 %	20.0 %	15.0 %	5.0 %	5.0 %
25	30.0	30.0	20.0	10.0	10.0	8.0	4.0	5.0
30	25.0	25.0	18.0	10.0	10.0	8.0	4.0	4.0
35	25.0	25.0	16.0	10.0	10.0	8.0	4.0	3.0
40	25.0	25.0	14.0	10.0	10.0	6.0	4.0	2.5
45	25.0	25.0	12.0	10.0	10.0	6.0	4.0	2.2
50	25.0	25.0	12.0	10.0	10.0	6.0	4.0	1.5
55	25.0	25.0	12.0	10.0	10.0	6.0	4.0	0.0

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



Section III: Demographic Assumptions

AGE	PRESENT RATES OF WITHDRAWAL							
	Nonhazardous Females							
	Years of Service							
	0	1	2	3	4	5	6 to 9	10 & over
20	30.0 %	50.0 %	30.0 %	20.0 %	20.0 %	15.0 %	5.0 %	5.0 %
25	25.0	30.0	20.0	16.0	11.0	10.0	5.0	5.0
30	20.0	20.0	16.0	12.0	11.0	9.0	5.0	4.0
35	20.0	20.0	12.0	9.0	10.0	8.0	4.0	3.0
40	15.0	18.0	10.0	9.0	7.0	5.0	4.0	2.5
45	15.0	18.0	10.0	9.0	7.0	5.0	3.0	2.0
50	15.0	18.0	10.0	9.0	7.0	5.0	3.0	1.5
55	15.0	18.0	10.0	9.0	7.0	5.0	3.0	0.0

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

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

CENTRAL AGE OF GROUP	NUMBER OF WITHDRAWALS					
	NONHAZARDOUS MALES			NONHAZARDOUS FEMALES		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
20	476	491	0.969	361	343	1.052
25	506	591	0.856	522	637	0.819
30	376	458	0.821	545	677	0.805
35	288	383	0.752	452	586	0.771
40	336	449	0.748	488	653	0.747
45	385	524	0.735	548	691	0.793
50	420	476	0.882	571	632	0.903
55	342	344	0.994	408	399	1.023
TOTAL	3,129	3,716	0.842	3,895	4,618	0.843



Section III: Demographic Assumptions

**COMPARISON OF ACTUAL AND EXPECTED WITHDRAWALS
FROM ACTIVE SERVICE
HAZARDOUS**

CENTRAL AGE OF GROUP	NUMBER OF WITHDRAWALS					
	HAZARDOUS			HAZARDOUS		
	MALES		Ratio of Actual to Expected	FEMALES		Ratio of Actual to Expected
Actual	Expected	Actual		Expected		
20	2	6	0.333	2	2	1.000
25	76	159	0.478	35	76	0.461
30	121	157	0.771	60	97	0.619
35	102	133	0.767	51	74	0.689
40	130	124	1.048	50	64	0.781
45	86	80	1.075	49	42	1.167
50	47	46	1.022	30	25	1.200
55	25	19	1.316	11	13	0.846
TOTAL	589	724	0.814	288	393	0.733

The preceding results indicate that the actual number of hazardous withdrawals that occurred during the study period were significantly less than expected in total. However at some older ages, the actual number of withdrawals was more than expected. Since the current hazardous withdrawal rates are based on a percentage of the current nonhazardous rates, we reviewed this methodology and find that maintaining the same percentages of the proposed withdrawal rates (35% Male and 55% Female), the proposed number of withdrawals for Hazardous employees better match the experience of the System. Therefore, we recommend that the hazardous withdrawal rates continue based on multiplying the nonhazardous rates by 35% for males and 55% for females.



Section III: Demographic Assumptions

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

COMPARATIVE RATES OF WITHDRAWAL FOR HAZARDOUS MEMBERS

AGE	PRESENT RATES OF WITHDRAWAL							
	Hazardous Males							
	Years of Service							
	0	1	2	3	4	5	6 to 9	10 & over
20	10.5 %	21.0 %	21.0 %	7.0 %	7.0 %	5.3 %	1.8 %	1.8 %
25	10.5	10.5	7.0	3.5	3.5	2.8	1.4	1.8
30	8.8	8.8	6.3	3.5	3.5	2.8	1.4	1.4
35	8.8	8.8	3.5	3.5	3.5	2.8	1.4	1.1
40	8.8	8.8	3.5	3.5	3.5	2.1	1.4	0.9
45	8.8	8.8	3.5	3.5	3.5	2.1	1.4	0.8
50	8.8	8.8	3.5	3.5	3.5	2.1	1.4	0.5
55	8.8	8.8	3.5	3.5	3.5	2.1	1.4	0.0

AGE	PROPOSED RATES OF WITHDRAWAL							
	Hazardous Males							
	Years of Service							
	0	1	2	3	4	5	6 to 9	10 & over
20	14.0 %	14.0 %	14.0 %	7.0 %	7.0 %	2.8 %	1.8 %	1.8 %
25	10.5	10.5	7.0	3.5	3.5	2.8	1.4	1.8
30	8.8	7.7	4.9	2.8	2.5	2.8	1.4	1.4
35	8.8	5.3	3.5	2.5	2.1	2.1	1.4	1.1
40	8.8	5.3	3.2	2.5	2.1	1.8	1.4	0.9
45	8.8	5.3	3.2	2.5	2.1	1.8	1.4	0.8
50	8.8	5.3	3.2	2.5	2.1	1.8	1.4	0.5
55	8.8	5.3	3.2	2.5	2.1	1.8	1.4	0.0



Section III: Demographic Assumptions

AGE	PRESENT RATES OF WITHDRAWAL							
	Hazardous Females							
	Years of Service							
	0	1	2	3	4	5	6 to 9	10 & over
20	16.5 %	27.5 %	16.5 %	11.0 %	11.0 %	8.3 %	2.8 %	2.8 %
25	13.8	16.5	11.0	8.8	6.1	5.5	2.8	2.8
30	11.0	11.0	8.8	6.6	6.1	5.0	2.8	2.2
35	11.0	11.0	6.6	5.0	5.5	4.4	2.2	1.7
40	8.3	9.9	5.5	5.0	3.9	2.8	2.2	1.4
45	8.3	9.9	5.5	5.0	3.9	2.8	1.7	1.1
50	8.3	9.9	5.5	5.0	3.9	2.8	1.7	0.8
55	8.3	9.9	5.5	5.0	3.9	2.8	1.7	0.0

AGE	PROPOSED RATES OF WITHDRAWAL							
	Hazardous Females							
	Years of Service							
	0	1	2	3	4	5	6 to 9	10 & over
20	19.3 %	24.8 %	16.5 %	11.0 %	11.0 %	5.5 %	2.8 %	2.8 %
25	13.8	13.8	8.3	6.6	5.0	5.5	2.8	2.8
30	11.0	11.0	5.5	5.0	3.9	4.4	2.8	2.2
35	11.0	8.3	5.0	3.9	3.3	3.3	2.2	1.7
40	11.0	8.3	4.4	3.9	3.3	2.8	2.2	1.4
45	11.0	8.3	4.4	3.9	3.3	2.8	1.7	1.1
50	11.0	8.3	4.4	3.9	3.3	2.8	1.7	0.8
55	11.0	8.3	4.4	3.9	3.3	2.8	1.7	0.0

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

CENTRAL AGE OF GROUP	NUMBER OF WITHDRAWALS					
	HAZARDOUS					
	MALES			FEMALES		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
20	2	6	0.333	2	2	1.000
25	76	142	0.535	35	60	0.583
30	121	135	0.896	60	74	0.811
35	102	115	0.887	51	60	0.850
40	130	108	1.204	50	57	0.877
45	86	70	1.229	49	38	1.289
50	47	39	1.205	30	23	1.304
55	25	18	1.389	11	12	0.917
TOTAL	589	633	0.930	288	326	0.883



