



State of Wisconsin
Department of Employee Trust Funds
 Robert J. Conlin
 SECRETARY

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Correspondence Memorandum

Date: June 2, 2017

To: Employee Trust Funds Board

From: Cindy Klimke-Armatoski, CPA
 Chief Trust Finance Officer

Subject: WRS Active Lives Valuation & Gain/Loss Analysis

ETF requests the Employee Trust Funds Board (Board) approve the Thirty-Sixth Annual Actuarial Valuation and Gain/Loss Analysis as of December 31, 2016.

Gabriel Roeder Smith & Company (GRS) has completed the actuarial valuation of non-retired members of the Wisconsin Retirement System. The results of the study are summarized below (millions \$):

	December 31,	
	2016	2015
Actuarial Accrued Liability	\$ 95,414.0	\$ 91,526.5
Actuarial Value of Assets	95,396.2	91,502.4
Unfunded Actuarial Accrued Liability	17.8	24.1
Funded Ratio	99.98%	99.97%

GRS recommends the following contribution rates for 2018:

	General, Teachers, Executive and Elected Officials		Protective Occupations			
			With Social Security		Without Social Security	
	2018	2017	2018	2017	2018	2017
Employer Normal Cost	6.70%	6.80%	10.70%	10.60%	14.90%	14.90%
Participant Normal Cost	6.70%	6.80%	6.70%	6.80%	6.70%	6.80%
Total Normal Cost	13.4%	13.6%	17.4%	17.4%	21.6%	21.7%

Actuaries from GRS will be at the Board meeting to present their report and to answer questions.

Attachment: Thirty-Sixth Annual Actuarial Valuation and Gain/Loss Analysis

Reviewed and approved by Robert J. Conlin, Secretary Electronically Signed 6/8/17
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Board	Mtg Date	Item #
JM	6.22.17	3A
ETF	6.22.17	4B

WISCONSIN RETIREMENT SYSTEM

**THIRTY-SIXTH ANNUAL ACTUARIAL VALUATION AND
GAIN/LOSS ANALYSIS**

DECEMBER 31, 2016

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June 2, 2017

Employee Trust Funds Board
 Wisconsin Department of Employee
 Trust Funds
 801 West Badger Road
 Madison, Wisconsin 53713

Ladies and Gentlemen:

The results of the **December 31, 2016 annual actuarial valuations of non-retired members covered by the Wisconsin Retirement System** are presented in this report. The valuations establish contribution rates for the 2018 calendar year in conformance with Chapter 40 of the Wisconsin Statutes. This report should not be relied upon for any other purpose. This report may be distributed to parties other than the Fund only in its entirety and only with the permission of the Board. GRS is not responsible for unauthorized use of this report. Determinations of financial results, associated with the benefits described in this report, for purposes other than those identified above may be significantly different. The change in the normal cost rates from last year are shown below:

<u>General and Executive/Elected</u>	<u>Protective with SS</u>	<u>Protective without SS</u>
-0.2%	0.0%	-0.1%

The valuations are based upon our understanding of the main plan provisions related to General, Executive and Elected, and Protective Occupation employment with and without Social Security coverage. The plan provisions evaluated are summarized in Section H of this report. Please advise us of any material misstatements in the summary and do not rely on this report until such are resolved.

The individual member statistical data required for the valuations was furnished by the Department of Employee Trust Funds (DETF), together with pertinent data on financial operations. The cooperation of DETF staff in furnishing these materials is acknowledged with appreciation. We checked for internal reasonability and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the information provided by others.

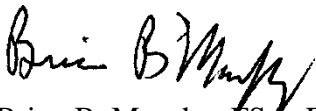
Actuarial valuations are based upon assumptions regarding future activity in specific risk areas including the rates of investment return and payroll growth, eligibility for the various classes of benefits, and longevity among retired lives. The Board adopts these assumptions after considering the advice of the actuary and other professionals. Each actuarial valuation takes into account all prior differences between actual and assumed experience in each risk area and adjusts the contribution rates as needed. The December 31, 2016 valuations were based upon assumptions that were recommended in connection with a study of experience during 2012-2014 and benefit provisions in effect on December 31, 2016.

Future actuarial measurements may differ significantly from those presented in this report due to such factors as experience differing from that anticipated by actuarial assumptions, changes in plan provisions, actuarial assumptions/methods or applicable law. Due to the limited scope of this assignment, we did not perform an analysis of the potential range of future measurements.

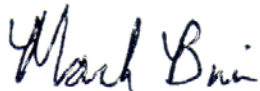
To the best of our knowledge, this report is complete and accurate and was made in accordance with generally recognized actuarial methods. Brian B. Murphy, Mark Buis, and James D. Anderson are Members of the American Academy of Actuaries (MAAA), and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. The signing actuaries are independent of the plan sponsor.

The valuations were completed by qualified actuaries in accordance with accepted actuarial procedures as prescribed by the Actuarial Standards Board. It is our opinion that the Wisconsin Retirement System is operating in accordance with actuarial principles of level percent-of-payroll financing.

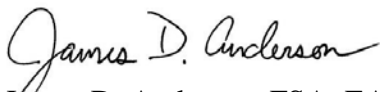
Respectfully submitted,



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



Mark Buis, FSA, EA, FCA, MAAA



James D. Anderson, FSA, EA, MAAA

BBM/MB/JDA:mrb

SECTION A

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

1. Required Employer Contributions to Support Retirement Benefits

	General, Executive & Elected Officials		Protective Occupation			
			With Soc. Sec.		Without Soc. Sec.	
	2018	2017	2018	2017	2018	2017
Employer Normal Cost	6.70%	6.80%	10.70%	10.60%	14.90%	14.90%
Participant Normal Cost	6.70%	6.80%	6.70%	6.80%	6.70%	6.80%
Total Normal Cost	13.4%	13.6%	17.4%	17.4%	21.6%	21.7%
Unfunded Actuarial Accrued Liability (UAAL)	0.03%	0.07%	0.03%	0.08%	0.05%	0.14%
WRS Average Total	13.4%	13.7%	17.4%	17.5%	21.7%	21.8%

Note: UAAL contribution rate is an estimate based on actual benefit payments paid during the prior year, adjusted for significant atypical payments.

Under Section 40.05 of the Wisconsin statutes updated for Act 10 and 32 of 2011, contribution rates are split evenly between the employer normal cost and the participant normal cost for both General Participants and Executive and Elected Officials. For protective occupations, the participant normal cost is set equal to the participant normal cost for General Participants.

Rates shown for UAAL are weighted averages of rates that vary by employer units based on amounts paid in the prior year. Each affected employer unit has a separately determined UAAL rate. Contributions to support the Section 40.65 Duty Disability Program and the Accumulated Sick Leave Conversion Credit Program are in addition to the WRS rates shown above.

EXECUTIVE SUMMARY

2. Reasons for Change

There are three general reasons why contribution rates change from one valuation to the next. The first is a change in the benefits or eligibility conditions of the plan. The second is a change in the valuation assumptions used to project future occurrences. The third is the difference during the year between the plan's actual experience and what the assumptions predicted.

There were no legislated benefit changes reported to the actuary for the year ended December 31, 2016. However, now that the member contribution rate is set equal to half of the total contribution rate, any increase in the member rate will result in an increased benefit amount (and vice-versa). This is due to the fact that when the member rate increases, the money purchase benefit will also increase (and vice-versa). It is referred to as "Effect of Money Purchase Benefit" in the chart below. There were no assumption changes this year. Assumptions will next be reviewed following completion of the 2017 valuation.

In total, changes in the contribution rate are illustrated on the following chart. Additional detail on gains and losses can be found in Section D of this report.

	General, Executive & Elected Officials	Protective with Soc. Sec.	Protective without Soc. Sec.
2017 Normal Cost Rate	13.60%	17.40%	21.70%
Effect of Asset Performance	(0.06)%	(0.11)%	(0.18)%
Effect of Assumption Change	0.00%	0.00%	0.00%
Effect of Salary Experience	(0.15)%	(0.05)%	(0.26)%
Demographic and Other Experience	0.06%	0.18%	0.36%
Effect of Money Purchase Benefit	(0.05)%	(0.02)%	(0.02)%
2018 Normal Cost Rate	13.40%	17.40%	21.60%

Please note that although the investment income is allocated proportionately to each group, the effect on the contribution rate will be different because the ratio of assets to payroll is different for each group.

EXECUTIVE SUMMARY

3. General Comments

Based upon this valuation, normal cost contribution rates decreased for most groups primarily due to favorable investment performance from prior years flowing through the Market Recognition Account (MRA) and lower than assumed salary increases.

In total, during 2016, investment return was above the assumed 2016 level of 7.20% on a market value basis. Under the asset valuation method (using the MRA), gains and losses are phased-in over a five year period, resulting in a 7.5% return on an Actuarial Value of Assets basis in the Core Fund. The Actuarial Value of Assets exceeds the Market Value of Assets by approximately 3.5% as of the valuation date. The statutory asset valuation method will recognize all of the differences between actuarial value and market value of \$3.1 billion over four future years putting upward pressure on future contribution rates.

This valuation includes liabilities for future claims under the Long Term Disability Insurance (LTDI) program that became operational late in 1992. Inter-fund transfers between WRS and the LTDI program to support claims currently payable are addressed by a different actuarial firm in communications to the Group Insurance and Employee Trust Funds Boards.

Conclusion. Based upon the results of the December 31, 2016 regular annual actuarial valuation, it is our opinion that *the Wisconsin Retirement System continues to operate in accordance with actuarial principles of level percent-of-payroll financing.*

OTHER OBSERVATIONS

General Implications of Contribution Allocation Procedure or Funding Policy on Future Expected Plan Contributions and Funded Status

Given the plan's contribution allocation procedure, if all actuarial assumptions are met (including the assumption of the plan earning 7.2% on the actuarial value of assets), it is expected that:

- (1) The normal cost as a percentage of pay will decrease to the level of the future service normal cost as time passes.
- (2) The unfunded liability will decrease in dollar amount until it is fully funded.
- (3) The funded status of the plan will remain very close to a 100% funded ratio.

Limitations of Funded Status Measurements

Unless otherwise indicated, a funded ratio measurement presented in this report is based upon the actuarial accrued liability and the actuarial value of assets. Unless otherwise indicated, with regard to any funded status measurements presented in this report:

- (1) The measurement is inappropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations, in other words, of transferring the obligations to a unrelated third party in an arm's length market value type transaction.
- (2) The measurement is dependent upon the actuarial cost method which, in combination with the plan's amortization policy, affects the timing and amounts of future contributions. The amount of future contributions will most certainly differ from those assumed in this report due to future actual experience differing from assumed experience based upon actuarial assumptions. A funded ratio measurement in this report of 100% is not synonymous with no required future contributions. If the funded ratio were 100%, the plan would still require future normal cost contributions (i.e., contributions to cover the cost of the active membership accruing an additional year of service credit).
- (3) The measurement would produce a different result if the market value of assets were used instead of the actuarial value of assets, unless the market value of assets is used in the measurement.

Limitation of Project Scope

Actuarial standards do not require the actuary to evaluate the ability of the plan sponsor or other contributing entity to make required contributions to the plan when due. Such an evaluation was not within the scope of this project and is not within the actuary's domain of expertise. Consequently, the actuary performed no such evaluation.

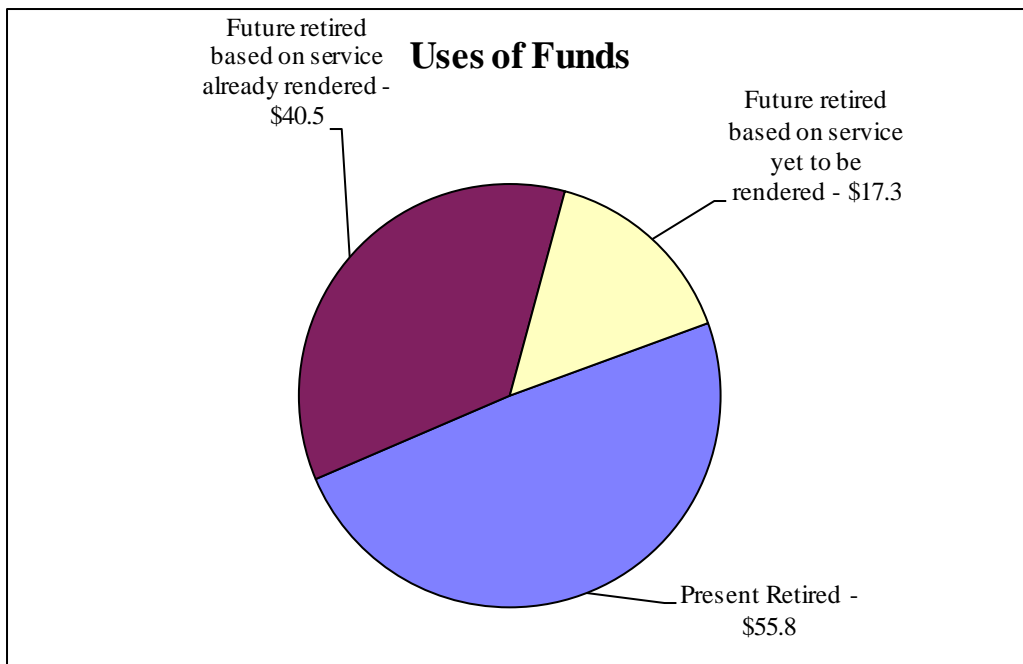
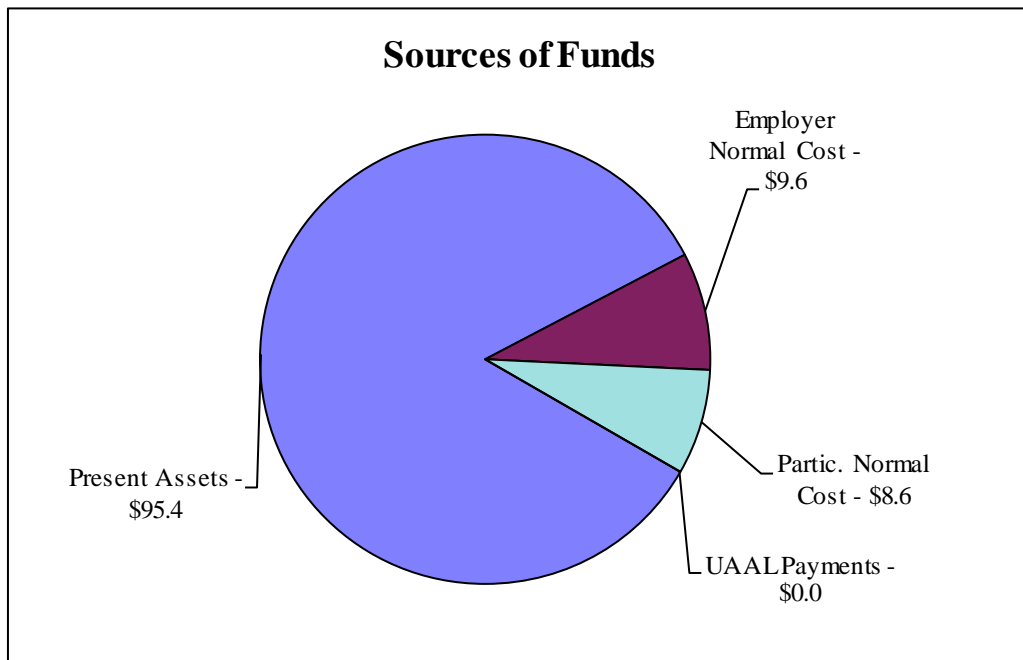
SECTION B

FUNDING RESULTS

**DEVELOPMENT OF CONTRIBUTION RATES
FOR CALENDAR YEAR 2018**

	General, Executives & Elected Officials	Protective Occupation		Average/ Total
		With Soc. Sec.	Without Soc. Sec.	
\$ Millions				
Total Reported Earnings	\$ 12,069.8	\$ 1,203.2	\$ 213.0	\$ 13,486.0
Present Value of Future Earnings	114,586.8	12,283.5	2,156.4	129,026.7
Present Value of Future Benefits	50,043.0	6,252.0	1,425.3	57,720.3
Non-Retired Assets	34,437.8	4,060.2	950.2	39,448.2
Unfunded Liability	14.1	1.2	2.4	17.7
Present Value of Future Normal Costs				
Future Service Portion	14,871.0	1,996.9	449.3	17,317.2
Exp. Amort. Res. Portion	720.1	193.7	23.4	937.2
Total	15,591.1	2,190.6	472.7	18,254.4
Normal Cost Amortization Years				
Future Service Portion	12.0	13.2	13.0	12.1
Exp. Amort. Res. Portion	20.0	20.0	20.0	
% 's of Active Member Payroll				
Normal Cost				
Future Service Portion	13.0 %	16.3 %	20.8 %	13.4 %
Exp. Amort. Res. Portion	0.4 %	1.1 %	0.8 %	0.5 %
Total	13.4 %	17.4 %	21.6 %	13.9 %
2018 Normal Cost Rates				
Employer Normal Cost	6.70 %	10.70 %	14.90 %	7.20 %
Participant Normal Cost	6.70 %	6.70 %	6.70 %	6.70 %
Total Normal Cost	13.40 %	17.40 %	21.60 %	13.90 %
Average Unfunded Liability Amortization	0.03 %	0.03 %	0.05 %	0.03 %
Average Total Rate	13.4 %	17.4 %	21.7 %	13.9 %

**FINANCING \$113.6 BILLION* OF BENEFIT PROMISES
FOR PRESENT ACTIVE AND RETIRED PARTICIPANTS
DECEMBER 31, 2016**



* Present value of future benefits; all divisions combined.