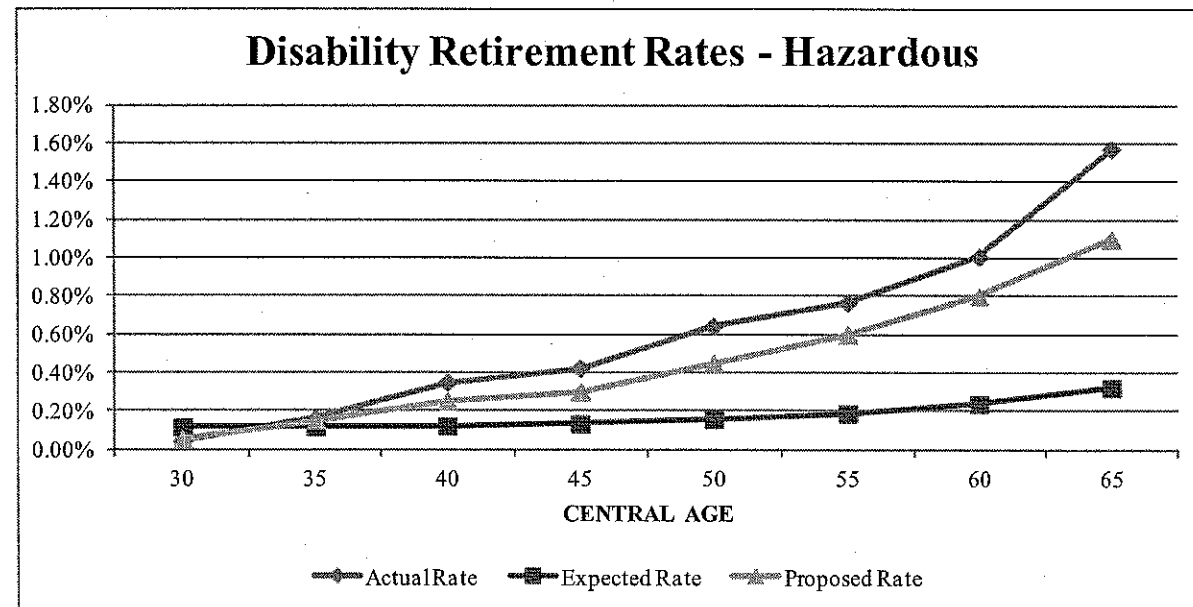
Section III: Demographic Assumptions

RATES OF DISABILITY RETIREMENT

COMPARISON OF ACTUAL AND EXPECTED DISABILITY RETIREMENTS

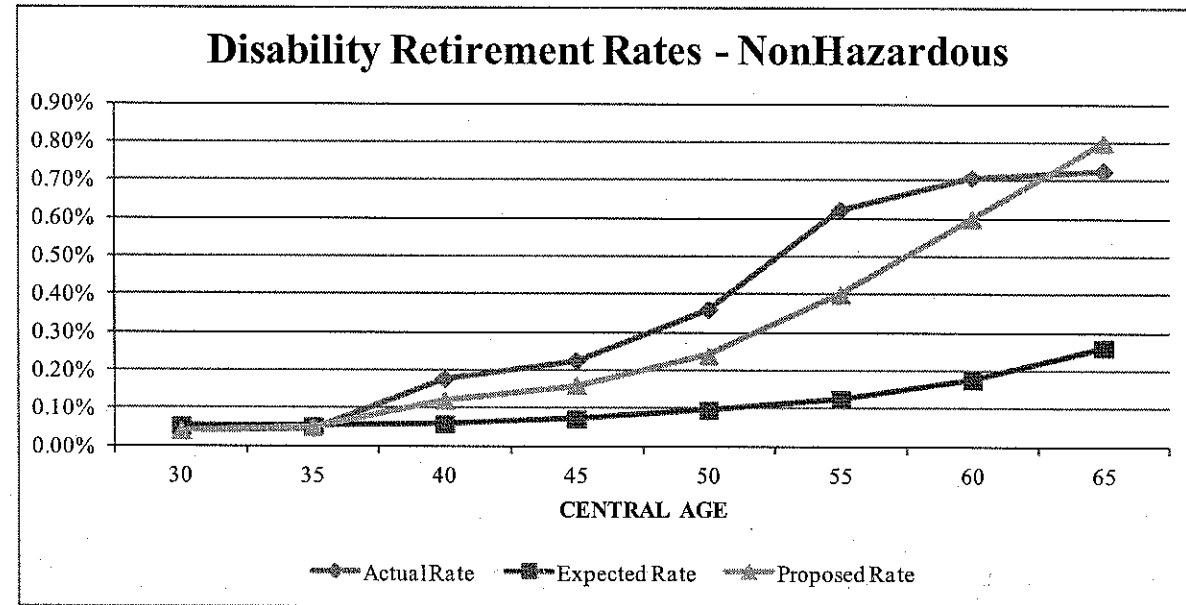
CENTRAL AGE OF GROUP	NUMBER OF DISABILITY RETIREMENTS					
	Hazardous			Nonhazardous		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
30	2	5	0.400	4	5	0.800
35	11	8	1.375	6	7	0.857
40	34	12	2.833	35	12	2.917
45	36	11	3.273	62	20	3.100
50	37	9	4.111	111	29	3.828
55	28	7	4.000	179	36	4.972
60	21	5	4.200	127	32	3.969
65	14	3	4.667	50	18	2.778
TOTAL	183	60	3.050	574	159	3.610

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





Section III: Demographic Assumptions



The preceding results indicate that the actual number of disability retirements was significantly more than expected during the study period over all age groups and for both hazardous and nonhazardous employees. We primarily attribute this to the continued improvement in the accuracy of current retirement designations that SERS staff is administering. The current rates of disability retirement for Non-Service disabilities used the 1975 Social Security Table. We recommend a change in the rates of disability retirement to more closely reflect the experience of the System and we recommend a post-decrement probability of 20% for In-Service disability retirements and 80% for Not-In-Service disability retirements.



Section III: Demographic Assumptions

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

COMPARATIVE RATES OF DISABILITY RETIREMENT

AGE	RATES OF DISABILITY RETIREMENT			
	Hazardous		Nonhazardous	
	Present	Proposed	Present	Proposed
30	0.11 %	0.05 %	0.05 %	0.04 %
35	0.11	0.15	0.05	0.05
40	0.12	0.25	0.06	0.12
45	0.13	0.30	0.07	0.16
50	0.16	0.45	0.10	0.24
55	0.19	0.60	0.13	0.40
60	0.24	0.80	0.18	0.60
65	0.32	1.10	0.26	0.80

**COMPARISON OF ACTUAL AND EXPECTED DISABILITY RETIREMENTS
BASED ON PROPOSED RATES**

CENTRAL AGE OF GROUP	NUMBER OF DISABILITY RETIREMENTS					
	Hazardous			Nonhazardous		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
30	2	2	1.000	4	4	1.000
35	11	10	1.100	6	6	1.000
40	34	24	1.417	35	24	1.458
45	36	26	1.385	62	44	1.409
50	37	26	1.423	111	74	1.500
55	28	22	1.273	179	115	1.557
60	21	17	1.235	127	108	1.176
65	14	10	1.400	50	55	0.909
TOTAL	183	137	1.336	574	430	1.335