DEVELOPMENT OF ACTUARIAL PRESENT VALUES
DECEMBER 31, 2016
(\$ MILLIONS)

Present Value of Future Benefits for	General, Executives & Elected Officials	Protectives		Total
		With Soc. Sec.	Without Soc. Sec.	
Active Participants				
Service Retirement	\$40,055.5	\$5,401.6	\$ 1,313.9	\$ 46,771.0
Withdrawal	2,908.6	240.5	23.2	3,172.3
Death-in-Service	460.9	50.0	10.7	521.6
Disability	612.1	45.9	23.7	681.7
Total Active	44,037.1	5,738.0	1,371.5	51,146.6
Inactive Participants	5,695.1	480.8	47.8	6,223.7
Variable Adjustment	310.8	33.1	6.0	349.9
Active and Inactive	50,043.0	6,251.9	1,425.3	57,720.2
Additional Contributions				184.0
Present Retired				55,764.0
Actuarial Present Value of Future Benefits				\$113,668.2

Computing the actuarial present value of future benefits is the first step in the actuarial valuation process. If the WRS had assets equal to that value, and if future experience were exactly in accordance with assumptions, then the present assets together with future investment income on those assets would be sufficient to pay promised benefits to all present participants, retirees and beneficiaries. *There is no need for the Retirement System to have \$113,668.2 million immediately. What is needed, however, is a plan for obtaining the money in an orderly fashion. That is the purpose of the remainder of the actuarial valuation.*

EXPERIENCE AMORTIZATION RESERVE (EAR)

Actuarial gains or losses arising from the difference between actual and assumed experience are reflected in the determination of the normal cost. The computed normal cost is made up of two parts: (i) the pure Entry-Age Normal Cost (EANC) determined without regard to past gains or losses, and (ii) an experience amortization component. Section 40.04(1) of the Wisconsin Statutes provides authority to maintain accounts and reserves determined to be “useful in achieving the funds’ purposes...” A fundamental WRS objective is stable contribution rates. Accordingly, the experience portion of the normal cost is separately calculated each year and the amortization period is varied upward or downward in order to minimize short-term rate fluctuations. A positive EAR indicates amortization of gains. A negative EAR indicates amortization of losses.

Development of EAR as of December 31, 2016

	General, Executives & Elected Officials	Protective Occupation		Total
		With Soc. Sec	Without Soc. Sec.	
\$ Millions				
1. Present Value of Future Benefits for Non-Retired	\$50,043.0	\$6,251.9	\$1,425.3	\$57,720.2
2. Present Value of Future Entry Age Normal Costs	14,870.9	1,996.8	449.3	17,317.0
3. Entry Age Accrued Liability: (1)-(2)	35,172.1	4,255.1	976.0	40,403.2
4. Non-Retired Assets -WRS	34,454.6	4,064.8	951.0	39,470.4
-LTDI	(16.8)	(4.6)	(0.8)	(22.2)
-Total	34,437.8	4,060.2	950.2	39,448.2
5. Entry Age Unfunded Accrued Liability: (3)-(4)	734.3	194.9	25.8	955.0
6. WRS Frozen Unfunded Accrued Liability	14.2	1.2	2.4	17.8
7. EAR: (6)-(5)	\$ (720.1)	\$ (193.7)	\$ (23.4)	\$ (937.2)
8. Prior Year EAR	\$ (987.1)	\$ (196.2)	\$ (26.6)	\$ (1,209.9)

LTDI reserves provided by Milliman.

UNFUNDED ACTUARIAL ACCRUED LIABILITY (UAAL)
DECEMBER 31, 2016

	General, Executives & Elected Officials	Protective Occupation		Totals
		With Soc. Sec	Without Soc. Sec	
Balance January 1, 2016	\$17,144,598	\$1,827,224	\$ 5,101,076	\$24,072,898
Plus: New Employers	0	0	0	0
Less: Adjustments	0	0	0	0
Less: Payments	(3,921,568)	(683,262)	(2,832,641)	(7,437,471)
Plus: Interest	952,059	82,365	163,327	1,197,751
Balance December 31, 2016	\$14,175,089	\$1,226,327	\$ 2,431,762	\$17,833,178

The UAAL is amortized as a level percent of payroll. A separate calculation is made for each affected employer.

Payments made during 2016 include a large one-time payment (approximately \$3.5 million) for one employer.

COMPARATIVE STATEMENT OF COMPUTED CONTRIBUTION RATES

Valuation 12/31	Rate Effective 1/1	General				Executive and Elected			
		Participant	Benefit Adj. Contr.	Employer ¹	Total	Participant	Benefit Adj. Contr.	Employer ¹	Total
1992	1994	5.0 %	1.2 %	6.1 %	12.3 %	5.5 %	0.1 %	12.0 %	17.6 %
1993	1995	5.0 %	1.2 %	6.1 %	12.3 %	5.5 %	0.1 %	12.0 %	17.6 %
1994	1996	5.0 %	1.5 %	6.4 %	12.9 %	4.6 %	0.0 %	11.1 %	15.7 %
1995	1997	5.0 %	1.4 %	6.3 %	12.7 %	4.7 %	0.0 %	11.2 %	15.9 %
1996	1998	5.0 %	1.2 %	6.1 %	12.3 %	4.7 %	0.0 %	11.2 %	15.9 %
1997	1999	5.0 %	0.8 %	5.8 %	11.6 %	4.3 %	0.0 %	10.8 %	15.1 %
1998	2000	5.0 %	0.5 %	5.5 %	11.0 %	4.1 %	0.0 %	10.6 %	14.7 %
1999	2001	5.0 %	0.2 %	5.1 %	10.3 %	3.9 %	0.0 %	10.4 %	14.3 %
2000	2002	5.0 %	0.2 %	5.1 %	10.3 %	3.1 %	0.0 %	9.6 %	12.7 %
2001 ²	2003	5.0 %	0.4 %	5.2 %	10.6 %	2.6 %	0.0 %	9.1 %	11.7 %
2002	2004	5.0 %	0.6 %	5.2 %	10.8 %	2.6 %	0.0 %	8.9 %	11.5 %
2003	2005	5.0 %	0.8 %	4.7 %	10.5 %	2.8 %	0.0 %	8.4 %	11.2 %
2004	2006	5.0 %	0.9 %	4.7 %	10.6 %	2.9 %	0.0 %	8.5 %	11.4 %
2005	2007	5.0 %	1.0 %	4.8 %	10.8 %	3.0 %	0.0 %	8.6 %	11.6 %
2006	2008	5.0 %	1.0 %	4.8 %	10.8 %	3.0 %	0.0 %	8.6 %	11.6 %
2007	2009	5.0 %	0.9 %	4.7 %	10.6 %	3.0 %	0.0 %	8.5 %	11.5 %
2008	2010	5.0 %	1.2 %	5.0 %	11.2 %	3.2 %	0.0 %	8.7 %	11.9 %
2009	2011	5.0 %	1.5 %	5.2 %	11.7 %	3.9 %	0.0 %	9.4 %	13.3 %
2010	2012	5.0 %	1.6 %	5.3 %	11.9 %	4.3 %	0.0 %	9.8 %	14.1 %
2011 ³	2013	6.7 %	N/A	6.8 %	13.4 %	7.0 %	N/A	7.0 %	14.0 %
2012	2014	7.0 %	N/A	7.0 %	14.0 %	7.8 %	N/A	7.8 %	15.5 %
2013	2015	6.8 %	N/A	6.8 %	13.6 %	7.7 %	N/A	7.7 %	15.4 %
2014	2016	6.6 %	N/A	6.6 %	13.2 %	7.8 %	N/A	7.8 %	15.6 %
2015 ⁴	2017	6.8 %	N/A	6.9 %	13.7 %	6.8 %	N/A	6.9 %	13.7 %
2016	2018	6.7 %	N/A	6.7 %	13.4 %	6.7 %	N/A	6.7 %	13.4 %

¹ Employer normal cost plus weighted average of unfunded actuarial accrued liability contribution rates.

² Act 11 of 1999 was implemented in 2001.

³ Act 10 and Act 32 were implemented in 2011.

⁴ Contribution rates for General and Executive and Elected Officials groups were combined beginning with the 2015 valuation. Actual 2016 Participant and Employer contribution rates for the Executive and Elected Officials group were each 6.6% respectively.

COMPARATIVE STATEMENT OF COMPUTED CONTRIBUTION RATES

Valuation 12/31	Rate Effective 1/1	Protective With Social Security				Protective Without Social Security			
		Participant	Benefit Adj. Contr.	Employer ¹	Total	Participant	Benefit Adj. Contr.	Employer ¹	Total
1992	1994	6.0 %	0.6 %	10.7 %	17.3 %	7.5 %		16.3 %	23.8 %
1993	1995	6.0 %	0.5 %	10.6 %	17.1 %	7.2 %		16.0 %	23.2 %
1994	1996	6.0 %	0.1 %	10.2 %	16.3 %	6.8 %		15.7 %	22.5 %
1995	1997	5.8 %	0.0 %	9.8 %	15.6 %	6.2 %		15.1 %	21.3 %
1996	1998	5.4 %	0.0 %	9.4 %	14.8 %	5.8 %		14.6 %	20.4 %
1997	1999	4.9 %	0.0 %	8.9 %	13.8 %	5.4 %		14.3 %	19.7 %
1998	2000	4.1 %	0.0 %	8.0 %	12.1 %	4.4 %		13.3 %	17.7 %
1999	2001	3.8 %	0.0 %	7.6 %	11.4 %	3.3 %		12.2 %	15.5 %
2000	2002	4.0 %	0.0 %	7.8 %	11.8 %	3.0 %		11.9 %	14.9 %
2001 ²	2003	4.0 %	0.0 %	7.7 %	11.7 %	2.4 %		11.3 %	13.7 %
2002	2004	4.5 %	0.0 %	8.0 %	12.5 %	3.2 %		11.8 %	15.0 %
2003	2005	4.9 %	0.0 %	8.1 %	13.0 %	3.3 %		11.3 %	14.6 %
2004	2006	5.0 %	0.0 %	8.2 %	13.2 %	3.3 %		11.1 %	14.4 %
2005	2007	5.1 %	0.0 %	8.3 %	13.4 %	3.4 %		11.2 %	14.6 %
2006	2008	5.1 %	0.0 %	8.3 %	13.4 %	3.4 %		11.2 %	14.6 %
2007	2009	5.0 %	0.0 %	8.2 %	13.2 %	3.2 %		10.9 %	14.1 %
2008	2010	5.5 %	0.0 %	8.6 %	14.1 %	3.9 %		11.6 %	15.5 %
2009	2011	5.8 %	0.0 %	8.9 %	14.7 %	4.8 %		12.5 %	17.3 %
2010	2012	5.9 %	0.0 %	9.0 %	14.9 %	4.9 %		12.6 %	17.5 %
2011 ³	2013	6.7 %	N/A	9.8 %	16.4 %	6.7 %		12.7 %	19.3 %
2012	2014	7.0 %	N/A	10.1 %	17.1 %	7.0 %		14.0 %	21.0 %
2013	2015	6.8 %	N/A	9.5 %	16.3 %	6.8 %		13.4 %	20.2 %
2014	2016	6.6 %	N/A	9.4 %	16.0 %	6.6 %		13.4 %	20.0 %
2015	2017	6.8 %	N/A	10.7 %	17.5 %	6.8 %		15.0 %	21.8 %
2016	2018	6.7 %	N/A	10.7 %	17.4 %	6.7 %		15.0 %	21.7 %

¹ Employer normal cost plus weighted average of unfunded actuarial accrued liability contribution rates.

² Act 11 of 1999 was implemented in 2001.

³ Act 10 and Act 32 were implemented in 2011.

SECTION C
FUND ASSETS

DEVELOPMENT OF PARTICIPANT AND EMPLOYER RESERVES DURING THE YEAR

	Participant Accumulation			Employer Accumulation			Grand Total
	Core	Variable	Total	Core	Variable	Total	
Ending Balance December 31, 2015	\$15,078,126,530	\$1,459,097,486	\$16,537,224,016	\$20,522,746,877	\$1,459,097,487	\$21,981,844,364	\$38,519,068,380
Closing Adjustments	(105,568)	(94,046)	(199,614)	(351,039)	13,862	(337,177)	(536,791)
Beginning Balance January 1, 2016	15,078,020,962	1,459,003,440	16,537,024,402	20,522,395,838	1,459,111,349	21,981,507,187	38,518,531,589
Revenues:							
Employer Contributions	-	-	-	868,613,815	94,077,201	962,691,016	962,691,016
Participant Contributions	816,757,911	94,862,144	911,620,055	-	-	-	911,620,055
Total Revenues	816,757,911	94,862,144	911,620,055	868,613,815	94,077,201	962,691,016	1,874,311,070
Expenses:							
Separations	37,092,056	2,022,572	39,114,628	-	-	-	39,114,628
Retirement Single Sums	22,220,983	764,848	22,985,831	22,825,250	801,940	23,627,191	46,613,022
Death Benefits	16,736,283	2,235,672	18,971,955	9,080,507	1,721,980	10,802,487	29,774,442
Disability Insurance	-	-	-	71,270,980	-	71,270,980	71,270,980
	76,049,322	5,023,092	81,072,414	103,176,738	2,523,920	105,700,658	186,773,072
Transfers:							
Earnings Allocation	1,106,126,319	135,330,733	1,241,457,052	1,567,494,077	131,844,248	1,699,338,325	2,940,795,377
Annuities Awarded	(1,353,189,789)	(77,770,594)	(1,430,960,383)	(2,150,058,500)	(95,755,277)	(2,245,813,777)	(3,676,774,160)
Intra-Fund Transfers	(385,946)	14,532	(371,414)	724,024	46,489	770,513	399,099
Inter-Fund Transfers	43,941,170	(43,941,170)	-	43,892,476	(43,892,476)	-	-
	(203,508,246)	13,633,500	(189,874,745)	(537,947,922)	(7,757,017)	(545,704,939)	(735,579,684)
Ending December 31, 2016	\$15,615,221,305	\$1,562,475,992	\$17,177,697,298	\$20,749,884,993	\$1,542,907,612	\$22,292,792,605	\$39,470,489,903
Internal Rate of Return	7.5%	9.4%	7.6%	7.9%	9.2%	8.0%	7.8%

**RESERVES FOR NON-RETIRED PARTICIPANTS
BALANCES BY VALUATION GROUP**

	Reserve for Year Ended			December 31, 2015 (Total in \$ Millions)
	December 31, 2016			
	Participant	Employer	Total *	
General, Executives & Elected	\$15,580,935,397	\$18,873,712,632	\$34,454,648,029	\$33,625.7
Protective with Soc. Sec.	1,334,895,795	2,729,911,521	4,064,807,316	3,957.5
Protective w/o Soc. Sec.	261,866,107	689,168,454	951,034,561	935.9
Total	\$17,177,697,299	\$22,292,792,607	\$39,470,489,906	\$38,519.1

** Totals differ slightly from page C-1 due to rounding.*

The above schedule shows the distribution of Participant and Employer reserves among the valuation groups according to WRS accounting records. This separation of assets is needed because the valuation groups are separately experience rated. The assets are pooled for investment purposes.

CORE INVESTMENT TRUST: MARKET RECOGNITION ACCOUNT

	For the Year Ended December 31						
	2014	2015	2016	2017	2018	2019	2020
Beginning of year							
a. Funding value	\$81,635,165,224	\$86,109,303,264	\$88,695,483,883	\$92,112,530,220	\$91,599,801,764	\$90,133,652,131	\$88,910,239,098
b. Market value	86,355,982,436	88,649,071,976	85,291,480,633	89,030,802,138	89,030,802,138	89,030,802,138	89,030,802,138
End of year							
c. Market value	88,649,071,976	85,291,480,633	89,030,802,138				
d. Non-investment cash flow (contributions minus benefits)	(2,288,570,809)	(2,738,977,618)	(3,136,649,165)				
e. Investment income							
e1. Total investment income	4,581,660,350	(618,613,725)	6,875,970,669				
e2. Assumed rate	7.2%	7.2%	7.2%				
e3. Amount for immediate recognition	5,795,343,347	6,101,266,641	6,273,155,470	-	-	-	-
e4. Amount for phased-in recognition: e1-e3	(1,213,682,997)	(6,719,880,366)	602,815,199	-	-	-	-
f. Phased-in recognition of investment income							
f1. Current year: 0.2 x e4	(242,736,599)	(1,343,976,073)	120,563,040	-	-	-	-
f2. First prior year	953,421,177	(242,736,599)	(1,343,976,073)	120,563,040	-	-	-
f3. Second prior year	793,268,488	953,421,177	(242,736,599)	(1,343,976,073)	120,563,040	-	-
f4. Third prior year	(936,085,396)	793,268,488	953,421,177	(242,736,599)	(1,343,976,073)	120,563,040	-
f5. Fourth prior year	399,497,833	(936,085,396)	793,268,488	953,421,177	(242,736,599)	(1,343,976,073)	120,563,040
f6. Total MRA recognition	967,365,503	(776,108,404)	280,540,032	(512,728,456)	(1,466,149,633)	(1,223,413,033)	120,563,040
f7. Amount for MRA recognition	-	-	-	-	-	-	-
f8. Total recognized gain (loss)	967,365,503	(776,108,404)	280,540,032	(512,728,456)	(1,466,149,633)	(1,223,413,033)	120,563,040
g. Total recognized investment income: e3 + f8	6,762,708,850	5,325,158,237	6,553,695,501	(512,728,456)	(1,466,149,633)	(1,223,413,033)	120,563,040
h. Funding value end of year: a + d + e3 + f8	86,109,303,264	88,695,483,883	92,112,530,220	91,599,801,764	90,133,652,131	88,910,239,098	89,030,802,138
i. Difference between market and funding values	2,539,768,712	(3,404,003,250)	(3,081,728,082)	(2,568,999,626)	(1,102,849,993)	120,563,040	-
j. Recognized rate of return	8.4%	6.3%	7.5%				
k. Market rate of return (net of fee)	5.4%	(0.7)%	8.2%				

SECTION D
GAIN/LOSS

ACTIVE MEMBER GAIN/LOSS ANALYSIS

Purpose of Gain/Loss Analysis. Regular actuarial valuations provide information about the composite change in computed contribution rates and total liabilities -- whether or not the rates and related liabilities are increasing or decreasing, and by how much. However, valuations do not show the portion of the change attributable to each risk area within the Retirement System financial mechanism: the rate of recognized investment income on plan assets; the rates of withdrawal of active participants who leave covered employment; the rates of mortality; the rates of disability; the rates of salary increases; and the assumed ages at actual retirement. In an actuarial valuation, assumptions are made as to what these rates will be for the next year and for decades in the future.

The objective of a gain and loss analysis is to determine the portion of the change that is attributable to each risk area.

The fact that actual experience differs from assumed experience should be expected. The future cannot be predicted with complete precision. Further, year-to-year statistical fluctuations occur, even in very large groups. This year's report reflects just a single year's experience. Changes in the valuation assumed experience for a risk area should be made only when the differences between assumed and actual experience have been observed to be sizable and persistent. One year's gain and loss analysis may or may not be indicative of *long-term trends, which are the basis of actuarial assumptions*. However, a persistent series of gains and losses can indicate a need for an assumption change or a method change, even if on a demographic basis, the assumptions appear to model reality well. In the Wisconsin Retirement System, longer term trends are reviewed in connection with the regular 3-year investigation of experience (the most recent 3-year investigation covered the period January 1, 2012 to December 31, 2014). It is the results of the 3-year investigation that lead to recommendations for changes in the actuarial assumptions.

Overall Experience

Overall experience resulted in a net actuarial gain of \$402 million for the 2016 calendar year. The gain was primarily attributable to lower than assumed salary increases and favorable investment performance. The net result was a decrease in the overall 2018 contribution rate of 0.2% of payroll.

POPULATION DEVELOPMENT DURING CALENDAR YEAR 2016

	General	Executive & Elected	Protective		Total	Expected
			With S.S.	Without S.S.		
Beginning Census	231,631	1,380	19,273	2,730	255,014	
(-) Normal Retirement	3,558	55	511	70	4,194	4,135
(-) Early Retirement	3,524	5	97	9	3,635	4,179
(-) Death	128	3	5	0	136	253
(-) Disability Retirement						
- Total disabilities approved	96	0	5	2	103	193
- Less pending at beginning of year	24	0	1	0	25	
- Net new from active status	72	0	4	2	78	
(-) Other Separations	13,103	65	819	29	14,016	12,090
(-) Transfers Out	1,609	25	281	11	1,926	
(+) Transfers In	1,608	58	234	26	1,926	
(+) New Entrants	21,439	62	1,641	111	23,253	
Ending Census	232,684	1,347	19,431	2,746	256,208	

This schedule reconciles the active member populations reported in connection with the December 31, 2016 and the prior year valuations. Assumptions related to population development are a primary focus of the gain/loss analysis. They generally tend to be more stable than economic assumptions, and therefore, measurements have more meaning. Please note also that the table above represents changes in actual and expected counts of members. Beginning with the 2009 valuations, some of the actuarial assumptions (retirement, turnover, etc.) are based on liability weighted rates. Therefore, comparing actual to expected number counts alone may not form the basis for our conclusions.

Transfers for the General group include transfer between subgroups (teachers, university, general employees, etc.).

COMMENTS

Population Results

Normal Retirements varied by group and gender. Overall normal retirements were slightly more than expected. In general, more normal retirements than assumed often creates a loss. However, looking at counts alone is not always an accurate predictor of whether a gain or loss occurs. If there are fewer retirements in shorter service, lower paid groups and more retirements than expected in longer service, higher paid groups, there will be a net loss to the System even if the actual total counts might be equal to or less than expected. In order to account for this, retirement rates are now developed partially on a liability weighted methodology. The net result for this past year was a small loss.

Early Retirements were less than expected, overall producing a small loss.

Deaths among active participants were less than expected. The net result for the past year was a small loss.

Disabilities were less than expected and produced a gain. This means that the reserves needed for the disability benefit were slightly smaller than the reserves that had been held for retirement benefits.

Other Separations varied by group, gender, and service but were overall higher than expected. The net result for the past year was a small gain.

In total, the population risk areas (retirement, death, disability, and other separations) produced gains and losses that almost entirely offset each other, producing a small net loss during 2016.

Economic Results

On a market value basis net of fee **investment return** was 8.2% and investment activity produced a gain for all groups due to the combined effect of this year's gain and the continued recognition of prior gains and losses. The total recognized investment gain of \$239 million was partially offset by a \$101 million gain in the combined value of variable excess benefits and money purchase benefits (as shown on page D-10), resulting in a net recognized investment gain of about \$138 million.

Pay Increases were overall less than expected, producing a gain.

COMMENTS

Other Analysis

The schedule on page D-8 analyzes gains or losses due to sources other than the demographic and economic areas. The **Reserve Difference** produced a loss of about \$12 million. This is primarily attributable to adjustments related to estimated annuities for which final computations have now been made. The **Re-established Liability** represents the liability for new or rehired active members who were not active in the prior year. Typically, it is expected that a new hire will have very little liability. However, often new members appear with more than one year of service or with liability greater than contributions made on their behalf. Although this amount is difficult to determine accurately due to the timing of contribution amounts, we estimate the Re-established Liability loss at about \$58 million.

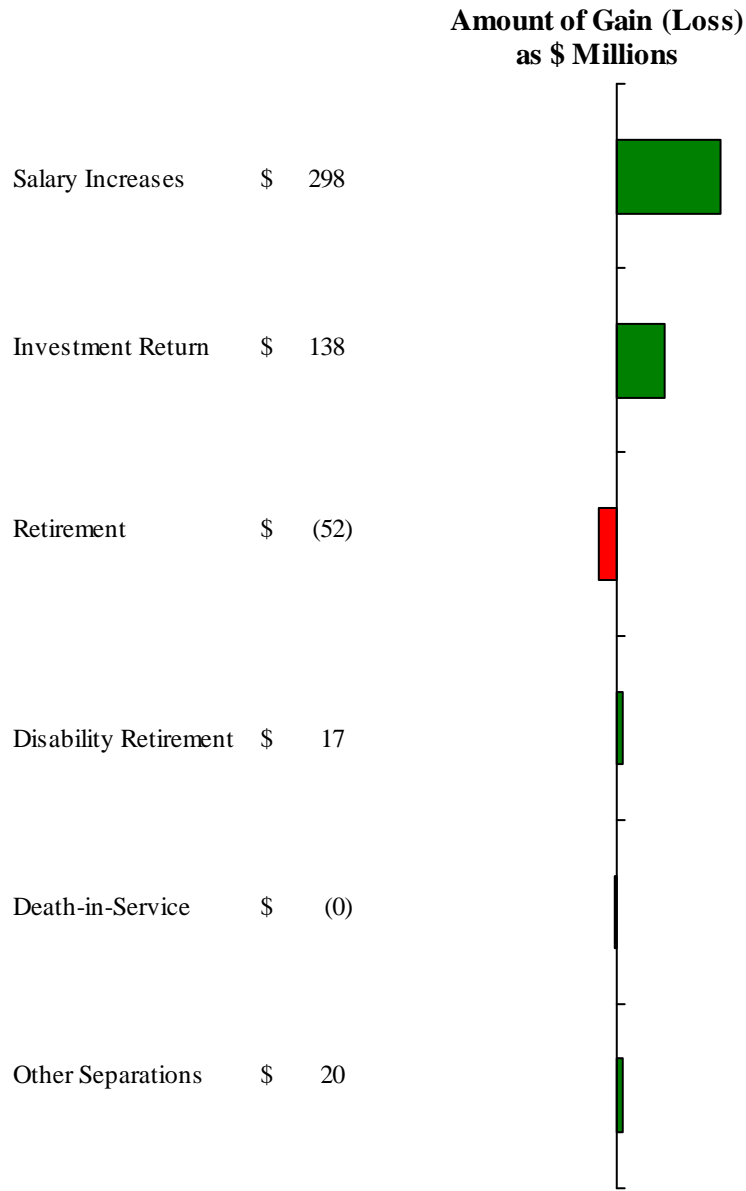
**ACTUAL VS. EXPECTED CHANGES IN UNFUNDED ACTUARIAL ACCRUED LIABILITY (UAAL) -
CALENDAR YEAR DECEMBER 31, 2016
(\$ MILLIONS)**

	Year Ended December 31, 2016				
	General	Executive & Elected	Protective		Total
			With S.S.	Without S.S.	
(1) Entry Age UAAL at start of year	\$ 930.7	\$ 61.5	\$ 194.7	\$ 31.1	\$ 1,218.0
(2) Normal cost from last valuation (Total)	1,598.2	13.6	200.5	45.4	1,857.7
(3) Actual contributions	1,616.9	14.8	197.2	45.4	1,874.3
(4) Interest	66.3	4.4	14.1	2.2	87.0
(5) Expected UAAL before changes: (1) + (2) - (3) + (4)	978.3	64.7	212.1	33.3	1,288.4
(6) Change in actuarial assumptions	0.0	0.0	0.0	0.0	0.0
(7) Other changes	0.0	0.0	0.0	0.0	0.0
(8) Expected UAAL after changes: (5) + (6) + (7)	978.3	64.7	212.1	33.3	1,288.4
(9) Actual Entry Age UAAL at end of year	637.4	50.1	179.0	19.8	886.3
(10) Gain (loss): (8) - (9)	\$ 340.9	\$ 14.6	\$ 33.1	\$ 13.5	\$ 402.1

The gain/loss analysis is intended to explain the financial effect of differences between actual and assumed experience in basic risk areas: Investment income, pay increases, retirement rates, turnover rates, etc. In order for the gain/loss analysis to proceed, the change in the Entry Age Unfunded Actuarial Accrued Liabilities from one year to the next is analyzed to remove the effect of expected changes. The table above develops this year's gain or loss (line 10) which is added to the Experience Amortization Reserve (EAR). When the EAR increases "unexpectedly," this is favorable experience and downward pressure is exerted on contribution rates. Similarly, an unexpected decrease in the EAR is unfavorable experience and upward pressure is exerted on contribution rates. In addition to the gain or loss described in line 10, non-recurring changes in lines 6 and 7 also may affect contribution rates.

By measuring gains and losses each year and, to the extent possible, determining the "responsible" assumptions, insight is gained into how well the actuarial assumptions estimate WRS liabilities. Such information aids in understanding financial effects of emerging trends and is particularly useful during preparation of the WRS experience study.

**GAIN/LOSS ANALYSIS
2016 EXPERIENCE
DIVISIONS COMBINED**



ACTUARIAL GAINS & LOSSES DURING CALENDAR YEAR 2016
(\$ MILLIONS)

Type of Activity	General	Executive & Elected	Protective		Total
			With S.S.	Without S.S.	
Decrement Risk Areas					
Normal Retirement	\$ (14.3)	\$ (0.7)	\$ (17.1)	\$ (1.0)	\$ (33.1)
Early Retirement	(18.3)	0.2	(0.3)	(0.1)	(18.5)
Disability Retirement	15.3	0.1	1.2	0.6	17.2
Death with Benefit	(0.5)	0.0	0.4	(0.1)	(0.2)
Other Separations	18.7	(1.2)	3.6	(1.1)	20.0
Economic Risk Areas					
Salary Increases	268.1	14.0	8.5	7.6	298.2
Investment Return	112.8	0.7	19.0	5.6	138.1
Other Activity	(40.9)	1.5	17.8	2.0	(19.6)
Total Gain (Loss)	\$ 340.9	\$ 14.6	\$ 33.1	\$ 13.5	\$ 402.1
-% of Accrued Liability	1.0%	6.6%	0.8%	1.4%	1.0%

ANALYSIS OF OTHER ACTIVITY
(\$ MILLIONS)

	General	Executive & Elected	Protective		Total
			With S.S.	Without S.S.	
Expected Reserve Transfers					
Normal Retirement	\$1,736	\$33	\$ 300	\$72	\$2,141
Early Retirement	1,073	2	55	8	1,138
Death	13	1	1	0	15
Disability Retirement	30	0	2	2	34
Deferred Retirement	327	3	25	17	372
Expected Total Reserve Transfers	3,179	39	383	99	3,700
Actual Reserve Transfer (From Retiree Report)	3,173	42	375	98	3,688
Reserve Difference	6	(3)	8	1	12
Expected Refunds	55	0	3	0	58
Actual Refunds	35	0	3	1	39
Refund Difference	20	0	0	(1)	19
Re-established Liability	(50)	(1)	(5)	(2)	(58)
Total Explained Difference	(24)	(4)	3	(2)	(27)
Unknown Difference	(17)	6	15	4	7
Total Other Activity	(41)	2	18	2	(20)
Other Activity as % of Liabilities	(0.12)%	0.90 %	0.44 %	0.21 %	(0.05)%

This schedule analyzes reserve transfers and contribution refunds and shows the portion of “other” activity that can be explained by those sources. Amounts may not sum due to rounding.

**COMPARATIVE SCHEDULE OF EXPERIENCE
5-YEAR HISTORY OF GAINS AND LOSSES
(\$ MILLIONS)**

Year	Retmt.	Disability Retmt.	Other Separations*	Salary Increases	Investment Return	Other	Total
GENERAL							
2012	\$ (35.6)	\$ 15.2	\$ 20.7	\$ 610.0	\$ (1,058.3)	\$ (82.8)	\$ (530.8)
2013	(32.2)	16.8	27.2	250.8	624.2	(125.0)	761.8
2014	(25.5)	18.1	24.5	14.5	269.0	(111.0)	189.6
2015	(33.3)	13.5	20.8	74.5	(163.0)	(11.8)	(99.3)
2016	(32.6)	15.3	18.2	268.1	112.8	(40.9)	340.9
EXECUTIVE & ELECTED							
2012	\$ 2.0	\$ 0.1	\$ (1.9)	\$ 1.4	\$ (13.0)	\$ 4.3	\$ (7.1)
2013	(1.1)	0.1	-	1.6	2.1	(1.4)	1.3
2014	1.8	0.1	(0.7)	(0.7)	2.1	(6.4)	(3.8)
2015	2.2	0.1	(1.2)	2.8	(0.7)	(4.4)	(1.2)
2016	(0.5)	0.1	(1.2)	14.0	0.7	1.5	14.6
PROTECTIVE WITH SOCIAL SECURITY							
2012	\$ (14.6)	\$ 1.5	\$ (0.8)	\$ 100.8	\$ (154.4)	\$ (10.0)	\$ (77.5)
2013	(8.6)	1.6	1.0	52.2	106.1	(7.5)	144.8
2014	(6.1)	1.5	0.3	13.0	42.6	(14.9)	36.4
2015	(15.9)	0.6	1.4	(11.1)	(30.3)	3.3	(52.0)
2016	(17.4)	1.2	4.0	8.5	19.0	17.8	33.1
PROTECTIVE WITHOUT SOCIAL SECURITY							
2012	\$ (0.6)	\$ 0.6	\$ (1.3)	\$ 6.2	\$ (40.3)	\$ (3.7)	\$ (39.1)
2013	(2.6)	0.6	(1.7)	3.6	31.5	(3.7)	27.7
2014	(0.3)	0.6	(0.7)	(3.3)	11.8	(7.4)	0.7
2015	(1.8)	0.2	(1.4)	(5.5)	(7.8)	(6.1)	(22.4)
2016	(1.1)	0.6	(1.2)	7.6	5.6	2.0	13.5

* Includes separation due to death.

GAIN (LOSS) FROM INVESTMENT INCOME DURING CALENDAR YEAR
(\$ MILLIONS)

	General	Executive & Elected	Protective		Total
			With SS	Without SS	
(1) Beginning of Year Active Participant Assets					
(a) Participant Accumulation Reserve	\$14,910.3	\$ 52.3	\$1,307.6	\$267.0	\$16,537.2
(b) PAR Closing Adjustment	(0.2)	0.0	0.0	0.0	(0.2)
(c) Employer Accumulation Reserve	18,482.8	180.3	2,649.9	668.8	21,981.8
(d) EAR Closing Adjustment	(0.3)	0.0	0.0	0.0	(0.3)
(e) Total	33,392.6	232.6	3,957.5	935.8	38,518.5
(2) End of Year Active Participant Assets					
(a) Participant Accumulation Reserve	15,534.8	46.2	1,334.9	261.9	17,177.8
(b) Employer Accumulation Reserve	18,699.2	174.5	2,729.9	689.2	22,292.8
(c) Total	34,234.0	220.7	4,064.8	951.1	39,470.6
(3) Investment Earnings Credited					
(a) Participant Accumulation Reserve	1,120.7	3.3	97.7	19.7	1,241.4
(b) Employer Accumulation Reserve	1,427.3	13.4	206.3	52.3	1,699.3
(c) Total	2,548.0	16.7	304.0	72.0	2,940.7
(4) Average Balance: $.5 \times \{(1e)+(2c)-(3c)\}$	32,539.3	218.3	3,859.2	907.5	37,524.3
(5) Expected Earnings: $.072 \times (4)$	2,342.8	15.7	277.9	65.3	2,701.7
(6) Gain (Loss) for Year from Investment Experience: $(3c)-(5)$	205.2	1.0	26.1	6.7	239.0
(7) Portion applied to Change in Variable Excess Reserve and Money Purchase Minimum Benefit	92.4	0.4	7.1	1.1	101.0
(8) Remaining Gain (Loss): (6)-(7)	\$ 112.8	\$ 0.7	\$ 19.0	\$ 5.6	\$ 138.0

SECTION E
CENSUS DATA

ACTIVE PARTICIPANTS INCLUDED IN VALUATIONS
DECEMBER 31, 2016

Active participants included in the valuations totaled 256,208 with an annual payroll totaling \$13,486.0 million, as follows:

Valuation Group	Number	Annual Earnings (\$Millions)	Group Averages			
			Earnings	Age	Years of Service	Contribs.
General	232,684	\$11,963.8	\$51,417	45.6	11.4	\$55,167
Executive Group & Elected Officials	1,347	106.0	78,667	55.4	13.1	102,601
Protective Occupation with Social Security	19,431	1,203.2	61,924	40.4	12.6	64,918
Protective Occupation without Social Security	2,746	213.0	77,553	41.1	14.1	80,375
Total Active Participants	256,208	\$13,486.0	\$52,637	45.2	11.5	\$56,427
Prior Year	255,014	\$13,273.1	\$52,048	45.3	11.7	\$54,906

Group averages are not used in the valuation, but are shown here for their general interest.