Section III: Demographic Assumptions

RATES OF SERVICE RETIREMENT
COMPARISON OF ACTUAL AND EXPECTED RETIREMENTS

AGE	NUMBER OF SERVICE RETIREMENTS		
	Actual	Hazardous	Ratio of Actual to Expected
Expected			
Less than 44	246	84	2.923
44	124	45	2.773
45	132	54	2.431
46	147	58	2.537
47	123	49	2.531
48	111	47	2.385
49	124	33	3.769
50	117	31	3.786
51	84	27	3.158
52	89	29	3.112
53	87	27	3.175
54	78	24	3.250
55	93	22	4.247
56	97	21	4.709
57	63	15	4.200
58	57	13	4.524
59	46	11	4.340
60	50	18	2.841
61	58	17	3.452
62	61	16	3.861
63	52	14	3.768
64	31	11	2.952
65	24	8	3.057
TOTAL	2,094	670	3.127



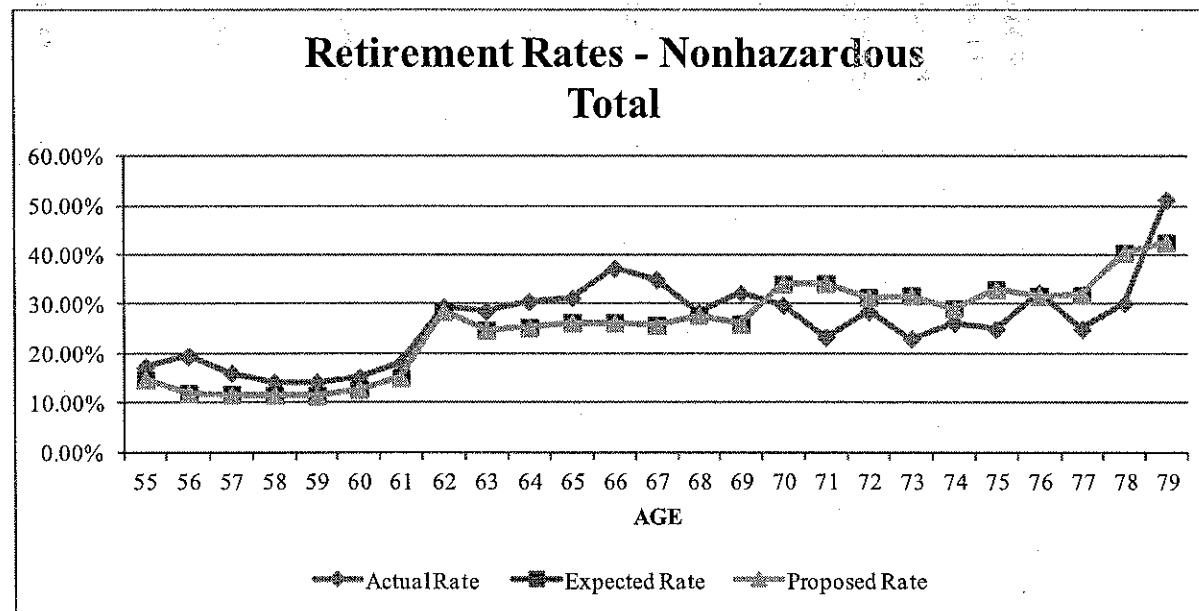
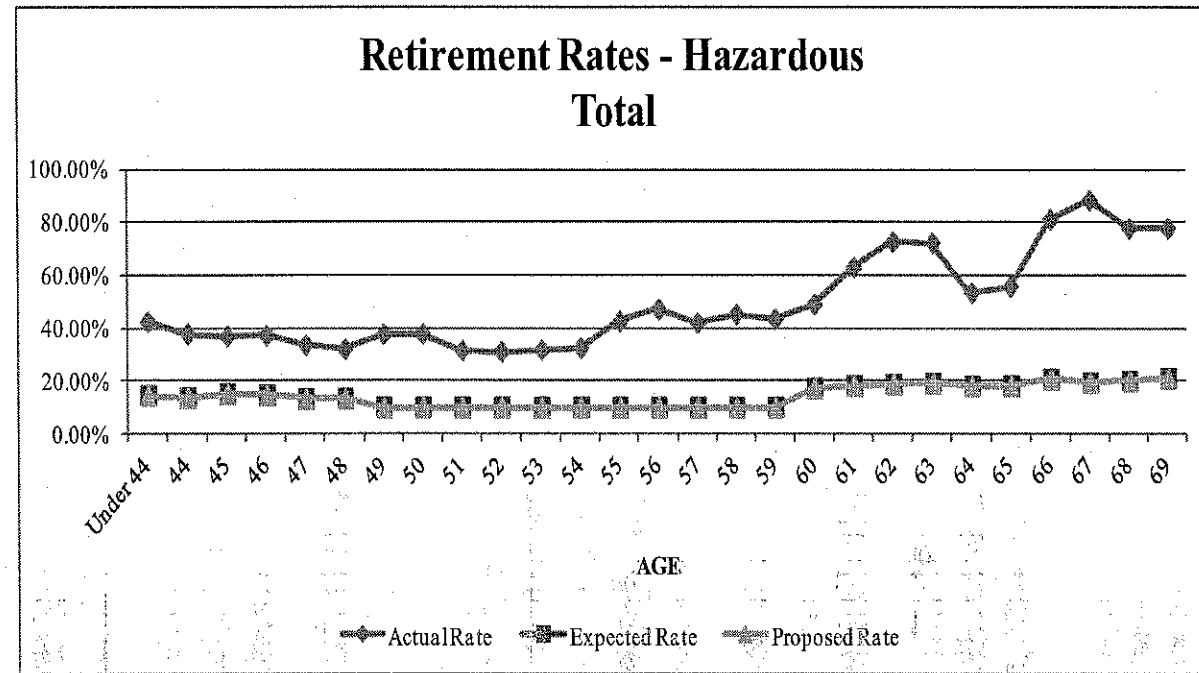
Section III: Demographic Assumptions

AGE	NUMBER OF SERVICE RETIREMENTS		
	Actual	Nonhazardous Expected	Ratio of Actual to Expected
55	810	690	1.174
56	825	506	1.632
57	577	420	1.373
58	457	372	1.228
59	411	331	1.243
60	412	347	1.187
61	438	366	1.198
62	622	604	1.029
63	452	392	1.154
64	370	307	1.206
65	287	241	1.190
66	284	200	1.421
67	206	152	1.359
68	117	114	1.023
69	103	83	1.240
70	81	93	0.871
71	46	67	0.682
72	50	55	0.909
73	32	44	0.724
74	32	36	0.899
75	20	26	0.758
76	22	22	1.019
77	13	17	0.783
78	13	17	0.747
79	20	17	1.205
TOTAL	6,700	5,518	1.214



Section III: Demographic Assumptions

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



The preceding results indicate that for service retirements, the actual number of retirements overall was significantly higher than the expected number over this period for both hazardous and nonhazardous employees. This is in large part due to the Retirement Incentive Program



Section III: Demographic Assumptions

(RIP) that was offered to members in 2009 and the 2011 SEBAC plan changes that caused many employees to retire between July 1, 2011 and October 2, 2011, which was accounted for in the June 30, 2011 valuation and the last period of this experience study. However, if we reviewed just the first two periods (2007-2008 and 2008-2009) in this study, the number of actual retirements was much closer to the expected number of retirements. Nevertheless, due to the 2011 SEBAC changes to both retirement and retiree health care, retirement eligibility will be expected to begin a trend toward later retirement ages. To take this into consideration, we made adjustments in the non-hazardous early retirement rates for the 2011 valuation. During the next experience study, we will review the retirement rates very carefully to see if the trend is holding.