**INACTIVE PARTICIPANTS INCLUDED IN VALUATIONS
DECEMBER 31, 2016**

Inactive participants included in the valuations totaled 160,987 as follows:

Valuation Group	Number	Group Averages		
		Age	Service	Money Purchase Balance
General	154,098	47.6	3.2	\$14,629
Executive Group & Elected Officials	609	55.1	4.4	29,197
Protective Occupation with Social Security	5,976	41.9	4.3	18,811
Protective Occupation without Social Security	214	43.1	6.5	33,891
Total Inactive Participants	160,897	47.4	3.2	\$14,865
Prior Year	158,240	47.3	3.2	\$14,156

The valuations also included 3,990 QDRO cases whose average age was 52.3 years. These accounts for divorced spouses of WRS participants have been established in accordance with Wisconsin Domestic Relations Law.

GENERAL PARTICIPANTS AS OF DECEMBER 31, 2016
BY ATTAINED AGE AND YEARS OF SERVICE

Attained Ages	Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	No.	Valuation Payroll
15-19	121							121	\$ 2,681,071
20-24	4,796	16						4,812	152,674,247
25-29	17,519	1,875	11					19,405	774,694,594
30-34	13,222	9,597	1,511	14				24,344	1,107,416,658
35-39	10,417	7,106	8,592	1,754	12			27,881	1,423,634,081
40-44	8,200	5,264	5,573	8,117	972	7		28,133	1,543,902,904
45-49	7,735	5,359	4,964	6,815	6,405	1,172	20	32,470	1,818,164,196
50-54	6,509	5,082	5,023	6,033	5,159	5,822	1,151	34,779	1,928,990,992
55	1,209	964	1,093	1,150	976	1,037	804	7,233	392,150,577
56	1,142	986	1,027	1,223	887	1,007	894	7,166	387,347,686
57	1,055	853	999	1,143	847	895	892	6,684	362,629,546
58	901	834	968	1,150	781	864	833	6,331	344,944,161
59	929	718	892	1,075	718	711	780	5,823	308,783,352
60	815	731	757	937	702	637	751	5,330	279,183,973
61	738	547	695	815	582	524	656	4,557	238,085,599
62	600	517	615	760	583	451	574	4,100	216,389,213
63	512	459	437	593	452	368	471	3,292	173,993,898
64	395	327	410	469	355	315	368	2,639	137,344,553
65	334	309	312	391	255	221	284	2,106	110,180,965
66	264	225	174	236	153	148	208	1,408	72,718,810
67	203	146	156	150	90	93	133	971	49,567,623
68	171	99	86	97	67	54	99	673	32,650,769
69	167	83	56	78	45	51	74	554	27,136,148
70	139	63	79	58	53	39	67	498	23,811,692
71	80	40	34	28	23	22	36	263	12,237,811
72	75	45	20	19	15	25	37	236	10,185,615
73	74	30	22	21	12	6	29	194	8,057,740
74	61	33	21	15	16	10	30	186	7,636,579
75 & Up	200	110	41	32	25	26	61	495	16,606,716
Totals	78,583	42,418	34,568	33,173	20,185	14,505	9,252	232,684	\$11,963,801,769

**EXECUTIVE GROUP AND ELECTED OFFICIALS
AS OF DECEMBER 31, 2016
BY ATTAINED AGE AND YEARS OF SERVICE**

Attained Ages	Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	No.	Valuation Payroll
15-19									
20-24	2							2	45,602
25-29	11	2						13	821,878
30-34	25	14	3					42	2,637,972
35-39	15	17	15	3				50	3,567,171
40-44	34	16	25	21	1			97	7,446,078
45-49	54	30	27	25	25	5		166	12,976,132
50-54	71	33	25	30	23	23	8	213	17,404,461
55	15	8	5	3	7	6	2	46	3,908,690
56	11	12	5	7	9	6	9	59	4,913,428
57	18	4	6	9	3	9	12	61	5,191,645
58	18	6	6	6	8	10	8	62	5,248,128
59	15	6	8	9	6	4	8	56	4,845,765
60	14	2	3	4	2	7	13	45	3,642,944
61	11	5	2	4	6	6	11	45	4,816,473
62	12	8	2		4	7	5	38	2,822,013
63	13	10	6	5	5	5	12	56	4,439,375
64	6	6	3	4	7	4	3	33	2,707,267
65	15	7	4	10	4	1	10	51	3,857,864
66	5	6	2	2	8	2	9	34	2,737,999
67	4	5	3	4	1	5	2	24	2,105,937
68	14	3	1	5			5	28	2,110,551
69	9	5	4	2	1	3	3	27	2,121,380
70	4	4	5	2	4	2	3	24	2,086,462
71	7						1	8	379,195
72	4	3		1	1			9	755,639
73	5		1			3	1	10	566,206
74	5	4	3	2		1		15	635,178
75 & Up	16	10		1	1	2	3	33	1,173,513
Totals	433	226	164	159	126	111	128	1,347	\$105,964,946

**PROTECTIVE OCCUPATION PARTICIPANTS WITH SOCIAL SECURITY
AS OF DECEMBER 31, 2016
BY ATTAINED AGE AND YEARS OF SERVICE**

Attained Ages	Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	No.	Valuation Payroll
15-19	9							9	\$ 276,126
20-24	839	2						841	33,770,040
25-29	2,081	397	7					2,485	126,632,672
30-34	1,031	1,359	499	18				2,907	169,142,630
35-39	485	637	1,198	632	4			2,956	181,463,921
40-44	267	300	575	1,475	358			2,975	196,116,701
45-49	192	199	368	910	1,336	370	3	3,378	231,938,037
50	35	31	41	99	157	208	7	578	41,810,740
51	20	32	53	97	130	182	17	531	37,287,063
52	20	22	54	76	94	181	23	470	33,967,701
53	20	24	40	63	101	121	49	418	29,322,109
54	27	22	33	66	67	82	46	343	23,727,097
55	15	29	37	57	59	66	32	295	19,526,715
56	17	18	30	51	43	39	41	239	15,691,846
57	10	10	25	36	35	33	34	183	12,303,145
58	4	12	32	35	26	20	36	165	11,450,940
59	9	13	25	32	15	25	18	137	8,699,287
60	11	11	20	30	12	18	26	128	7,966,794
61	9	15	17	25	16	11	20	113	6,725,119
62	11	8	18	16	12	12	22	99	6,130,639
63	4	3	12	8	5	7	9	48	2,853,755
64	8	5	5	11	5	4	7	45	2,296,525
65	4	2	3	7	3	4	6	29	1,630,849
66	1	5	3	1	4	2	4	20	1,019,026
67	3		1		1		1	6	249,873
68	2	2		3	2	1	1	11	519,276
69	2		1	1		1		5	210,452
70 & Up	8	2	2	2	1		2	17	518,745
Totals	5,144	3,160	3,099	3,751	2,486	1,387	404	19,431	\$1,203,247,823

**PROTECTIVE OCCUPATION PARTICIPANTS WITHOUT SOCIAL SECURITY
AS OF DECEMBER 31, 2016
BY ATTAINED AGE AND YEARS OF SERVICE**

Attained Ages	Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	No.	Valuation Payroll
20-24	61							61	\$ 3,106,541
25-29	224	70	1					295	18,332,875
30-34	144	216	67					427	29,913,223
35-39	55	122	178	71				426	31,736,699
40-44	18	49	88	240	46			441	35,196,572
45-49	10	13	59	165	191	62		500	42,040,142
50	2	3	7	29	23	27		91	7,955,485
51	2		7	19	35	30	3	96	8,368,318
52			2	13	30	32	7	84	7,207,420
53		2	3	3	24	41	9	82	7,157,821
54	3	1	2	4	12	24	8	54	4,802,775
55	1	1	2	10	10	20	8	52	4,866,472
56			2	4	9	9	13	37	3,402,044
57	2	1		5	11	8	7	34	2,887,050
58	1	1	1	4	4	11	1	23	2,124,614
59			1		3	4	4	12	1,039,342
60	1	2			2	4	2	11	1,021,659
61						3	1	4	401,226
62					2	3	1	6	519,370
63			2		2	2	2	8	714,224
64						1		1	72,908
66							1	1	94,480
Totals	524	481	422	567	404	281	67	2,746	\$212,961,260

**ACTIVE PARTICIPANTS
AS OF DECEMBER 31, 2016
BY YEARS OF SERVICE AND GENDER**

Completed Years of Service	Males	Females	Totals	Valuation Payroll	
				Total	Average
0	7,009	14,629	21,638	\$ 643,312,864	\$29,731
1	6,564	12,090	18,654	716,664,101	38,419
2	5,972	10,785	16,757	691,944,570	41,293
3	5,329	9,413	14,742	647,003,008	43,888
4	4,878	8,015	12,893	585,728,544	45,430
5	3,947	7,017	10,964	514,078,539	46,888
6	3,158	5,810	8,968	427,941,404	47,719
7	2,692	5,389	8,081	395,902,350	48,992
8	3,222	5,913	9,135	469,496,023	51,395
9	3,335	5,802	9,137	480,811,373	52,622
10	2,990	5,328	8,318	449,383,654	54,025
11	2,687	5,106	7,793	423,737,619	54,374
12	2,665	4,808	7,473	420,534,228	56,274
13	2,509	4,573	7,082	399,438,399	56,402
14	2,707	4,880	7,587	448,691,559	59,140
15 & Up	36,731	50,255	86,986	5,771,307,562	66,348
Totals	96,395	159,813	256,208	\$13,485,975,797	\$52,637

Average

Age	45.3	45.1	45.2
Service	12.3	11.1	11.5

COMPARATIVE STATEMENT OF ACTIVE PARTICIPANTS IN VALUATIONS

Valuation 12/31	General				Executive and Elected			
	No.	Earnings			No.	Earnings		
		\$ Millions	Average	% Incr.		\$ Millions	Average	% Incr.
1992	207,882	\$ 5,747	\$ 27,643	4.2%	1,463	\$ 58	\$39,598	5.5 %
1993	210,627	6,084	28,886	4.5%	1,452	60	41,476	4.7 %
1994	214,280	6,342	29,595	2.5%	1,450	63	43,528	4.9 %
1995	216,434	6,597	30,479	3.0%	1,475	67	45,135	3.7 %
1996	219,265	6,832	31,160	2.2%	1,459	67	45,967	1.8 %
1997	222,888	7,128	31,980	2.6%	1,455	71	48,881	6.3 %
1998	227,017	7,457	32,847	2.7%	1,450	73	50,664	3.6 %
1999*	229,657	7,704	34,445	4.9%	1,468	77	53,263	5.1 %
2000	234,076	8,335	35,610	3.4%	1,486	83	55,582	4.4 %
2001	238,944	8,746	36,605	2.8%	1,486	85	57,060	2.7 %
2002	240,990	9,007	37,377	2.1%	1,476	87	58,865	3.2 %
2003	239,696	9,273	38,686	3.5%	1,468	86	58,336	(0.9)%
2004	238,943	9,501	39,764	2.8%	1,469	89	60,379	3.5 %
2005	237,501	9,661	40,678	2.3%	1,452	90	61,788	2.3 %
2006	236,877	9,933	41,935	3.1%	1,436	93	64,480	4.4 %
2007	237,124	10,278	43,344	3.4%	1,427	95	66,320	2.9 %
2008**	238,994	10,806	45,216	4.3%	1,430	101	70,316	6.0 %
2009	240,401	11,098	46,165	2.1%	1,427	101	70,786	0.7 %
2010	239,959	11,195	46,655	1.1%	1,418	101	71,394	0.9 %
2011	232,518	10,947	47,080	0.9%	1,393	99	70,802	(0.8)%
2012	231,765	11,041	47,639	1.2%	1,408	104	73,968	4.5 %
2013	231,973	11,270	48,584	2.0%	1,397	106	76,125	2.9 %
2014	232,433	11,574	49,794	2.5%	1,401	109	77,998	2.5 %
2015	231,631	11,786	50,881	2.2%	1,380	108	78,230	0.3 %
2016	232,684	11,964	51,417	1.1%	1,347	106	78,667	0.6 %

* After change in method of calculating average pay.

** Some groups had a 27 period payroll during 2008.

COMPARATIVE STATEMENT OF ACTIVE PARTICIPANTS IN VALUATIONS

Valuation 12/31	Protective with Social Security				Protective without Social Security			
	No.	Earnings			No.	Earnings		
		\$ Millions	Average	% Incr.		\$ Millions	Average	% Incr.
1992	12,160	\$ 390	\$ 32,049	4.7%	2,622	\$100	\$38,007	6.6 %
1993	12,388	408	32,928	2.7%	2,611	103	39,371	3.6 %
1994	12,825	436	34,005	3.3%	2,612	106	40,633	3.2 %
1995	13,434	467	34,747	2.2%	2,630	112	42,478	4.5 %
1996	13,820	495	35,807	3.1%	2,625	116	44,063	3.7 %
1997	14,232	536	37,625	5.1%	2,654	121	45,568	3.4 %
1998	14,810	570	38,509	2.3%	2,658	127	47,733	4.8 %
1999*	16,483	649	39,864	3.5%	2,691	131	48,947	2.5 %
2000	16,970	717	42,263	6.0%	2,685	135	50,423	3.0 %
2001	17,981	772	42,914	1.5%	2,715	142	52,339	3.8 %
2002	18,325	804	43,871	2.2%	2,709	148	54,603	4.3 %
2003	18,660	856	45,891	4.6%	2,714	154	56,673	3.8 %
2004	18,964	896	47,266	3.0%	2,709	159	58,546	3.3 %
2005	19,036	920	48,330	2.3%	2,689	162	60,241	2.9 %
2006	19,297	977	50,622	4.7%	2,692	167	62,153	3.2 %
2007	19,757	1,036	52,419	3.5%	2,695	174	64,449	3.7 %
2008**	20,038	1,099	54,859	4.7%	2,724	181	66,502	3.2 %
2009	20,205	1,124	55,636	1.4%	2,733	189	69,149	4.0 %
2010	20,019	1,125	56,184	1.0%	2,754	189	68,559	(0.9)%
2011	19,610	1,119	57,065	1.6%	2,711	189	69,898	2.0 %
2012	19,353	1,105	57,104	0.1%	2,727	193	70,949	1.5 %
2013	19,290	1,121	58,127	1.8%	2,736	197	71,960	1.4 %
2014	19,533	1,151	58,916	1.4%	2,733	204	74,487	3.5 %
2015	19,273	1,171	60,755	3.1%	2,730	209	76,376	2.5 %
2016	19,431	1,203	61,924	1.9%	2,746	213	77,553	1.5 %

* After change in method of calculating average pay.

** Some groups had a 27 period payroll during 2008.

SECTION F

FINANCIAL REPORTING

GASB 67 and 68 Information is provided in a separate report.

SUMMARY OF ACTUARIAL ASSUMPTIONS AND METHODS

Valuation Date	December 31, 2016
Actuarial Cost Method	Frozen Entry Age
Amortization Method	Level Percent -- Closed Period
Amortization Period	30-Year closed from date of participation in WRS
Asset Valuation Method	5-Year Smoothed Market (Closed)
Actuarial Assumptions	
Net Investment Rate of Return	5.5%
Weighted based on assumed rate for:	
Retired participants	5.0%
Post-retirement active participants	5.0%
Pre-retirement active participants	7.2%
Projected Salary Increases*	3.3% to 8.8%
Payroll Growth Rate	3.2%
Population Growth Rate	0.0%

* Includes merit and seniority increases that vary by service plus wage inflation of 3.2%/year.

STATEMENT OF NET PLAN ASSETS (\$ THOUSANDS)

	2016	2015
Assets		
Cash and Cash Equivalents	\$ 6,451,314	\$ 3,956,982
Securities Lending Collateral	1,004,940	1,177,769
Prepaid Expenses	6,368	29,173
Total Short Term Assets	7,462,622	5,163,924
Receivables		
Contributions	174,233	179,588
Prior Service Contributions	18,352	25,978
Benefits Overpayment	2,270	2,254
Due from Other Trust Funds	14,821	6,533
Miscellaneous	6,477	3,050
Interest and Dividends	244,205	226,909
Investment Sales	910,708	1,041,414
Total Receivables	1,371,066	1,485,726
Investments at Fair Value		
Fixed Income	28,622,140	24,955,170
Financial Futures Contracts	(79,142)	(247)
Preferred Securities	166,542	178,666
Convertible Securities	639	0
Stocks	44,963,360	47,185,254
Options	252	(1,179)
Limited Partnerships	11,285,915	10,679,849
Real Estate	1,275,526	1,119,024
Foreign Currency Contracts	67,024	3,274
Multi Asset Investments	4,407,772	4,102,892
Investment in Core Fund	0	0
Investment in External Pool	23,624	9,754
Total Investments	90,733,652	88,232,457
Capital Assets	25,774	13,897
Total Assets	99,593,114	94,896,004
Liabilities		
Fixed Investment Due Other Programs	3,326,057	3,327,057
Variable Investment Due Other Programs	19,809	19,759
Obligation Under Reverse Repo Agreement	1,831,169	809,678
Short Sell Obligations	305,937	166,161
Securities Lending Collateral Liability	1,004,940	1,177,769
Collateral Due to Counterparty	74,340	21,870
Benefits Payable	339,462	337,104
Unearned Revenue	75	75
Due to Other Trust Funds	75,660	75,620
Miscellaneous Payables	134,794	122,592
Investment Payables	161,529	333,649
Total Liabilities	7,273,772	6,391,334
Net Assets in Trust for Pension Benefits	\$92,319,342	\$88,504,670

STATEMENT OF CHANGES IN ASSETS (\$ THOUSANDS)

	Activity During Year	
	2016	2015
Additions:		
Contributions:		
Employer Contributions	\$ 963,113	\$ 977,734
Employee Contributions	921,864	937,225
Total Contributions	1,884,977	1,914,959
Investment Income:		
Net Appreciation (Depreciation) in Fair Value of Investments	5,861,708	(2,328,202)
Interest	568,127	550,054
Dividends	1,239,791	1,206,311
Securities Lending Income	36,529	35,068
Other	242,854	188,537
Less		
Current Income Distributed	(536,897)	26,147
SWIB Investment Expense	(391,427)	(350,036)
Investment Income Distributed to Securities Lending Rebates and Fees	(2,973)	(2,867)
Net Investment Income	7,017,712	(674,988)
Interest on Prior Service Receivable	1,198	1,617
Miscellaneous Income	305	248
Total Additions	8,904,192	1,241,836
Deductions:		
Benefits and Refunds:		
Retirement, Disability, and Beneficiary	4,951,650	4,780,290
Separation Benefits	39,276	37,642
Total Benefits and Refunds	4,990,926	4,817,932
ETF Administrative Expenses	27,322	22,709
Other Expenses	71,271	43,296
Total Deductions	5,089,519	4,883,937
Net Increase (Decrease)	3,814,673	(3,642,101)
Net Assets Held in Trust:		
Beginning of Year	\$88,504,670	\$92,146,772
End of Year	\$92,319,342	\$88,504,670

SCHEDULE OF FUNDING PROGRESS & ACCRUED LIABILITIES
\$ MILLIONS

Valuation Date Dec. 31	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL) Frozen Entry Age (b)	Unfunded AAL (UAAL) (b) - (a)	Funded Ratio		Covered Payroll (c)	UAAL as a Percent of Covered Payroll [(b) - (a)] / (c)
				F-I-L (a)/(b)	Entry Age		
2004	\$ 66,209.4	\$ 66,622.3	\$ 412.9	99.4 %		\$ 10,897.6	3.8 %
2005	68,615.1	68,987.5	372.5	99.5 %		10,973.4	3.4 %
2006	73,415.3	73,735.8	320.5	99.6 %		11,308.2	2.8 %
2007	79,791.9	80,079.7	287.8	99.6 %		11,720.2	2.5 %
2008	77,159.4	77,412.0	252.6	99.7 %		12,289.6	2.1 %
2009	78,911.3	79,104.6	193.3	99.8 %		12,622.2	1.5 %
2010	80,626.9	80,758.8	131.9	99.8 %		12,744.0	1.0 %
2011	78,940.0	79,039.3	99.3	99.9 %		12,855.6	0.8 %
2012	78,613.0	78,682.7	69.7	99.9 %		12,627.6	0.6 %
2013	85,276.1	85,328.7	52.6	99.9 %		12,884.8	0.4 %
2014	89,360.4	89,392.1	31.7	100.0 %	99.5 %	13,219.5	0.2 %
2015	91,502.4	91,526.5	24.1	100.0 %	98.7 %	13,530.5	0.2 %
2016	95,396.2	95,414.0	17.8	100.0 %	99.0 %	13,706.0	0.1 %

* Affected by prepayment of UAAL in connection with Pension Obligation Bond issued by the state and various local government employers.