Section III: Demographic Assumptions

RATES OF MORTALITY

**COMPARISON OF ACTUAL AND EXPECTED CASES OF
POST-RETIREMENT DEATHS**

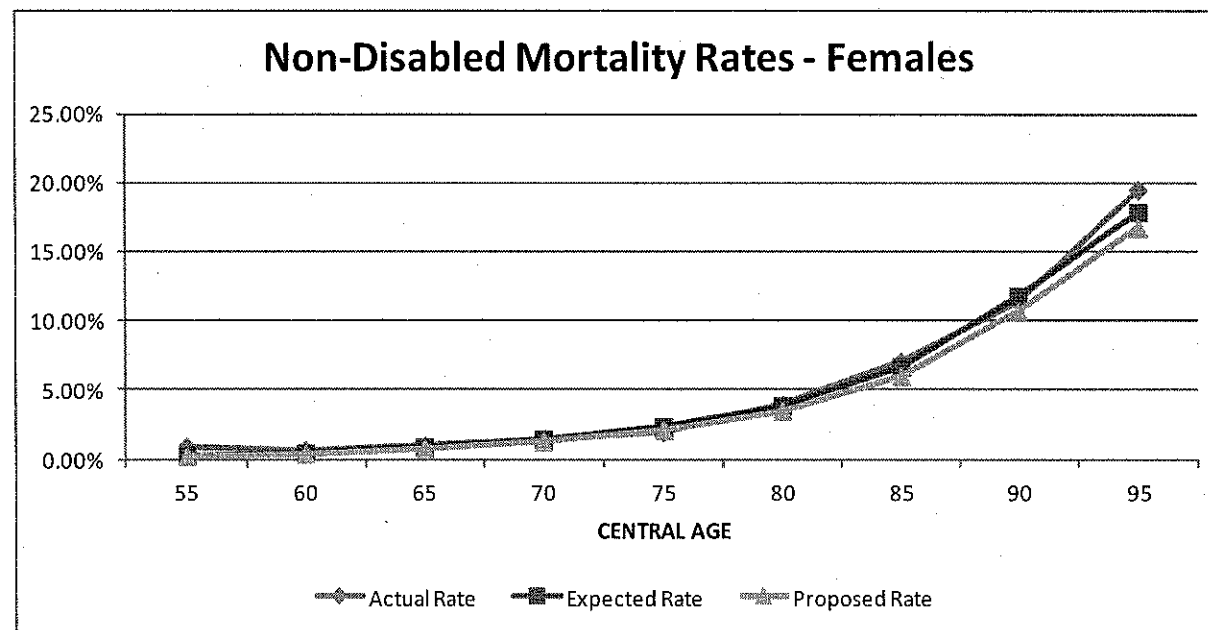
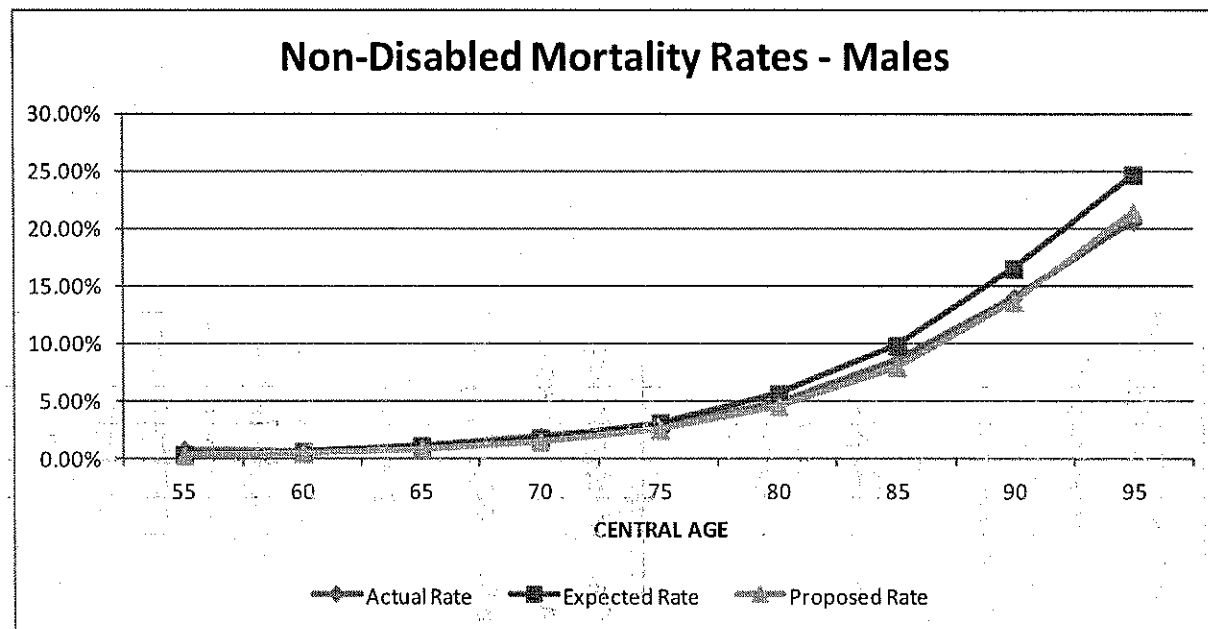
CENTRAL AGE OF GROUP	NUMBER OF POST-RETIREMENT DEATHS					
	MALES			FEMALES		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
SERVICE RETIREMENTS AND BENEFICIARIES						
55	33	13	2.538	31	9	3.444
60	66	57	1.158	66	45	1.467
65	132	127	1.039	129	111	1.162
70	193	184	1.049	172	174	0.989
75	271	286	0.948	211	251	0.841
80	385	446	0.863	418	409	1.022
85	449	519	0.865	599	566	1.058
90	323	380	0.850	518	537	0.965
95	110	132	0.833	306	281	1.089
98 & over	28	27	1.037	101	79	1.278
TOTAL	1,990	2,171	0.917	2,551	2,462	1.036
DISABILITY RETIREMENTS						
47 and Under	10	19	0.526	5	8	0.625
50	13	22	0.591	19	13	1.462
55	20	30	0.667	22	24	0.917
60	29	40	0.725	26	37	0.703
65	25	35	0.714	37	41	0.902
70	31	31	1.000	20	34	0.588
75	24	28	0.857	21	33	0.636
80	21	23	0.913	15	29	0.517
85	16	13	1.231	18	20	0.900
88 & over	10	10	1.000	12	21	0.571
TOTAL	199	251	0.793	195	260	0.750



Section III: Demographic Assumptions

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

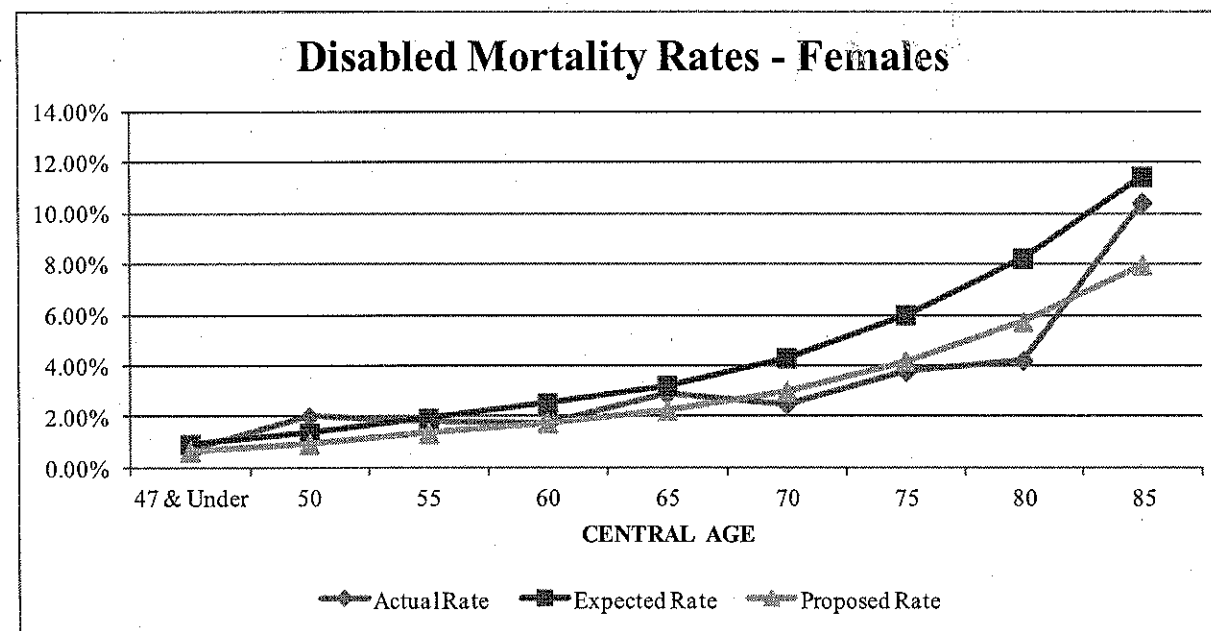
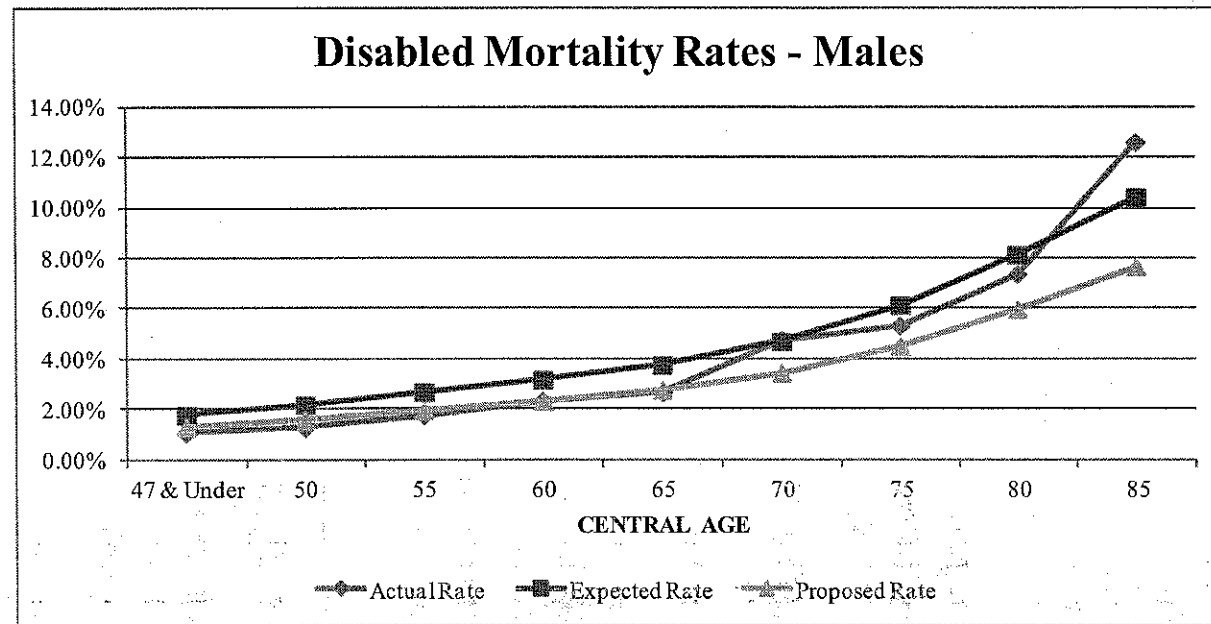
POST-RETIREMENT DEATHS SERVICE RETIREMENTS AND BENEFICIARIES OF DECEASED MEMBERS





Section III: Demographic Assumptions

POST-RETIREMENT DEATHS DISABILITY RETIREMENTS





Section III: Demographic Assumptions

The preceding results indicate that the actual number of non-disabled post-retirement deaths of service retirees and beneficiaries was slightly less than expected for males and slightly more than expected for females. For disability retirements, the actual mortality rates were significantly less than expected overall for males and females.

Since the current mortality table is a very recent published mortality table and the table uses projection scales to account for improved mortality in the future, we only recommend a small adjustment in each of the tables to get the expected results more in line with the experience of the System and to allow for some improved mortality in the future. We recommend that the male rates of mortality be set back 2 years and the female rates be set back 1 year. This results in a better margin for improved longevity in the future.

In addition, we recommend that the rates of disability mortality be revised to 55% of the RP-2000 Disabled Mortality Table for males and 80% of the RP-2000 Disabled Mortality Table for females.

We will use the same mortality rates for pre-retirement mortality as well.

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

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

AGE	RATES OF POST-RETIREMENT DEATH			
	SERVICE RETIREMENTS AND BENEFICIARIES			
	MALES		FEMALES	
	Present	Proposed	Present	Proposed
35	0.0717 %	0.0585 %	0.0360 %	0.0330 %
40	0.0957	0.0855	0.0484	0.0444
45	0.1239	0.1067	0.0751	0.0688
50	0.1628	0.1416	0.1092	0.1416
55	0.2718	0.2187	0.2223	0.1983
60	0.5297	0.4140	0.4460	0.3918
65	1.0309	0.8104	0.8563	0.7604
70	1.7702	1.4246	1.4770	1.3110
75	3.0622	2.4595	2.2993	2.0826
80	5.5360	4.4829	3.8490	3.4821
85	9.9680	8.0745	6.6628	5.9807
90	17.2706	14.1803	12.2153	11.0532



Section III: Demographic Assumptions

COMPARATIVE RATES OF POST-RETIREMENT DISABILITY MORTALITY

AGE	RATES OF POST-RETIREMENT DEATH DISABILITY RETIREMENTS			
	MALES		FEMALES	
	Present	Proposed	Present	Proposed
35	1.6928 %	1.2414 %	0.8567 %	0.5960 %
40	1.6928	1.2414	0.8568	0.5960
45	1.6928	1.2414	0.8568	0.5960
50	2.1731	1.5936	1.3265	0.9228
55	2.6582	1.9493	1.9026	1.3235
60	3.1532	2.3123	2.5115	1.7471
65	3.7631	2.7596	3.2230	2.2421
70	4.6937	3.4421	4.3280	3.0108
75	6.1550	4.5137	6.0065	4.1784
80	8.2029	6.0155	8.3159	5.7850
85	10.6202	7.7882	11.5233	8.0162
90	13.7556	10.0874	16.1056	11.2039



Section III: Demographic Assumptions

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

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

CENTRAL AGE OF GROUP	NUMBER OF POST-RETIREMENT DEATHS					
	MALES			FEMALES		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
SERVICE RETIREMENTS AND BENEFICIARIES						
55	33	10	3.300	31	8	3.875
60	66	44	1.500	66	39	1.692
65	132	99	1.333	129	99	1.303
70	193	149	1.295	172	157	1.096
75	271	230	1.178	211	227	0.930
80	385	360	1.069	418	370	1.130
85	449	420	1.069	599	508	1.179
90	323	313	1.032	518	486	1.066
95	110	114	0.965	306	263	1.163
98 & over	28	25	1.120	101	77	1.312
TOTAL	1,990	1,764	1.128	2,551	2,234	1.142
DISABILITY RETIREMENTS						
47 and Under	10	14	0.714	5	5	1.000
50	13	16	0.813	19	9	2.111
55	20	22	0.909	22	16	1.375
60	29	29	1.000	26	26	1.000
65	25	26	0.962	37	29	1.276
70	31	22	1.409	19	24	0.792
75	24	20	1.200	22	23	0.957
80	21	17	1.235	15	20	0.750
85	16	10	1.600	18	14	1.286
88 & over	10	7	1.429	12	15	0.800
TOTAL	199	183	1.087	195	181	1.077