FUNDING METRICS (\$MILLIONS)

Valuation Date Dec. 31	Valuation Assets	F-I-L Accrued Liability for				Percent Funded for			
		Annuitants and Beneficiaries	Member Contribs.	Active & Inactive Members	Total	Annuitants and Beneficiaries	Participant Contributions	Active & Inactive Members	Total
2003	\$62,685.3	\$28,707.8	\$14,503.1	\$20,000.8	\$63,211.7	100.0%	100.0%	97.4%	99.2%
2004	66,209.4	30,829.9	15,050.3	20,742.1	66,622.3	100.0%	100.0%	98.0%	99.4%
2005	68,615.1	32,668.0	15,155.3	21,164.2	68,987.5	100.0%	100.0%	98.2%	99.5%
2006	73,415.3	35,774.7	15,902.4	22,058.7	73,735.8	100.0%	100.0%	98.5%	99.6%
2007	79,791.9	39,675.1	16,795.4	23,609.2	80,079.7	100.0%	100.0%	98.8%	99.6%
2008	77,159.4	38,372.6	16,045.3	22,994.1	77,412.0	100.0%	100.0%	98.9%	99.7%
2009	78,911.3	39,734.2	16,156.6	23,213.8	79,104.6	100.0%	100.0%	99.2%	99.8%
2010	80,626.9	41,139.0	16,253.6	23,366.2	80,758.8	100.0%	100.0%	99.4%	99.8%
2011	78,940.0	43,609.4	14,434.4	20,995.5	79,039.3	100.0%	100.0%	99.5%	99.9%
2012	78,613.0	44,055.5	14,401.1	20,226.1	78,682.7	100.0%	100.0%	99.7%	99.9%
2013	85,276.1	48,460.5	15,559.2	21,309.0	85,328.7	100.0%	100.0%	99.8%	99.9%
2014	89,360.4	51,131.1	16,259.3	22,001.7	89,392.1	100.0%	100.0%	99.9%	100.0%
2015	91,502.4	52,851.8	16,707.2	21,967.5	91,526.5	100.0%	100.0%	99.9%	100.0%
2016	95,396.2	55,764.0	17,361.7	22,288.3	95,414.0	100.0%	100.0%	99.9%	100.0%

CONTRIBUTIONS REQUIRED AND CONTRIBUTIONS MADE

Year Ended December 31	Annual Required Contribution	Percent Contributed *
2003	\$462.7	334.0%
2004	497.6	121.0%
2005	535.6	108.0%
2006	569.0	104.0%
2007	614.0	105.0%
2008	644.8	105.0%
2009	699.3	108.0%
2010	686.7	108.0%
2011	784.1	104.0%
2012	826.1	100.0%
2013	912.4	100.0%
2014	977.1	100.0%
2015	966.5	100.0%
2016	954.2	100.0%

* Includes additional UAAL payments when amount is greater than 100%.

Employers did not make the full actuarially required contribution for 2000 through 2002. In lieu of the full contribution, employers were allowed to recognize a credit due to a distribution from the TAA in accordance with the provisions of Act 11 of 1999. 2003 percent contributed includes pension obligation proceeds.

SECTION G

METHODS AND ASSUMPTIONS

ACTUARIAL VALUATION METHOD

The actuarial funding method prescribed in the statute for WRS is the **Frozen Entry Age Method**. Under this method, the amount of remaining unfunded actuarial accrued liabilities at any valuation date is affected only by the monthly amortization payments, compound interest, the added liability created by new employer units, and any added liabilities caused by changes in benefit provisions.

Actuarial gains or losses arising from the difference between actual and assumed experience are reflected in the determination of the normal cost. In this manner, experience gains or losses in any year are amortized (spread) over the average future working lifetime of the active participant group - a period of approximately 20 years. Hence, the computed normal cost is made up of two parts:

- The pure entry-age normal cost (EANC) determined without regard to past gains or losses, and
- an experience amortization component.

Section 40.04(1) of the Wisconsin Statutes provides authority to maintain accounts and reserves determined to be “useful in achieving the funds’ purposes - - -”. A fundamental WRS objective is stable contribution rates. Accordingly, based on the authority granted under Section 40.04, the experience portion of the normal cost is separately calculated each year and the amortization period is varied upward or downward in order to minimize short-term rate fluctuations. The policy regarding the EAR amortization period is described below:

- The standard period is set 20 years.
- The standard period is reconsidered as part of each triennial experience study (no changes were made with the most recent experience study).
- Temporary interim changes in the period are made only when there are large, but mostly offsetting market gains and losses known to be flowing through the MRA that would otherwise result in contribution rate volatility. Large changes would be defined as those which, over a 2-year period, were expected to result in contribution rate changes of at least 0.4% of payroll.
- The minimum and maximum EAR amortization periods are 10 years and 30 years respectively.
- The amortization policy will be applied in the same manner to market gains and losses flowing through the MRA.
- For 2016, a 20-year period was used.

ASSET VALUATION METHOD

An essential step in the valuation process is comparing valuation assets with computed liabilities. Computed liabilities result from actuarial calculations involving the covered population, the benefits, and actuarial assumptions. Valuation assets are those assets that are recognized and available to fund the System's liabilities. WRS assets are invested in the Core Investment Trust, and in the Variable Investment Trust, both of which are managed by the State of Wisconsin Investment Board (SWIB). Assets in the Variable Investment Trust are marked to market each year. Assets in the Core Investment Trust (most of the assets) are valued (or recognized) using an "asset valuation method."

Asset valuation methods are distinguished by the timing of the recognition of investment return. Total investment return is the sum of ordinary income and capital value changes. Under a book value approach, ordinary income is recognized immediately and capital gains (or losses) are recognized only when securities are sold. Book value investment return is directly affected by the timing of sales activity and underlying experience may be distorted. Under a pure market value approach, ordinary investment income and all capital value changes are recognized immediately. Because of market volatility, use of pure market values in retirement funding can result in volatile contribution rates and unstable financial ratios, contrary to WRS objectives.

The asset valuation method used for WRS valuations is statutory, and is referred to as the "Market Recognition Account" or MRA. Act 11 of 1999 closed the former Transaction Amortization Account (TAA) and created the Market Recognition Account (MRA). The MRA recognizes assumed returns fully each year. Differences between actual and assumed returns are phased-in over a closed 5-year period. The objective is to give recognition to long-term changes in asset values while minimizing the effect of short-term fluctuations in the capital markets. In accordance with its smoothing objective, the MRA will tend to exceed the market value when the markets are doing poorly, and will fall short of the market value when markets are doing well. Some retirement systems set limits on the amount by which the recognized value of assets can differ from the market value.

**SUMMARY OF ASSUMPTIONS
USED FOR ANNUAL ACTUARIAL VALUATIONS
ASSUMPTIONS ADOPTED BY ETF BOARD AFTER
CONSULTING WITH ACTUARY**

ECONOMIC ASSUMPTIONS

The rationale for these assumptions is based upon an experience study covering the period 2012-2014

For determining plan liabilities, the discount rate is 5.0% for retired participants, 5.0% for active and inactive participants following retirement, and 7.2% for active participants prior to their retirement. A valuation performed assuming a 5.5% discount rate for all participants at all stages of life, reproduces the results of an actuarial valuation using the 5.0% post-retirement and 7.2% pre-retirement assumptions. Thus, it can be said that **the net discount rate assumed in the valuations was 5.5% per year, compounded annually (net after administrative expenses).**

The **Wage Inflation Rate** assumed in this valuation was 3.2% per year. The wage inflation rate is defined to be the portion of total pay increases for an individual that are due to macro economic forces including productivity, price inflation, and labor market conditions. The wage inflation rate does not include pay changes rated to individual merit and seniority effects.

No specific **Price Inflation** assumption is required to perform this valuation. The price inflation assumption used to evaluate the investment return assumption is 2.7%.

The assumed **Real Rate of Return** over wage inflation is defined to be the portion of total investment return that is more than the assumed total wage growth rate. Considering other economic assumptions, the 7.2% pre-retirement investment return rate translates to an assumed real rate of return over wage inflation of 4.0%. The assumed real rate of return over price inflation is 4.5% considering an inflation assumption of 2.7%.

Pay increase assumptions for individual active members are shown for sample services below. Part of the assumption for each age is for merit and/or seniority increase, and the other 3.2% recognizes wage inflation, including price inflation, productivity increases, and other macro economic forces.

% Merit and Longevity Increase Next Year						
Service	Gen.	University Teachers	Public School Teachers	Protective		Exec. & Elec.
				With S.S.	W/O S.S.	
1	3.5 %	3.0 %	5.6 %	4.8 %	5.5 %	2.5 %
2	3.5 %	3.0 %	5.6 %	4.8 %	5.5 %	2.5 %
3	3.1 %	2.9 %	5.2 %	4.1 %	4.7 %	2.0 %
4	2.8 %	2.8 %	4.7 %	3.5 %	3.8 %	1.6 %
5	2.5 %	2.7 %	4.3 %	2.8 %	3.0 %	1.1 %
10	1.5 %	2.2 %	2.6 %	1.1 %	0.9 %	0.2 %
15	1.1 %	1.7 %	1.4 %	0.8 %	0.5 %	0.2 %
20	0.9 %	1.2 %	0.6 %	0.7 %	0.4 %	0.2 %
25	0.6 %	0.9 %	0.3 %	0.6 %	0.3 %	0.2 %
30	0.4 %	0.7 %	0.2 %	0.5 %	0.2 %	0.2 %

DECREMENT PROBABILITIES

The Active Member Population is assumed to remain constant. For purposes of financing the unfunded liabilities and amortizing the EAR, total payroll is assumed to grow at the wage inflation rate – 3.20% per year.

The mortality table used to measure mortality for retired participants was the Wisconsin 2012 Mortality Table. The rates in this table were based on actual WRS experience adjusted for future mortality improvements using the MP-2015 fully generational improvement scale (multiplied by 50%). This mortality assumption was adopted by the Board in connection with the 2012-2014 Experience Study. Sample retirement values from this table are shown below. This assumption is used to measure the probabilities of participants dying before retirement and the probabilities of each benefit payment being made after retirement.

Single Life Retirement Values Wisconsin 2012 Mortality Table with 5% Interest

Sample Attained Ages in 2016	Present Value of \$1 Monthly for Life		Future Life Expectancy (years)	
	Males	Females	Males	Females
40	\$212.18	\$217.30	44.6	47.9
45	203.58	209.85	39.6	42.8
50	192.84	200.64	34.6	37.8
55	179.99	189.45	29.8	32.9
60	165.62	176.13	25.3	28.1
65	148.39	159.99	20.8	23.5
70	128.80	140.83	16.6	19.0
75	107.08	119.17	12.8	14.8
80	84.34	95.93	9.3	11.0
85	63.12	72.84	6.5	7.8

The values shown above are for non-disabled participants in 2016. For disabled participants, the following table was used:

Sample Attained Ages in 2016	Present Value of \$1 Monthly for Life		Future Life Expectancy (years)	
	Males	Females	Males	Females
40	\$198.68	\$207.47	37.2	41.4
45	186.71	197.67	32.2	36.4
50	172.91	185.79	27.5	31.6
55	156.89	171.64	22.9	26.8
60	138.23	154.74	18.6	22.2
65	117.74	134.96	14.6	17.8
70	95.51	112.80	11.0	13.7
75	73.23	89.31	7.8	10.0
80	53.78	66.82	5.4	7.0
85	38.08	48.76	3.6	4.8

ACTIVE PARTICIPANT MORTALITY RATES

Sample Attained Ages in 2016	Mortality Rates	
	Males	Females
20	0.000135	0.000078
25	0.000162	0.000086
30	0.000203	0.000117
35	0.000356	0.000210
40	0.000480	0.000297
45	0.000632	0.000462
50	0.000854	0.000685
55	0.001997	0.001219
60	0.002845	0.001750
65	0.004333	0.002664
70	0.007145	0.004516
75	0.012149	0.008194
80	0.022343	0.015345

This assumption is used to measure the probability of participants dying while in service in 2016. Future years will reflect improvements in life expectancy.

RATES OF RETIREMENT FOR THOSE ELIGIBLE TO RETIRE

Normal Retirement

Age	General		Public School		University		Protective*		Exec. & Elected
	Male	Female	Male	Female	Male	Female	With S.S.	W/O S.S.	
50							6%	4%	
51							7%	4%	
52							9%	5%	
53							23%	17%	
54							19%	25%	
55							19%	21%	
56							19%	27%	
57	18%	15%	36%	28%	12%	14%	19%	30%	12%
58	18%	15%	31%	28%	12%	12%	18%	30%	12%
59	18%	15%	24%	28%	12%	10%	16%	30%	12%
60	18%	15%	30%	28%	12%	12%	20%	26%	12%
61	18%	15%	28%	28%	12%	16%	20%	15%	12%
62	25%	25%	37%	36%	12%	14%	22%	20%	12%
63	30%	25%	32%	30%	12%	19%	26%	40%	12%
64	25%	25%	27%	27%	12%	13%	17%	40%	12%
65	25%	28%	29%	35%	15%	18%	30%	40%	12%
66	32%	32%	33%	35%	17%	22%	25%	40%	20%
67	26%	26%	27%	30%	16%	17%	30%	40%	15%
68	19%	22%	24%	30%	16%	16%	30%	40%	15%
69	19%	20%	24%	30%	16%	14%	30%	40%	10%
70	19%	20%	20%	35%	16%	18%	100%	100%	10%
71	19%	20%	20%	30%	18%	18%	100%	100%	10%
72	19%	20%	20%	22%	14%	18%	100%	100%	15%
73	19%	20%	20%	22%	14%	18%	100%	100%	15%
74	19%	20%	20%	22%	10%	18%	100%	100%	15%
75	100%	100%	100%	100%	100%	100%	100%	100%	100%

* Includes reduced retirements for protective with 20+ years of service.

Reduced Retirement

Age	% Retiring Next Year							Exec. & Elected
	General		Public School		University			
	Male	Female	Male	Female	Male	Female		
55	9.0%	7.0%	13.0%	12.0%	4.0%	5.5%	3.0%	
56	9.0%	7.0%	13.0%	12.0%	3.0%	5.5%	3.0%	
57	4.8%	5.0%	12.0%	12.0%	2.5%	4.0%	3.0%	
58	5.8%	6.0%	13.0%	12.0%	2.5%	5.5%	3.0%	
59	6.5%	6.0%	14.0%	13.0%	3.0%	6.5%	3.0%	
60	8.5%	8.5%	14.0%	17.0%	4.3%	8.0%	5.0%	
61	8.5%	8.5%	15.0%	17.0%	5.0%	6.0%	5.0%	
62	16.0%	16.0%	21.0%	23.0%	6.0%	12.0%		
63	17.0%	16.0%	21.0%	23.0%	7.0%	12.0%		
64	17.0%	16.0%	21.0%	23.0%	7.0%	12.0%		

The assumed rates of separation from employment prior to service retirement due to disability and other causes are shown below for sample ages. For other terminations it was assumed that a percentage, depending on age of participants terminating after age 35 with 5 or more years service, will leave their contributions on deposit and be paid a benefit at normal retirement age and that the remaining participants would take a separation benefit. The percentage taking a separation benefit is 25% at age 35, grading downward to 0% at retirement eligibility. All participants terminating prior to normal retirement age with less than 5 years of service were assumed to take a separation benefit.