Section III: Demographic Assumptions

RATES OF SALARY INCREASE COMPARISON OF ACTUAL AND EXPECTED SALARIES OF ACTIVE MEMBERS

SERVICE OF GROUP	SALARIES AT END OF YEAR (Millions)		
	MALES AND FEMALES		Ratio of Actual to Expected
Actual	Expected		
0	506	450	1.124
1	555	625	0.888
2	548	570	0.961
3	516	523	0.987
4	434	440	0.986
5	378	382	0.990
6	353	356	0.992
7	443	446	0.993
8	530	534	0.993
9	533	537	0.993
10	484	490	0.988
11	401	407	0.985
12	405	409	0.990
13	435	441	0.986
14	500	506	0.988
15+	5,773	5,831	0.990
TOTAL	12,794	12,947	0.988

The preceding results indicate that salary increases were slightly less than expected over this four-year period. However, the salary increases have temporarily been adjusted due to the changes that were passed in the 2011 SEBAC agreement. We recommend no change in the merit rates of salary increase at this time, however, if the second recommendation of economic assumptions is adopted, there will be a slight decrease in the overall salary increases due to the price inflation changing to 2.75%.



Section III: Demographic Assumptions

OTHER ASSUMPTIONS AND METHODS

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

VALUATION COST METHOD: Currently, the valuation uses the Projected Unit Credit (PUC) Cost Method. While there is no issue with this method, the Commission may want to consider having a discussion about changing to the Entry Age Normal (EAN) Cost Method. The EAN cost method is the most widely used cost method of large public sector plans and has demonstrated the highest degree of contribution stability as compared to alternative methods. Actuarial gains and losses under EAN are reflected in the unfunded actuarial accrued liability. In addition, the EAN method is the only method allowed under the new GASB standards. Below is a table showing the proposed results using the current PUC Method versus the EAN Method at 8.25% and at 8.00%.

Impact on Principal Valuation Results				
	Recommendation #1 Assumptions (PUC) 8.25%	Recommendation #1 Assumptions (EAN) 8.25%	Recommendation #2 Assumptions (PUC) 8.00%	Recommendation #2 Assumptions (EAN) 8.00%
Unfunded Accrued Liability	\$11,909,732,107	\$12,597,693,015	\$12,213,653,513	\$12,904,402,099
Funding Ratio	45.9%	44.6%	45.3%	44.0%
Employer Annual Required Contribution				
Normal	7.28%	6.46%	7.38%	6.53%
Accrued Liability	<u>23.81</u>	<u>25.40</u>	<u>24.54</u>	<u>26.14</u>
Total	31.09%	31.86%	31.92%	32.67%
Amortization Period (in years)	20	20	20	20



Section III: Demographic Assumptions

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

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

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



Appendix A – CPI (U) Index

Historical June CPI (U) Index

Year	CPI (U)	Year	CPI (U)
1961	29.8	1987	113.5
1962	30.2	1988	118.0
1963	30.6	1989	124.1
1964	31.0	1990	129.9
1965	31.6	1991	136.0
1966	32.4	1992	140.2
1967	33.3	1993	144.4
1968	34.7	1994	148.0
1969	36.6	1995	152.5
1970	38.8	1996	156.7
1971	40.6	1997	160.3
1972	41.7	1998	163.0
1973	44.2	1999	166.2
1974	49.0	2000	172.4
1975	53.6	2001	178.0
1976	56.8	2002	179.9
1977	60.7	2003	183.7
1978	65.2	2004	189.7
1979	72.3	2005	194.5
1980	82.7	2006	202.9
1981	90.6	2007	208.352
1982	97.0	2008	218.815
1983	99.5	2009	215.693
1984	103.7	2010	217.965
1985	107.6	2011	225.722
1986	109.5	2012	229.478



Appendix B – Capital Market Assumptions and Asset Allocation

The tables below and on the following page are extracted from materials provided to us by the Treasurer’s Office prepared by the investment consultant serving that office, Hewitt Ennis Knupp.

Real Rates of Return and Standard Deviations by Asset Class

Asset Class	Expected Real Rate of Return	Standard Deviation
Large Cap U.S. Equities	5.8%	19.5%
Developed Non-U.S. Equities	6.6	21.0
Emerging Market (Non-U.S.)	8.3	30.5
Real Estate	5.1	15.5
Private Equity	7.6	27.5
Alternative Investments	4.1	8.5
Fixed Income (Core)	1.3	5.0
High Yield Bonds	3.9	14.5
Emerging Market Bonds	3.7	14.5
TIPS	1.0	4.5
Cash	0.4	2.0

Asset Allocation Targets

Asset Class	Asset Allocation
Large Cap U.S. Equities	21%
Developed Non-U.S. Equities	18
Emerging Market (Non-U.S.)	9
Real Estate	7
Private Equity	11
Alternative Investments	8
Fixed Income (Core)	8
High Yield Bonds	5
Emerging Market Bonds	4
TIPS	5
Cash	4



Appendix B – Capital Market Assumptions and Asset Allocation

Asset Correlation Matrix

ASSET CLASS	Large Cap U.S. Equities	Developed Non-U.S. Equities	Emerging Market (Non-U.S.)	Cash	TIPS	Fixed Income (Core)	High Yield Bonds	Emerging Market Bonds	Alternative Investments	Real Estate	Private Equity	Inflation
Large Cap U.S. Equities	1.00											
Developed Non-U.S. Equities	0.78	1.00										
Emerging Market (Non-U.S.)	0.58	0.63	1.00									
Cash	0.11	0.09	0.04	1.00								
TIPS	0.00	0.01	-0.01	0.54	1.00							
Fixed Income (Core)	0.05	0.05	0.01	0.53	0.33	1.00						
High Yield Bonds	0.44	0.33	0.25	0.15	0.08	0.43	1.00					
Emerging Market Bonds	0.38	0.29	0.22	0.20	0.11	0.52	0.88	1.00				
Alternative Investments	0.52	0.51	0.36	0.37	0.17	0.22	0.31	0.29	1.00			
Real Estate	0.36	0.35	0.25	0.16	0.06	0.07	0.18	0.17	0.32	1.00		
Private Equity	0.60	0.47	0.36	0.09	0.01	0.05	0.33	0.29	0.39	0.28	1.00	
Inflation	0.09	0.11	0.07	0.61	0.55	0.11	0.06	0.06	0.23	0.11	0.08	1.00



Appendix C – Social Security Administration Wage Index

Social Security Administration Wage Index

Year	Wage Index	Annual Increase	Year	Wage Index	Annual Increase
1959	3,855.80	4.95%	1985	16,822.51	4.26%
1960	4,007.12	3.92	1986	17,321.82	2.97
1961	4,086.76	1.99	1987	18,426.51	6.38
1962	4,291.40	5.01	1988	19,334.04	4.93
1963	4,396.64	2.45	1989	20,099.55	3.96
1964	4,576.32	4.09	1990	21,027.98	4.62
1965	4,658.72	1.80	1991	21,811.60	3.73
1966	4,938.36	6.00	1992	22,935.42	5.15
1967	5,213.44	5.57	1993	23,132.67	0.86
1968	5,571.76	6.87	1994	23,753.53	2.68
1969	5,893.76	5.78	1995	24,705.66	4.01
1970	6,186.24	4.96	1996	25,913.90	4.89
1971	6,497.08	5.02	1997	27,426.00	5.84
1972	7,133.80	9.80	1998	28,861.44	5.23
1973	7,580.16	6.26	1999	30,469.84	5.57
1974	8,030.76	5.94	2000	32,154.82	5.53
1975	8,630.92	7.47	2001	32,921.92	2.39
1976	9,226.48	6.90	2002	33,252.09	1.00
1977	9,779.44	5.99	2003	34,064.95	2.44
1978	10,556.03	7.94	2004	35,648.55	4.65
1979	11,479.46	8.75	2005	36,952.94	3.66
1980	12,513.46	9.01	2006	38,651.41	4.60
1981	13,773.10	10.07	2007	40,405.48	4.54
1982	14,531.34	5.51	2008	41,334.97	2.30
1983	15,239.24	4.87	2009	40,711.61	(1.50)
1984	16,135.07	5.88	2010	41,673.83	2.36



Appendix D – Proposed Demographic Assumptions

**TABLE 1
RATES OF WITHDRAWAL FROM ACTIVE SERVICE**

PROPOSED RATES OF WITHDRAWAL								
AGE	Hazardous Males							
	Years of Service							
	0	1	2	3	4	5	6 to 9	10 & over
Under 18	15.8 %	15.8 %	14.0 %	7.0 %	7.0 %	2.8 %	1.8 %	1.8 %
18-22	14.0	14.0	14.0	7.0	7.0	2.8	1.8	1.8
23-27	10.5	10.5	7.0	3.5	3.5	2.8	1.4	1.8
28-32	8.8	7.7	4.9	2.8	2.5	2.8	1.4	1.4
33-37	8.8	5.3	3.5	2.5	2.1	2.1	1.4	1.1
38-42	8.8	5.3	3.2	2.5	2.1	1.8	1.4	0.9
43-47	8.8	5.3	3.2	2.5	2.1	1.8	1.4	0.8
48-52	8.8	5.3	3.2	2.5	2.1	1.8	1.4	0.5
53-57	8.8	5.3	3.2	2.5	2.1	1.8	1.4	0.0
58 & Over	8.8	5.3	3.2	2.5	2.1	1.8	1.4	0.0
Hazardous Females								
AGE	Years of Service							
	0	1	2	3	4	5	6 to 9	10 & over
Under 18	22.0 %	27.5 %	16.5 %	11.0 %	11.0 %	5.5 %	2.8 %	2.8 %
18-22	19.3	24.8	16.5	11.0	11.0	5.5	2.8	2.8
23-27	13.8	13.8	8.3	6.6	5.0	5.5	2.8	2.8
28-32	11.0	11.0	5.5	5.0	3.9	4.4	2.8	2.2
33-37	11.0	8.3	5.0	3.9	3.3	3.3	2.2	1.7
38-42	11.0	8.3	4.4	3.9	3.3	2.8	2.2	1.4
43-47	11.0	8.3	4.4	3.9	3.3	2.8	1.7	1.1
48-52	11.0	8.3	4.4	3.9	3.3	2.8	1.7	0.8
53-57	11.0	8.3	4.4	3.9	3.3	2.8	1.7	0.0
58 & Over	11.0	8.3	4.4	3.9	3.3	2.8	1.7	0.0
Nonhazardous Males								
AGE	Years of Service							
	0	1	2	3	4	5	6 to 9	10 & over
Under 18	45.0 %	45.0 %	40.0 %	20.0 %	20.0 %	8.0 %	5.0 %	5.0 %
18-22	40.0	40.0	40.0	20.0	20.0	8.0	5.0	5.0
23-27	30.0	30.0	20.0	10.0	10.0	8.0	4.0	5.0
28-32	25.0	22.0	14.0	8.0	7.0	8.0	4.0	4.0
33-37	25.0	15.0	10.0	7.0	6.0	6.0	4.0	3.0
38-42	25.0	15.0	9.0	7.0	6.0	5.0	4.0	2.5
43-47	25.0	15.0	9.0	7.0	6.0	5.0	4.0	2.2
48-52	25.0	15.0	9.0	7.0	6.0	5.0	4.0	1.5
53-57	25.0	15.0	9.0	7.0	6.0	5.0	4.0	0.0
58 & Over	25.0	15.0	9.0	7.0	6.0	5.0	4.0	0.0
Nonhazardous Females								
AGE	Years of Service							
	0	1	2	3	4	5	6 to 9	10 & over
Under 18	40.0 %	50.0 %	30.0 %	20.0 %	20.0 %	10.0 %	5.0 %	5.0 %
18-22	35.0	45.0	30.0	20.0	20.0	10.0	5.0	5.0
23-27	25.0	25.0	15.0	12.0	9.0	10.0	5.0	5.0
28-32	20.0	20.0	10.0	9.0	7.0	8.0	5.0	4.0
33-37	20.0	15.0	9.0	7.0	6.0	6.0	4.0	3.0
38-42	20.0	15.0	8.0	7.0	6.0	5.0	4.0	2.5
43-47	20.0	15.0	8.0	7.0	6.0	5.0	3.0	2.0
48-52	20.0	15.0	8.0	7.0	6.0	5.0	3.0	1.5
53-57	20.0	15.0	8.0	7.0	6.0	5.0	3.0	0.0
58 & Over	20.0	15.0	8.0	7.0	6.0	5.0	3.0	0.0



Appendix D – Proposed Demographic Assumptions

**TABLE 2
RATES OF SERVICE RETIREMENT FROM ACTIVE SERVICE**

RATES OF SERVICE RETIREMENT		
Hazardous		
AGE	First Year Eligible	All Years After
44 & Under	18.0 %	10.0 %
45-48	25.0	10.0
49-59	10.0	10.0
60-69	25.0	15.0
70-79	100.0	20.0
80	100.0	100.0

RATES OF SERVICE RETIREMENT			
Nonhazardous			
AGE	Early Ret	Normal Ret	
		First Year	Other Years
55	7.5 %	15.0 %	12.5 %
56-59	5.0	15.0	12.5
60	5.0	25.0	12.5
61	10.0	25.0	15.0
62	10.0	10.0	30.0
63	10.0	35.0	25.0
64	10.0	45.0	25.0
65-69	25.0	65.0	25.0
70-79	25.0	100.0	20.0
80	100.0	100.0	100.0



Appendix D – Proposed Demographic Assumptions

**TABLE 3
RATES OF DISABILITY RETIREMENT FROM ACTIVE SERVICE**

AGE	RATES OF DISABILITY	
	Hazardous	Nonhazardous
20	0.0000 %	0.0000 %
21	0.0000	0.0000
22	0.0000	0.0000
23	0.0000	0.0100
24	0.0000	0.0100
25	0.0000	0.0100
26	0.0000	0.0100
27	0.0000	0.0100
28	0.0500	0.0400
29	0.0500	0.0400
30	0.0500	0.0400
31	0.0500	0.0400
32	0.0500	0.0400
33	0.1500	0.0500
34	0.1500	0.0500
35	0.1500	0.0500
36	0.1500	0.0500
37	0.1500	0.0500
38	0.2500	0.1200
39	0.2500	0.1200
40	0.2500	0.1200
41	0.2500	0.1200
42	0.2500	0.1200
43	0.3000	0.1600
44	0.3000	0.1600
45	0.3000	0.1600
46	0.3000	0.1600
47	0.3000	0.1600
48	0.4500	0.2400
49	0.4500	0.2400
50	0.4500	0.2400
51	0.4500	0.2400
52	0.4500	0.2400
53	0.6000	0.4000
54	0.6000	0.4000
55	0.6000	0.4000
56	0.6000	0.4000
57	0.6000	0.4000
58	0.8000	0.6000
59	0.8000	0.6000
60	0.8000	0.6000
61	0.8000	0.6000
62	0.8000	0.6000
63	1.1000	0.8000
64	1.1000	0.8000
65	1.1000	0.8000
66	1.1000	0.8000
67	1.1000	0.8000
68	1.4000	1.0000
69	1.4000	1.0000
70	1.4000	1.0000