**Assumed Termination Rates
by Attained Age and Years of Service**

Age	Service	% of Active Participants Terminating								
		Protective		Public Schools		University		Exec. & Elected	General	
		With Soc. Sec.	Without Soc. Sec.							
		Males	Females	Males	Females	Males	Females			
	0	17.0%	4.0%	18.3%	16.0%	16.0%	16.0%	18.0%	16.8%	20.0%
	1	8.0%	3.5%	11.0%	10.8%	14.0%	15.0%	14.0%	12.7%	14.1%
	2	5.0%	1.5%	7.8%	7.7%	12.0%	13.0%	12.0%	9.0%	11.0%
	3	4.3%	1.3%	5.9%	5.8%	10.0%	10.0%	10.0%	7.3%	8.9%
	4	3.8%	1.2%	4.9%	5.0%	8.5%	9.9%	10.0%	7.0%	8.5%
	5	3.1%	1.1%	3.6%	4.3%	8.0%	8.4%	8.0%	4.8%	6.7%
	6	3.0%	1.0%	3.2%	3.8%	7.5%	6.4%	7.0%	4.3%	5.6%
	7	2.9%	0.9%	2.6%	3.4%	5.7%	5.7%	6.0%	4.2%	5.0%
	8	2.5%	0.8%	2.6%	2.8%	4.6%	4.7%	6.0%	3.4%	4.7%
	9	2.2%	0.7%	2.4%	2.5%	4.0%	4.2%	6.0%	3.1%	4.5%
25	10 & Over	2.0%	0.7%	1.3%	2.2%	4.0%	5.0%	6.0%	2.5%	4.5%
30		1.8%	0.7%	1.3%	1.9%	3.9%	4.6%	5.1%	2.5%	4.3%
35		1.6%	0.7%	1.3%	1.6%	3.6%	4.2%	4.3%	2.4%	3.5%
40		1.3%	0.6%	1.3%	1.3%	3.1%	3.4%	4.1%	2.1%	2.7%
45		1.1%	0.6%	1.3%	1.1%	2.3%	2.6%	3.2%	1.8%	2.2%
50		1.0%	0.5%	1.3%	1.0%	1.9%	2.1%	2.5%	1.5%	1.9%
55		1.0%	0.5%	1.3%	1.0%	1.8%	2.0%	2.4%	1.5%	1.8%
60		1.0%	0.5%	1.3%	1.0%	1.8%	2.0%	2.4%	1.5%	1.8%

Disability Rates

Age	% of Active Participants Becoming Disabled									
	Protective		Public Schools		University		Exec. & Elected		General	
	With SS	W/O SS	Males	Females	Males	Females	Males	Females	Males	Females
20	0.01%	0.04%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%
25	0.01%	0.04%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%
30	0.01%	0.04%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.01%	0.02%
35	0.02%	0.04%	0.01%	0.01%	0.00%	0.02%	0.01%	0.01%	0.01%	0.03%
40	0.02%	0.06%	0.01%	0.02%	0.01%	0.03%	0.01%	0.01%	0.03%	0.04%
45	0.03%	0.11%	0.03%	0.05%	0.01%	0.03%	0.01%	0.01%	0.06%	0.06%
50	0.06%	0.64%	0.08%	0.10%	0.02%	0.06%	0.02%	0.02%	0.13%	0.09%
55	0.87%	0.48%	0.16%	0.14%	0.05%	0.09%	0.09%	0.09%	0.24%	0.16%
60	1.46%	0.14%	0.26%	0.21%	0.07%	0.13%	0.11%	0.11%	0.43%	0.23%

MISCELLANEOUS AND TECHNICAL ASSUMPTIONS

Expenses:	Assumed investment return is net of administrative and investment expenses.
Marriage Assumption:	80% of males and 70% of females are assumed to be married for purposes of death-in-service benefits. Male spouses are assumed to be three years older than female spouses.
Pay Increase Timing:	Beginning of (calendar) year for most people. Middle of calendar year for teachers.
Pay Annualization:	Reported pay for members with less than twelve contributing months was annualized by the ratio of 12 to the number of contributing months in the year.
Final Average Salary:	For present value of future benefit purposes, final average salary was calculated in accordance with pay increase assumptions, but was not permitted to fall below the final average salary reported in the data.
Decrement Timing:	Decrements of all types are assumed to occur mid-year.
Decrement Operation:	Disability operates during the retirement pattern.
Decrement Relativity:	Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.
Eligibility Testing:	Eligibility for benefits is determined based upon the age nearest birthday and total service (in all benefit groups) nearest whole year on the date the decrement is assumed to occur.
Benefit Service:	Exact fractional service on the decrement date is used to determine the amount of benefit payable.
Non-Benefit Service:	Liabilities for service in divisions other than the division in which the individual is currently active are calculated as indexed deferred vested benefits. Benefits are indexed in accordance with the salary adjustment factors for the division where the member was formerly employed. People are assumed to retire at the earliest age that full benefits will become available. The liabilities are assigned to the division in which the service was rendered.
Service Credit Accruals:	It is assumed that members accrue one year of service credit per year.

MISCELLANEOUS AND TECHNICAL ASSUMPTIONS (CONCLUDED)

Incidence of Contributions:	Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in this report, and the actual payroll payable at the time contributions are made.
Assumed Retirement for Deferred Members:	Members with a deferred vested benefit were assumed to retire at age 65 for General members, age 54 for Protective members and age 62 for Executive and Elected members.
Normal Form of Benefit:	The assumed normal form of benefit is a straight life benefit, except where otherwise noted.
Disability Valuation:	<p>The Post-10/15/92 Disability benefit consists of one benefit payable to age 65 (10% of FAE) plus another benefit payable on and after age 65 (WRS benefit accrued to date of disability plus 7% of FAE during disability). For valuation purposes, the 7% of FAE portion of the post 65 benefit was added to the 40% of FAE benefit prior to age 65.</p> <p>Additionally, there are certain cases in which the disability benefit at the member's normal retirement age is larger than the member's benefit under the normal retirement benefit formula. To account for this, an adjustment is made to the member's normal retirement benefit present value calculation which is equal to 15% of the difference between the present values of the LTDI benefit and the normal retirement benefit.</p>
Variable Excess Benefits:	These benefits are valued by increasing the otherwise calculated liabilities by an amount equal to twice the value of the variable excess. (The variable excess is the difference between the variable account and the variable at core account, summed over all participants.)
Liability Adjustments:	Final Average Salaries were increased 2.5% (3.0% for Executive and Elected and 3.5% for Protectives) to account for additional contingencies in actual benefit amount calculated at the time of retirement.
Amortization Payoff Reserve:	Additional reserves in the amount of \$8,432,547 (discounted from the year 2029 to the current valuation date) were added to general group liabilities to account for the possibility that some non-state employers may never be able to pay off their unfunded actuarial accrued liability.

SECTION H
PLAN PROVISIONS

**SUMMARY OF BENEFIT PROVISIONS EVALUATED
DECEMBER 31, 2016 ACTUARIAL VALUATION**

Normal Retirement Eligibility

The age a participant becomes eligible for an unreduced age and service annuity is:

General		Protective		Executive & Elected	
Age	Service	Age	Service	Age	Service
65	Any*	54	Any*	62	Any*
57	30	53	25	57	30

* Participants first employed after 1989 and terminated before April 24, 1998 must have creditable service in 5 calendar years.

Normal Retirement Annuity

The age and service annuity payable at Normal Retirement Age is based on Final Average Earnings (FAE) and Creditable Service (CS) as follows:

Multiplier for Service Rendered			Group
Before 2000	Between 2000 and 2011	After 2011	
2.165%	2.0%	1.6%	Executive group and elected officials
2.165%	2.0%	2.0%	Protective occupation participants covered by Social Security
2.665%	2.5%	2.5%	Protective occupation participants not covered by Social Security
1.765%	1.6%	1.6%	All other participants

FAE is generally the average of the 3 highest years of earnings (July 1 - June 30 for teachers, educational support staff, and judges; calendar year for others) preceding retirement. These years do not have to be consecutive. For legislators and state constitutional officers who are ineligible to receive pay increases during their term, FAE is the statutory rate of earnings at termination.

Maximum formula annuity is 85% of FAE for protective occupation participants not covered by Social Security, 65% of FAE for protectives covered by Social Security, and 70% for all other participants. If greater than the formula amount, an annuity equal to the actuarial equivalent of two times the required accumulated contributions is paid in lieu of the formula amount.

Reduced Retirement. Any participant who has attained age 55 and any Protective occupation participant who has attained age 50 may apply for an early retirement annuity. The benefit is reduced 0.4% for each month that the annuity effective date precedes the Normal Retirement Age. For Non-Protective participants terminating after 6/30/90, the 0.4% is reduced for months after the attainment of age 57 and before the annuity effective date by .001111% for each month of creditable service.

Voluntary Termination Before Immediate Benefit Eligibility. Participant may either (i) receive a refund of accumulated contributions, or (ii) leave contributions on deposit and apply for a retirement annuity on or after the minimum retirement age based upon age and accrued service at time of termination.

Post-Retirement Adjustments. Annuities are increased annually if the investment income credited to retired life funds is in excess of the assumed benefit rate (presently 5%), other plan experiences are within projected ranges, and the resulting adjustment would be at least 0.5% (2.0% for the variable fund).

Disability Annuity. Eligibility: generally total and permanent incapacity to engage in gainful employment. Participant must have completed at least 6 months of creditable service (in at least 5 out of the last 7 calendar years) preceding application for disability. Service requirement is waived if disability is from service-related causes.

For Protective occupations, eligibility also can be met if a member has 15 years of service, is between the ages of 50 and 55 and unable to safely and efficiently perform one's duties.

Disability Amounts. Amounts payable in case of disability depend upon the plan from which payment is made and are described below.

	Pre-10/16/1992 WRS Plan	Post-10/15/1992 LTDI Plan
Participants covered	Participants hired before 10/16/1992 who do not elect LTDI coverage.	Participants entering after 10/15/1992 and participants on 10/15/1992 who elect LTDI coverage.
Benefit to age 65*	WRS formula benefit based on service projected to normal retirement age.	40% of FAE for participants covered by Social Security; 50% of FAE for non-covered participants who cannot qualify for Social Security disability benefits.
Benefit at age 65*	Continuation of pre-65 amount.	WRS benefit accrued to date of disability plus 7% of FAE money purchase benefit during disability period, both of which are adjusted in accordance with dividend rate.

* Conversion age is later for participants becoming disabled after age 61.

Death-in-Service.

- (a) Prior to age 50 for Protective participants, age 55 for others, the benefit is the equivalent of twice the accumulated employee contributions required and all additional contributions and employer amounts contributed prior to 1974 for teachers, or 1966 for others.
- (b) After age 50 for Protective participants, age 55 for others, the benefit is the amount that would have been paid if participant had retired and elected 100% survivor option. Benefit is payable to any natural living person.

Interest Credits. For years after 1999, and for people with some active service after 1999, participant core accounts (including the variable at core accounts) are credited with interest at the full (core) effective rate. For others, accounts are credited with interest as follows:

Date of Participation	Rate Credited for Purpose of	
	Money Purchase	Refunds
	Minimum	
Prior to 1982	Actual	Actual
January 1, 1982 & Later	5%	3%

Participant variable accounts are credited with interest based on the earnings in the variable portfolio.

Contribution Rates. The financial objective of WRS is to establish and receive contributions that will remain level from year to year and decade to decade.

Statutory required participant contributions prior to July 1, 2011 were as follows:

General	5.0%
Executives & Elected Officials	5.5
Protectives	
- With Social Security	6.0
- Without Social Security	8.0

Statutory required participant contributions after July 1, 2011 are set equal to one-half of the actuarially determined rate for General participants and Executive and Elected Officials. Participant contributions for Protective participants are set equal to the participant contribution for General members.

Normal Form of Benefit. The normal form of benefit is a straight life annuity with no death benefits. Optional forms of benefit which are actuarially reduced are listed below:

- A life annuity with 60 or 180 monthly payments guaranteed.
- A joint survivorship annuity with 75% continued to beneficiary.
- A joint survivorship annuity with 100% continued to beneficiary.
- A joint survivorship annuity reduced 25% upon either your death or your beneficiary's death.
- A joint survivorship annuity with 100% continued to beneficiary combined with 180 monthly payments guaranteed.

For formula benefit calculations, optional forms are calculated at the lower of the current age or age 62 (Normal Retirement Age for Protective occupations).

Vesting. Participants hired prior to July 1, 2011 vest immediately. After July 1, 2011, participants vest after 5 years of service.

APPENDIX 1

GLOSSARY

GLOSSARY

Actuarial Accrued Liability. The difference between (i) the actuarial present value of future plan benefits, and (ii) the actuarial present value of future normal cost. Sometimes referred to as “accrued liability” or “past service liability.”

Accrued Service. The service credited under the plan which was rendered before the date of the actuarial valuation.

Actuarial Assumptions. Estimates of future plan experience with respect to rates of mortality, disability, turnover, retirement, rate or rates of investment income and salary increases. Decrement assumptions (rates of mortality, disability, turnover and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (salary increases and investment income) consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation.

Actuarial Cost Method. A mathematical budgeting procedure for allocating the dollar amount of the “actuarial present value of future plan benefits” between the actuarial present value of future normal cost and the actuarial accrued liability. Sometimes referred to as the “actuarial funding method.”

Actuarial Equivalent. A series of payments is called an actuarial equivalent of another series of payments if the two series have the same actuarial present value.

Actuarial Present Value. The amount of funds presently required to provide a payment or series of payments in the future. It is determined by discounting the future payments at a predetermined rate of interest, taking into account the probability of payment.

Amortization. Paying off an interest-bearing liability by means of periodic payments of interest and principal, as opposed to paying it off with a lump sum payment.

Experience Gain (Loss). A measure of the difference between actual experience and that expected based upon a set of actuarial assumptions during the period between two actuarial valuation dates, in accordance with the actuarial cost method being used.

GLOSSARY (CONCLUDED)

Normal Cost. The annual cost assumed, under the actuarial funding method, for current and subsequent plan years. Sometimes referred to as “current service cost.” Any payment toward the unfunded actuarial accrued liability is not part of the normal cost.

Plan Termination Liability. The actuarial present value of future plan benefits based on the assumption that there will be no future accruals for future service and salary. The termination liability will generally be less than the liabilities computed on a “going-concern” basis and is not normally determined in a routine actuarial valuation.

Reserve Account. An account used to indicate that funds have been set aside for a specific purpose and are not generally available for other uses.

Unfunded Actuarial Accrued Liability. The difference between the actuarial accrued liability and valuation assets. Sometimes referred to as “unfunded accrued liability.”

Valuation Assets. The value of current plan assets recognized for valuation purposes. Generally based on book value plus a portion of unrealized appreciation or depreciation.

APPENDIX 2

VALUATION PROCESS

FINANCIAL PRINCIPLES & OPERATIONAL TECHNIQUES OF THE WISCONSIN RETIREMENT SYSTEM

Benefit Promises Made Which Must be Paid For. A retirement program is an orderly means of handing out, keeping track of, and financing contingent retirement promises. As each participant of the Retirement System acquires a unit of service credit he is, in effect, handed an “IOU” which reads: “The Wisconsin Retirement System promises to pay you one unit of annuity benefits, payments in cash commencing when you retire.”

The principal related financial question is: *When shall the money required to cover the “IOU” be contributed?* This year, when the benefit of the participant’s unit of service is received? Or, some future year, when the “IOU” becomes a cash demand?

The law governing the Wisconsin Retirement System financing intends that the money to cover an “IOU” is contributed in the year the “IOU” is handed out. In this way contribution rates expressed as percents of participant payroll can be determined so as to remain approximately level from year to year and decade to decade as long as the basic experience and make-up of the group of participants does not change significantly. This means that for equivalent benefits each generation of Wisconsin taxpayers will contribute at approximately the same payroll rates.

Translated into actuarial terminology, the level percent-of-payroll contribution objective means that the contribution rate must total at least:

Normal Cost (the current discounted value of benefits likely to be paid on account of participants’ service rendered in the current year)

... plus ...

Interest on Unfunded Actuarial Accrued Liabilities (unfunded actuarial accrued liabilities are the difference between (i) the present value of future benefits and (ii) the present value of future normal costs, and reduced by the assets on hand at the valuation date).

If contributions to the system are less than the preceding amount, the difference, **plus investment earnings not realized thereon**, will have to be contributed at some later time, or benefits will have to be reduced, to satisfy the fundamental equation under which all retirement programs must operate; that is:

$$B = C + I - E$$

Benefit payments to any group of participants and their beneficiaries cannot exceed

Contributions received on behalf of the group
... plus ...
Ivestment earnings on those contributions
... minus ...
Expenses incurred in operating the program.

There are retirement programs (Social Security is an example) designed to defer the bulk of contributions far into the future. The present contribution rate for such systems is artificially low, but is destined to increase relentlessly to a level which may be greatly in excess of the level percent-of-payroll rate.

A by-product of a level percent-of-payroll contribution objective is the accumulation of invested assets for varying periods of time. Investment income becomes the third and largest contributor to the retirement system and the amount is directly related to the amount of contributions and investment performance.

Computing Contribution Rates to Finance Benefits. From a given schedule of benefits and from the data furnished, the actuary calculates the contribution rates **by means of an actuarial valuation** – the technique of assigning monetary values to the risks assumed in operating a retirement program.

ACTUARIAL METHOD AND ASSUMPTIONS USED IN VALUATIONS

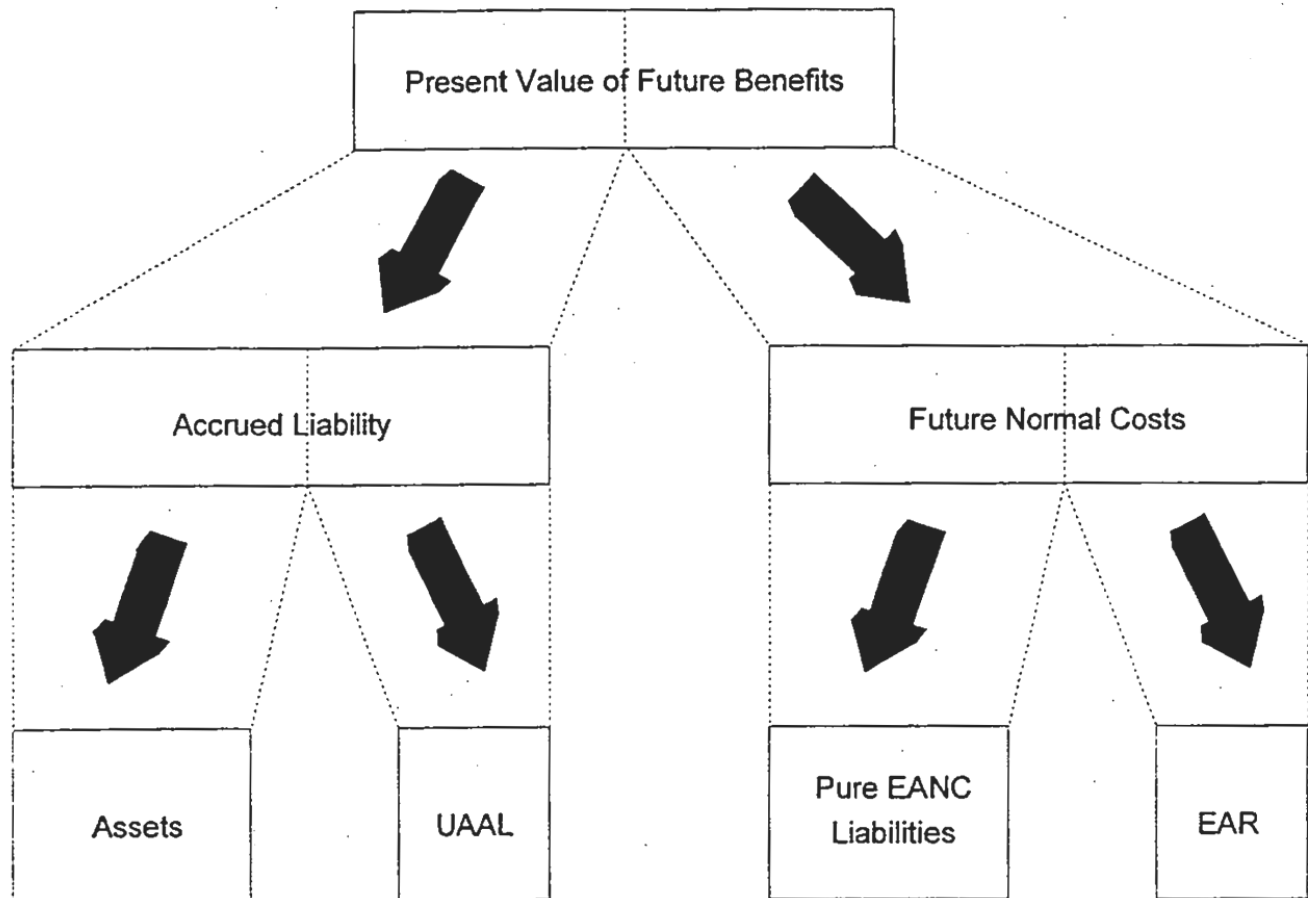
The principal areas of risk assumption are:

- long-term *rates of investment income* likely to be generated by system assets
- *rates of mortality* among participants, retirants and beneficiaries
- *rates of withdrawal* of active participants
- *rates of disability* among participants
- *patterns of salary increases* to be experienced by participants
- the age and service *distribution of actual retirements*

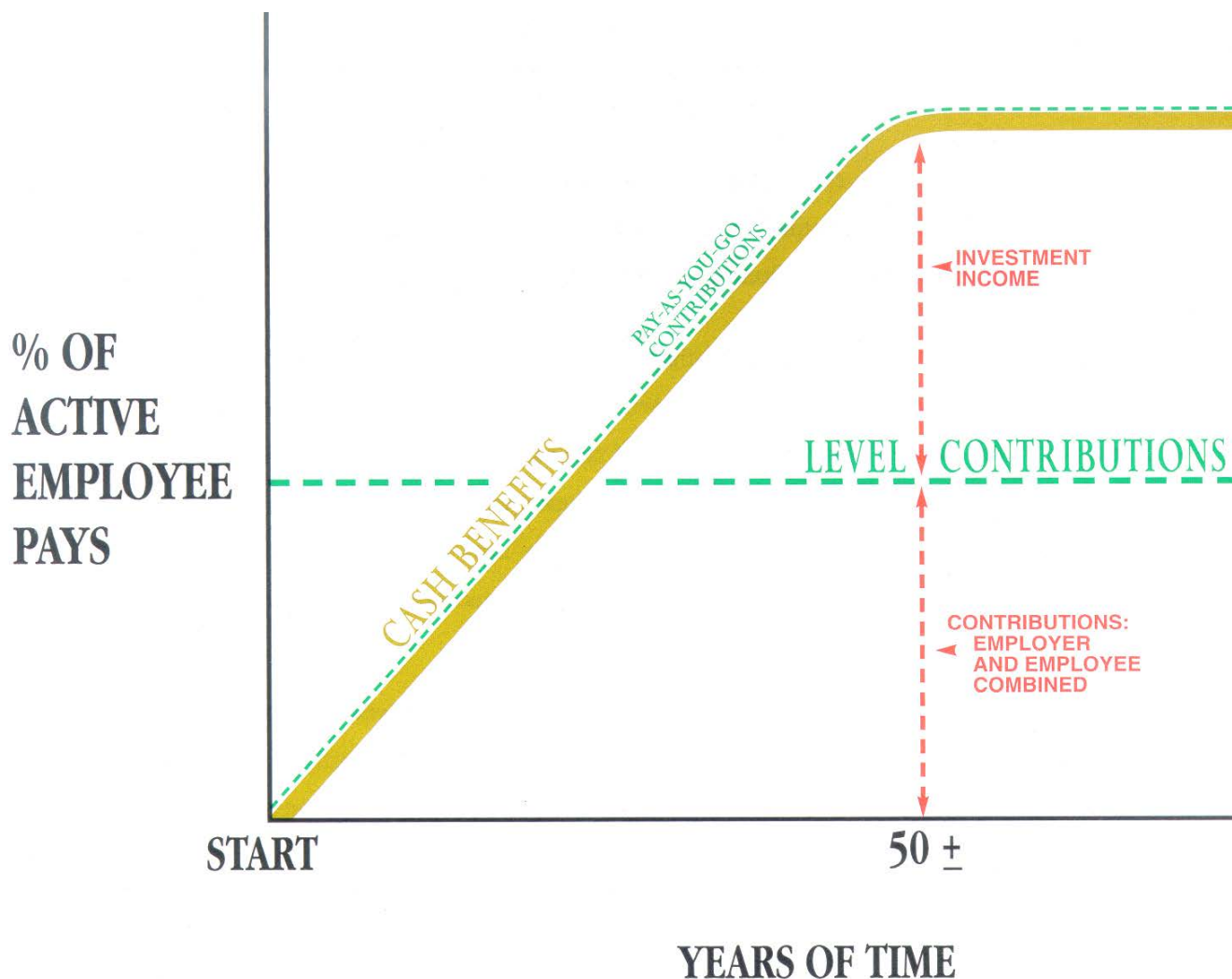
In an actuarial valuation, the actuary projects the monetary effect of each risk assumption for each distinct experience group, for the next year and for each year over the next half-century or longer.

Once actual risk experience has occurred and been observed, it will not coincide exactly with assumed risk experience, regardless of the skill of the actuary, the completeness of the data, and the precision of the calculations. Each valuation provides a complete recalculation of assumed future risk experience and takes into account all past differences between assumed and actual risk experience. The result is a continual series of small adjustments to the computed contribution rate. From time to time it becomes necessary to adjust the package of risk measurements to reflect basic experience trends – but not random year-to-year fluctuations.

The Actuarial Valuation Process



- UAAL: Unfunded actuarial accrued liabilities are amortized over a fixed period of years.
- Pure EANC: Entry age normal cost liabilities are financed over the working lifetimes of WRS participants.
- EAR: The Experience Amortization Reserve portion of future normal costs is financed over varying periods which are selected to optimize contribution rate stability.



CASH BENEFITS LINE. This relentlessly increasing line is the fundamental reality of retirement plan financing. It happens each time a new benefit is added for future retirements (and happens regardless of the design for contributing for benefits).

LEVEL CONTRIBUTION LINE. Determining the level contribution line requires detailed assumptions concerning a variety of experiences in future decades, including:

Economic Risk Areas

- Rates of investment return
- Rates of pay increase
- Changes in active member group size

Non-Economic Risk Areas

- Ages at actual retirement
- Rates of mortality
- Rates of withdrawal of active members (turnover)
- Rates of disability

APPENDIX 3

GAIN/LOSS EXHIBITS

**GENERAL MALES
WITHDRAWAL EXPERIENCE
DURING CALENDAR YEAR 2016**

**Male Service-Based Withdrawals
All Ages**

Service Index	Withdrawals	Exposure	Crude Rates	Current Rates	Expected Withdrawals
1	383	2,130	0.1798	0.1680	358
2	513	4,169	0.1231	0.1270	529
3	374	3,613	0.1035	0.0900	325
4	273	2,921	0.0935	0.0730	213
5	214	2,691	0.0795	0.0700	188
6	122	1,869	0.0653	0.0480	90
7	91	1,446	0.0629	0.0430	62
8	95	1,548	0.0614	0.0420	65
9	84	1,711	0.0491	0.0340	58
10	64	1,535	0.0417	0.0310	48
Totals	2,213	23,633	0.0936	0.0819	1,936

**Male Age-Based Withdrawals
10+ Years of Service**

Age	Withdrawals	Exposure	Crude Rates	Current Rates	Expected Withdrawals
25-29	1	7	0.1429	0.0250	-
30-34	17	296	0.0574	0.0250	7
35-39	43	1,333	0.0323	0.0225	30
40-44	48	2,190	0.0219	0.0200	44
45-49	84	3,443	0.0244	0.0160	55
50-54	89	4,865	0.0183	0.0150	73
Over 54	147	11,039	0.0133		147
Totals	429	23,173	0.0185	0.0154	356

**GENERAL FEMALES
WITHDRAWAL EXPERIENCE
DURING CALENDAR YEAR 2016**

**Female Service-Based Withdrawals
All Ages**

Service Index	Withdrawals	Exposure	Crude Rates	Current Rates	Expected Withdrawals
1	1,004	5,049	0.1989	0.2000	1,010
2	1,284	8,600	0.1493	0.1410	1,213
3	888	6,977	0.1273	0.1100	767
4	638	5,786	0.1103	0.0890	515
5	407	4,794	0.0849	0.0850	407
6	298	3,883	0.0767	0.0670	260
7	215	3,299	0.0652	0.0560	185
8	226	3,452	0.0655	0.0500	173
9	189	3,287	0.0575	0.0470	154
10	165	3,104	0.0532	0.0450	140
Totals	5,314	48,231	0.1102	0.1000	4,824

**Female Age-Based Withdrawals
10+ Years of Service**

Age	Withdrawals	Exposure	Crude Rates	Current Rates	Expected Withdrawals
25-29	-	5	0.0000	0.0450	-
30-34	24	522	0.0460	0.0420	22
35-39	98	2,106	0.0465	0.0300	63
40-44	135	3,206	0.0421	0.0250	80
45-49	153	4,840	0.0316	0.0200	97
50-54	221	7,715	0.0286	0.0175	135
Over 54	257	19,192	0.0134		257
Totals	888	37,586	0.0236	0.0174	654

**PUBLIC SCHOOLS MALES
WITHDRAWAL EXPERIENCE
DURING CALENDAR YEAR 2016**

**Male Service-Based Withdrawals
All Ages**

Service Index	Withdrawals	Exposure	Crude Rates	Current Rates	Expected Withdrawals
1	62	512	0.1211	0.1830	94
2	85	1,039	0.0818	0.1100	114
3	75	1,010	0.0743	0.0780	79
4	76	1,022	0.0744	0.0590	60
5	48	911	0.0527	0.0490	45
6	32	763	0.0419	0.0360	27
7	17	590	0.0288	0.0320	19
8	23	624	0.0369	0.0260	16
9	28	678	0.0413	0.0260	18
10	23	693	0.0332	0.0240	17
Totals	469	7,842	0.0598	0.0624	489

**Male Age-Based Withdrawals
10+ Years of Service**

Age	Withdrawals	Exposure	Crude Rates	Current Rates	Expected Withdrawals
25-29	-	-	N/A	0.0125	-
30-34	3	157	0.0191	0.0125	2
35-39	27	1,790	0.0151	0.0125	22
40-44	39	2,445	0.0160	0.0125	31
45-49	37	2,841	0.0130	0.0125	36
50-54	38	2,607	0.0146	0.0125	33
Over 54	27	2,974	0.0091		27
Totals	171	12,814	0.0133	0.0118	151

**PUBLIC SCHOOLS FEMALES
WITHDRAWAL EXPERIENCE
DURING CALENDAR YEAR 2016**

**Female Service-Based Withdrawals
All Ages**

Service Index	Withdrawals	Exposure	Crude Rates	Current Rates	Expected Withdrawals
1	148	1,477	0.1002	0.1600	236
2	305	3,210	0.0950	0.1080	347
3	265	3,201	0.0828	0.0770	246
4	202	2,967	0.0681	0.0580	172
5	161	2,620	0.0615	0.0500	131
6	125	2,216	0.0564	0.0430	95
7	100	1,987	0.0503	0.0380	76
8	89	2,019	0.0441	0.0340	69
9	93	2,239	0.0415	0.0280	63
10	90	2,144	0.0420	0.0250	54
Totals	1,578	24,080	0.0655	0.0618	1,489

**Female Age-Based Withdrawals
10+ Years of Service**

Age	Withdrawals	Exposure	Crude Rates	Current Rates	Expected Withdrawals
25-29	-	-	N/A	0.0220	-
30-34	20	636	0.0314	0.0175	11
35-39	100	4,735	0.0211	0.0150	71
40-44	115	5,879	0.0196	0.0120	71
45-49	109	7,012	0.0155	0.0110	77
50-54	112	6,647	0.0168	0.0100	66
Over 54	93	8,315	0.0112		93
Totals	549	33,224	0.0165	0.0117	389

**UNIVERSITY MALES
WITHDRAWAL EXPERIENCE
DURING CALENDAR YEAR 2016**

**Male Service-Based Withdrawals
All Ages**

Service Index	Withdrawals	Exposure	Crude Rates	Current Rates	Expected Withdrawals
1	56	349	0.1605	0.1600	56
2	142	667	0.2129	0.1400	93
3	118	667	0.1769	0.1200	80
4	95	627	0.1515	0.1000	63
5	50	527	0.0949	0.0850	45
6	37	428	0.0864	0.0800	34
7	34	383	0.0888	0.0750	29
8	27	351	0.0769	0.0570	20
9	23	380	0.0605	0.0460	17
10	20	325	0.0615	0.0400	13
Totals	602	4,704	0.1280	0.0957	450

**Male Age-Based Withdrawals
10+ Years of Service**

Age	Withdrawals	Exposure	Crude Rates	Current Rates	Expected Withdrawals
25-29	-	-	N/A	0.0400	-
30-34	-	18	0.0000	0.0375	1
35-39	8	169	0.0473	0.0350	6
40-44	18	424	0.0425	0.0275	12
45-49	37	798	0.0464	0.0200	16
50-54	18	874	0.0206	0.0175	15
Over 54	11	2,646	0.0042		11
Totals	92	4,929	0.0187	0.0124	61

**UNIVERSITY FEMALES
WITHDRAWAL EXPERIENCE
DURING CALENDAR YEAR 2016**

**Female Service-Based Withdrawals
All Ages**

Service Index	Withdrawals	Exposure	Crude Rates	Current Rates	Expected Withdrawals
1	68	407	0.1671	0.1600	65
2	134	847	0.1582	0.1500	127
3	125	861	0.1452	0.1300	112
4	95	777	0.1223	0.1000	78
5	67	625	0.1072	0.0990	62
6	56	561	0.0998	0.0840	47
7	45	455	0.0989	0.0640	29
8	40	501	0.0798	0.0570	29
9	31	509	0.0609	0.0470	24
10	16	407	0.0393	0.0420	17
Totals	677	5,950	0.1138	0.0992	590

**Female Age-Based Withdrawals
10+ Years of Service**

Age	Withdrawals	Exposure	Crude Rates	Current Rates	Expected Withdrawals
25-29	-	-	N/A	0.0500	-
30-34	2	33	0.0606	0.0440	1
35-39	11	335	0.0328	0.0400	13
40-44	19	572	0.0332	0.0300	17
45-49	46	817	0.0563	0.0230	19
50-54	31	957	0.0324	0.0200	19
Over 54	12	2,171	0.0055		12
Totals	121	4,885	0.0248	0.0166	81

**PROTECTIVE WITH SOCIAL SECURITY
WITHDRAWAL EXPERIENCE
DURING CALENDAR YEAR 2016**

**Male and Female Service-Based Withdrawals
All Ages**

Service Index	Withdrawals	Exposure	Crude Rates	Current Rates	Expected Withdrawals
1	110	519	0.2119	0.1700	88
2	130	1,102	0.1180	0.0800	88
3	90	1,048	0.0859	0.0500	52
4	50	868	0.0576	0.0430	37
5	53	801	0.0662	0.0380	30
6	29	595	0.0487	0.0310	18
7	33	499	0.0661	0.0300	15
8	34	636	0.0535	0.0290	18
9	26	795	0.0327	0.0250	20
10	26	755	0.0344	0.0220	17
Totals	581	7,618	0.0763	0.0503	383

**Male and Female Age-Based Withdrawals
10+ Years of Service**

Age	Withdrawals	Exposure	Crude Rates	Current Rates	Expected Withdrawals
25-29	1	9	0.1111	0.0200	-
30-34	20	555	0.0360	0.0170	9
35-39	41	1,858	0.0221	0.0150	28
40-44	57	2,468	0.0231	0.0120	30
45-49	77	3,046	0.0253	0.0110	34
50-54	27	2,231	0.0121	0.0100	22
Over 54	15	1,475	0.0102		15
Totals	238	11,642	0.0204	0.0119	138