Appendix D – Proposed Demographic Assumptions

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

AGE	MALES	FEMALES	AGE	MALES	FEMALES
19	0.0226 %	0.0129 %	70	1.4246 %	1.3110 %
20	0.0237	0.0127	71	1.5785	1.4403
21	0.0252	0.0124	72	1.7702	1.5984
22	0.0267	0.0125	73	1.9586	1.7337
23	0.0285	0.0130	74	2.1747	1.9270
24	0.0301	0.0135	75	2.4595	2.0826
25	0.0321	0.0141	76	2.7438	2.2993
26	0.0344	0.0153	77	3.1091	2.5979
27	0.0349	0.0158	78	3.5184	2.8612
28	0.0351	0.0165	79	3.9735	3.1540
29	0.0354	0.0174	80	4.4829	3.4821
30	0.0365	0.0193	81	5.0581	3.8490
31	0.0382	0.0216	82	5.7062	4.2601
32	0.0412	0.0251	83	6.3864	4.7227
33	0.0463	0.0279	84	7.2437	5.2439
34	0.0521	0.0306	85	8.0745	5.9807
35	0.0585	0.0330	86	8.9800	6.8324
36	0.0651	0.0351	87	10.1197	7.8141
37	0.0717	0.0371	88	11.3903	8.7152
38	0.0768	0.0389	89	12.6189	9.9538
39	0.0814	0.0410	90	14.1803	11.0532
40	0.0855	0.0444	91	15.6710	12.2153
41	0.0892	0.0484	92	17.5326	13.4140
42	0.0928	0.0530	93	19.0966	14.9923
43	0.0967	0.0584	94	20.7060	16.2113
44	0.1014	0.0642	95	22.6749	17.3875
45	0.1067	0.0688	96	24.3277	18.5013
46	0.1131	0.0732	97	25.9578	20.0306
47	0.1202	0.0777	98	27.9676	20.9923
48	0.1269	0.0842	99	29.5386	21.8415
49	0.1341	0.0911	100	31.0600	22.5671
50	0.1416	0.1010	101	33.0207	23.7467
51	0.1496	0.1120	102	34.4556	24.4834
52	0.1579	0.1302	103	35.8628	25.4498
53	0.1809	0.1492	104	37.1685	26.6044
54	0.1970	0.1717	105	38.3040	27.9055
55	0.2187	0.1983	106	39.2003	29.3116
56	0.2434	0.2337	107	39.7886	30.7811
57	0.2802	0.2726	108	40.0000	32.2725
58	0.3297	0.3068	109	40.0000	33.7441
59	0.3684	0.3461	110	40.0000	35.1544
60	0.4140	0.3918	111	40.0000	36.4617
61	0.4739	0.4460	112	40.0000	37.6246
62	0.5378	0.5129	113	40.0000	38.6015
63	0.6213	0.5873	114	40.0000	39.3507
64	0.7088	0.6747	115	40.0000	39.8308
65	0.8104	0.7604	116	40.0000	40.0000
66	0.9270	0.8563	117	40.0000	40.0000
67	1.0467	0.9664	118	40.0000	40.0000
68	1.1662	1.0730	119	40.0000	40.0000
69	1.3011	1.1861	120	100.0000	100.0000



Appendix D – Proposed Demographic Assumptions

**TABLE 5
RATES OF MORTALITY FOR DISABILITY RETIREMENTS**

AGE	MALES	FEMALES	AGE	MALES	FEMALES
19	1.2414 %	0.5960 %	70	3.4421 %	3.0108 %
20	1.2414	0.5960	71	3.6213	3.2112
21	1.2414	0.5960	72	3.8173	3.4281
22	1.2414	0.5960	73	4.0311	3.6615
23	1.2414	0.5960	74	4.2632	3.9116
24	1.2414	0.5960	75	4.5137	4.1784
25	1.2414	0.5960	76	4.7823	4.4622
26	1.2414	0.5960	77	5.0682	4.7636
27	1.2414	0.5960	78	5.3702	5.0836
28	1.2414	0.5960	79	5.6866	5.4234
29	1.2414	0.5960	80	6.0155	5.7850
30	1.2414	0.5960	81	6.3549	6.1708
31	1.2414	0.5960	82	6.7032	6.5838
32	1.2414	0.5960	83	7.0589	7.0270
33	1.2414	0.5960	84	7.4208	7.5035
34	1.2414	0.5960	85	7.7882	8.0162
35	1.2414	0.5960	86	8.1606	8.5679
36	1.2414	0.5960	87	8.5379	9.1610
37	1.2414	0.5960	88	8.9202	9.7971
38	1.2414	0.5960	89	9.3078	10.4778
39	1.2414	0.5960	90	10.0874	11.2039
40	1.2414	0.5960	91	10.9873	11.9758
41	1.2414	0.5960	92	11.9133	12.7939
42	1.2414	0.5960	93	12.8514	13.6346
43	1.2414	0.5960	94	13.7881	14.6239
44	1.2414	0.5960	95	14.7120	15.5607
45	1.3116	0.6547	96	15.6148	16.4303
46	1.3818	0.7167	97	16.4919	17.2192
47	1.4522	0.7820	98	17.3413	17.9158
48	1.5228	0.8507	99	18.1614	18.5110
49	1.5936	0.9228	100	18.9506	18.9974
50	1.6647	0.9982	101	19.7245	19.5867
51	1.7360	1.0765	102	20.4427	20.3598
52	1.8072	1.1572	103	21.0672	21.2835
53	1.8784	1.2398	104	21.5602	22.3244
54	1.9493	1.3235	105	21.8837	23.4493
55	2.0203	1.4078	106	22.0000	24.6249
56	2.0914	1.4923	107	22.0000	25.8180
57	2.1634	1.5768	108	22.0000	26.9953
58	2.2367	1.6614	109	22.0000	28.1235
59	2.3123	1.7471	110	22.0000	29.1694
60	2.3911	1.8349	111	22.0000	30.0997
61	2.4740	1.9264	112	22.0000	30.8812
62	2.5621	2.0234	113	22.0000	31.4806
63	2.6569	2.1280	114	22.0000	31.8646
64	2.7596	2.2421	115	22.0000	32.0000
65	2.8717	2.3675	116	22.0000	32.0000
66	2.9948	2.5060	117	22.0000	32.0000
67	3.1300	2.6587	118	22.0000	32.0000
68	3.2787	2.8268	119	22.0000	32.0000
69	3.4421	3.0108	120	100.0000	100.0000



Appendix D – Proposed Demographic Assumptions

**TABLE 6
RATES OF ANTICIPATED SALARY INCREASES**

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

Due to the 2011 SEBAC Agreements, no salary increases are assumed for the 2012 and 2013 fiscal years. From fiscal year 2014 through 2016, salary increases are assumed to be 1% less than the table above. After the 2016 fiscal year, salary increases are assumed to continue using the table above.