**PROTECTIVE WITHOUT SOCIAL SECURITY
WITHDRAWAL EXPERIENCE
DURING CALENDAR YEAR 2016**

**Male and Female Service-Based Withdrawals
All Ages**

Service Index	Withdrawals	Exposure	Crude Rates	Current Rates	Expected Withdrawals
1	-	28	0.0000	0.0400	1
2	2	102	0.0196	0.0350	4
3	3	110	0.0273	0.0150	2
4	3	116	0.0259	0.0130	2
5	1	99	0.0101	0.0120	1
6	-	98	0.0000	0.0110	1
7	1	98	0.0102	0.0100	1
8	-	92	0.0000	0.0090	1
9	3	108	0.0278	0.0080	1
10	-	89	0.0000	0.0070	1
Totals	13	940	0.0138	0.0160	15

**Male and Female Age-Based Withdrawals
10+ Years of Service**

Age	Withdrawals	Exposure	Crude Rates	Current Rates	Expected Withdrawals
25-29	-	-	N/A	0.0070	-
30-34	-	64	0.0000	0.0070	-
35-39	2	245	0.0082	0.0065	2
40-44	3	389	0.0077	0.0060	2
45-49	4	461	0.0087	0.0055	3
50-54	4	440	0.0091	0.0050	2
Totals	13	1,599	0.0081	0.0056	9

**EXECUTIVE AND ELECTED MALES
WITHDRAWAL EXPERIENCE
DURING CALENDAR YEAR 2016**

**Male and Female Service-Based Withdrawals
All Ages**

Service Index	Withdrawals	Exposure	Crude Rates	Current Rates	Expected Withdrawals
1	6	49	0.1224	0.1800	9
2	9	102	0.0882	0.1400	14
3	9	69	0.1304	0.1200	8
4	5	78	0.0641	0.1000	8
5	5	57	0.0877	0.1000	6
6	3	80	0.0375	0.0800	6
7	6	33	0.1818	0.0700	2
8	2	39	0.0513	0.0600	2
9	2	34	0.0588	0.0600	2
10	1	44	0.0227	0.0600	3
Totals	48	585	0.0821	0.1026	60

**Male and Female Age-Based Withdrawals
10+ Years of Service**

Age	Withdrawals	Exposure	Crude Rates	Current Rates	Expected Withdrawals
25-29	-	-	N/A	0.0600	-
30-34	-	1	0.0000	0.0450	-
35-39	1	17	0.0588	0.0420	1
40-44	5	50	0.1000	0.0400	2
45-49	1	75	0.0133	0.0260	2
50-54	3	119	0.0252	0.0240	3
Over 54	7	477	0.0147		7
Totals	17	739	0.0230	0.0203	15

**GENERAL
DISABILITY EXPERIENCE
DURING CALENDAR YEAR 2016**

Male Disability Experience

Age	Disabilities	Exposure	Crude Rates	Current Rates	Expected Disabilities
Under 20	-	-	N/A	0.0001	-
20-24	-	12	0.0000	0.0001	-
25-29	-	470	0.0000	0.0001	-
30-34	-	1,826	0.0000	0.0001	-
35-39	-	2,854	0.0000	0.0002	-
40-44	-	3,372	0.0000	0.0005	2
45-49	-	4,620	0.0000	0.0006	3
50-54	9	6,057	0.0015	0.0017	10
55-59	8	6,143	0.0013	0.0030	18
60-64	6	3,663	0.0016	0.0059	21
65-69	-	954	0.0000	0.0023	2
70-74	-	218	0.0000	0.0020	-
75 and over	-	-	N/A	0.0020	-
Totals	23	30,189	0.0008	0.0019	56

Female Disability Experience

Age	Disabilities	Exposure	Crude Rates	Current Rates	Expected Disabilities
Under 20	-	-	N/A	0.0001	-
20-24	-	18	0.0000	0.0001	-
25-29	-	835	0.0000	0.0001	-
30-34	-	3,174	0.0000	0.0002	1
35-39	-	4,554	0.0000	0.0003	1
40-44	-	5,341	0.0000	0.0004	2
45-49	2	7,731	0.0003	0.0006	5
50-54	4	11,033	0.0004	0.0010	12
55-59	13	11,787	0.0011	0.0020	23
60-64	6	7,382	0.0008	0.0025	18
65-69	2	1,863	0.0011	0.0020	4
70-74	-	357	0.0000	0.0017	1
75 and over	-	-	N/A	0.0017	-
Totals	27	54,075	0.0005	0.0012	67

The people shown on this page are cases involving \$40.63 disability benefits and includes those who were either active or inactive with pending benefits at the beginning of the year. The LTDI plan is described in a separate report.

**PUBLIC SCHOOLS
DISABILITY EXPERIENCE
DURING CALENDAR YEAR 2016**

Male Disability Experience

Age	Disabilities	Exposure	Crude Rates	Current Rates	Expected Disabilities
Under 20	-	-	N/A	0.0001	-
20-24	-	-	N/A	0.0001	-
25-29	-	274	0.0000	0.0001	-
30-34	-	1,605	0.0000	0.0001	-
35-39	-	2,643	0.0000	0.0001	-
40-44	-	2,851	0.0000	0.0002	1
45-49	-	3,118	0.0000	0.0004	1
50-54	3	2,822	0.0011	0.0013	4
55-59	1	1,787	0.0006	0.0017	3
60-64	1	643	0.0016	0.0031	2
65-69	-	167	0.0000	0.0043	1
70-74	-	31	0.0000	0.0045	-
75 and over	-	-	N/A	0.0045	-
Totals	5	15,941	0.0003	0.0008	12

Female Disability Experience

Age	Disabilities	Exposure	Crude Rates	Current Rates	Expected Disabilities
Under 20	-	-	N/A	0.0001	-
20-24	-	-	N/A	0.0001	-
25-29	-	1,149	0.0000	0.0001	-
30-34	-	5,205	0.0000	0.0001	-
35-39	-	6,943	0.0000	0.0001	1
40-44	-	7,080	0.0000	0.0002	2
45-49	1	8,121	0.0001	0.0008	7
50-54	6	7,450	0.0008	0.0011	8
55-59	3	5,166	0.0006	0.0017	9
60-64	5	2,116	0.0024	0.0024	5
65-69	-	430	0.0000	0.0014	1
70-74	-	55	0.0000	0.0011	-
75 and over	-	-	N/A	0.0011	-
Totals	15	43,715	0.0003	0.0008	33

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**UNIVERSITY
DISABILITY EXPERIENCE
DURING CALENDAR YEAR 2016**

Male Disability Experience

Age	Disabilities	Exposure	Crude Rates	Current Rates	Expected Disabilities
Under 20	-	-	N/A	0.0000	-
20-24	-	-	N/A	0.0000	-
25-29	-	23	0.0000	0.0000	-
30-34	-	257	0.0000	0.0000	-
35-39	-	627	0.0000	0.0000	-
40-44	-	920	0.0000	0.0001	-
45-49	-	1,153	0.0000	0.0001	-
50-54	-	1,094	0.0000	0.0002	-
55-59	-	1,051	0.0000	0.0007	1
60-64	-	830	0.0000	0.0007	1
65-69	-	256	0.0000	0.0009	-
70-74	-	63	0.0000	0.0008	-
75 and over	-	-	N/A	0.0008	-
Totals	-	6,274	0.0000	0.0003	2

Female Disability Experience

Age	Disabilities	Exposure	Crude Rates	Current Rates	Expected Disabilities
Under 20	-	-	N/A	0.0000	-
20-24	-	-	N/A	0.0000	-
25-29	-	66	0.0000	0.0000	-
30-34	-	461	0.0000	0.0000	-
35-39	-	963	0.0000	0.0003	-
40-44	-	1,099	0.0000	0.0004	-
45-49	-	1,204	0.0000	0.0003	-
50-54	1	1,251	0.0008	0.0007	1
55-59	1	1,110	0.0009	0.0010	1
60-64	-	750	0.0000	0.0015	1
65-69	-	193	0.0000	0.0010	-
70-74	-	35	0.0000	0.0009	-
75 and over	-	-	N/A	0.0009	-
Totals	2	7,132	0.0003	0.0004	3

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**PROTECTIVE WITH SOCIAL SECURITY
DISABILITY EXPERIENCE
DURING CALENDAR YEAR 2016**

Male and Female Disability Experience

Age	Disabilities	Exposure	Crude Rates	Current Rates	Expected Disabilities
Under 20	-	-	N/A	0.0004	-
20-24	-	1	0.0000	0.0004	-
25-29	-	89	0.0000	0.0004	-
30-34	-	296	0.0000	0.0004	-
35-39	-	389	0.0000	0.0004	-
40-44	-	440	0.0000	0.0007	-
45-49	-	474	0.0000	0.0014	1
50-54	2	299	0.0067	0.0098	3
55-59	-	50	0.0000	0.0014	-
60-64	-	5	0.0000	0.0014	-
65-69	-	-	N/A	0.0014	-
70-74	-	-	N/A	0.0014	-
75 and over	-	-	N/A	0.0014	-
Totals	2	2,043	0.0010	0.0020	4

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**PROTECTIVE WITHOUT SOCIAL SECURITY
DISABILITY EXPERIENCE
DURING CALENDAR YEAR 2016**

Male and Female Disability Experience

Age	Disabilities	Exposure	Crude Rates	Current Rates	Expected Disabilities
Under 20	-	-	N/A	0.0001	-
20-24	-	4	0.0000	0.0001	-
25-29	-	561	0.0000	0.0001	-
30-34	-	2,110	0.0000	0.0001	-
35-39	-	2,572	0.0000	0.0002	1
40-44	-	2,812	0.0000	0.0003	1
45-49	-	3,282	0.0000	0.0004	1
50-54	4	1,893	0.0021	0.0007	1
55-59	-	592	0.0000	0.0140	8
60-64	-	276	0.0000	0.0150	4
65-69	-	54	0.0000	0.0010	-
70-74	-	-	N/A	0.0010	-
75 and over	-	-	N/A	0.0010	-
Totals	4	14,156	0.0003	0.0011	16

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**EXECUTIVE AND ELECTED
DISABILITY EXPERIENCE
DURING CALENDAR YEAR 2016**

Male and Female Disability Experience

Age	Disabilities	Exposure	Crude Rates	Current Rates	Expected Disabilities
Under 20	-	-	N/A	0.0000	-
20-24	-	-	N/A	0.0000	-
25-29	-	4	0.0000	0.0000	-
30-34	-	12	0.0000	0.0000	-
35-39	-	36	0.0000	0.0001	-
40-44	-	74	0.0000	0.0001	-
45-49	-	109	0.0000	0.0002	-
50-54	-	158	0.0000	0.0003	-
55-59	-	192	0.0000	0.0012	-
60-64	-	127	0.0000	0.0011	-
65-69	-	85	0.0000	0.0009	-
70-74	-	30	0.0000	0.0009	-
75 and over	-	-	N/A	0.0009	-
Totals	-	827	N/A	N/A	-

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**GENERAL
PAY INCREASE ASSUMPTION
DURING CALENDAR YEAR 2016**

Service-Based Pay Increase Experience

Service Group		Total % Increase	
Beginning of Year	Number	Actual	Expected
1-5	40,172	9.61 %	7.45 %
6-10	23,102	3.49 %	5.90 %
11-15	17,874	2.59 %	5.25 %
16-20	16,008	2.16 %	5.00 %
21-25	9,267	1.91 %	4.75 %
26-30	6,939	1.78 %	4.50 %
31-35	3,175	1.67 %	4.30 %
36-40	1,529	1.49 %	4.20 %
Over 40	316	1.41 %	4.10 %
Total	118,382		

**PUBLIC SCHOOLS
PAY INCREASE ASSUMPTION
DURING CALENDAR YEAR 2016**

Service-Based Pay Increase Experience

Service Group		Total % Increase	
Beginning of Year	Number	Actual	Expected
1-5	16,465	9.00 %	9.60 %
6-10	13,245	3.43 %	7.40 %
11-15	13,342	2.45 %	6.10 %
16-20	13,100	1.38 %	5.00 %
21-25	8,797	0.86 %	4.35 %
26-30	5,652	0.45 %	4.20 %
31-35	1,951	0.52 %	4.15 %
36-40	392	0.58 %	4.10 %
Over 40	73	(0.55)%	4.05 %
Total	73,017		

**UNIVERSITY
PAY INCREASE ASSUMPTION
DURING CALENDAR YEAR 2016**

Service-Based Pay Increase Experience

Service Group		Total % Increase	
Beginning of Year	Number	Actual	Expected
1-5	5,349	14.28 %	7.00 %
6-10	3,883	3.73 %	6.50 %
11-15	3,052	3.26 %	6.00 %
16-20	2,602	2.63 %	5.50 %
21-25	1,413	2.57 %	4.95 %
26-30	1,094	1.53 %	4.80 %
31-35	554	0.87 %	4.60 %
36-40	203	2.04 %	4.20 %
Over 40	88	0.91 %	4.10 %
Total	18,238		

**PROTECTIVE WITH SOCIAL SECURITY
PAY INCREASE ASSUMPTION
DURING CALENDAR YEAR 2016**

Male and Female Service-Based Pay Increase Experience

Service Group		Total % Increase	
Beginning of Year	Number	Actual	Expected
1-5	3,784	13.81 %	8.75 %
6-10	3,062	4.00 %	5.50 %
11-15	3,145	3.17 %	4.90 %
16-20	3,585	3.30 %	4.80 %
21-25	2,430	2.93 %	4.70 %
26-30	1,218	2.80 %	4.60 %
31-35	247	2.23 %	4.50 %
36-40	74	0.62 %	4.40 %
Over 40	11	1.65 %	4.20 %
Total	17,556		

**PROTECTIVE WITHOUT SOCIAL SECURITY
PAY INCREASE ASSUMPTION
DURING CALENDAR YEAR 2016**

Male and Female Service-Based Pay Increase Experience

Service Group		Total % Increase	
Beginning of Year	Number	Actual	Expected
1-5	443	15.31 %	9.50 %
6-10	479	3.42 %	5.30 %
11-15	403	2.25 %	4.60 %
16-20	584	2.45 %	4.50 %
21-25	383	3.11 %	4.40 %
26-30	258	2.67 %	4.30 %
31-35	54	1.28 %	4.20 %
36-40	5	(2.62)%	4.10 %
Over 40	-	N/A	4.05 %
Total	2,609		

**EXECUTIVE AND ELECTED
PAY INCREASE ASSUMPTION
DURING CALENDAR YEAR 2016**

Service-Based Pay Increase Experience

Service Group		Total % Increase	
Beginning of Year	Number	Actual	Expected
1-5	344	10.69 %	6.50 %
6-10	220	0.91 %	4.20 %
11-15	148	1.01 %	4.20 %
16-20	170	0.80 %	4.20 %
21-25	106	(0.02)%	4.20 %
26-30	111	0.28 %	4.20 %
31-35	71	0.67 %	4.20 %
36-40	45	0.51 %	4.20 %
Over 40	12	0.60 %	4.20 %
Total	1,227		

**GENERAL MALES
NORMAL RETIREMENT EXPERIENCE
DURING CALENDAR YEAR 2016**

Male Age-Based Retirement Experience

Age	Retirements	Exposure	Crude Rates	Current Rates	Expected Retirements
57	63	270	0.2333	0.1800	49
58	44	255	0.1725	0.1800	46
59	36	258	0.1395	0.1800	46
60	51	278	0.1835	0.1800	50
61	39	239	0.1632	0.1800	43
62	71	230	0.3087	0.2500	58
63	53	199	0.2663	0.3000	60
64	54	169	0.3195	0.2500	42
65	155	634	0.2445	0.2500	159
66	140	475	0.2947	0.3200	152
67	60	280	0.2143	0.2600	73
68	46	219	0.2100	0.1900	42
69	29	194	0.1495	0.1900	37
70	18	138	0.1304	0.1900	26
71	21	89	0.2360	0.1900	17
72	11	90	0.1222	0.1900	17
73	5	65	0.0769	0.1900	12
74	2	53	0.0377	0.1900	10
Totals	898	4,135	0.2172	0.2271	939
75 & Over	30	214			214
Totals	928	4,349			1,153

**GENERAL MALES
EARLY RETIREMENT EXPERIENCE
DURING CALENDAR YEAR 2016**

Male Age-Based Reduced Retirement Experience

Age	Retirements	Exposure	Crude Rates	Current Rates	Expected Retirements
55	89	1,497	0.0595	0.0900	135
56	79	1,430	0.0552	0.0900	129
57	39	1,112	0.0351	0.0475	53
58	40	1,104	0.0362	0.0580	64
59	50	1,000	0.0500	0.0650	65
60	58	874	0.0664	0.0850	74
61	68	850	0.0800	0.0850	72
62	123	786	0.1565	0.1600	126
63	103	623	0.1653	0.1700	106
64	65	530	0.1226	0.1700	90
Totals	714	9,806	0.0728	0.0932	914

**GENERAL FEMALES
NORMAL RETIREMENT EXPERIENCE
DURING CALENDAR YEAR 2016**

Female Age-Based Retirement Experience

Age	Retirements	Exposure	Crude Rates	Current Rates	Expected Retirements
57	71	368	0.1929	0.1500	55
58	61	359	0.1699	0.1500	54
59	65	367	0.1771	0.1500	55
60	59	310	0.1903	0.1500	47
61	63	277	0.2274	0.1500	42
62	70	260	0.2692	0.2500	65
63	57	207	0.2754	0.2500	52
64	49	149	0.3289	0.2500	37
65	316	1,084	0.2915	0.2800	304
66	207	729	0.2840	0.3200	233
67	118	437	0.2700	0.2600	114
68	79	361	0.2188	0.2200	79
69	47	247	0.1903	0.2000	49
70	41	200	0.2050	0.2000	40
71	22	114	0.1930	0.2000	23
72	16	95	0.1684	0.2000	19
73	13	101	0.1287	0.2000	20
74	11	90	0.1222	0.2000	18
Totals	1,365	5,755	0.2372	0.2269	1,306
75 & Over	32	216			216
Totals	1,397	5,971			1,522

**GENERAL FEMALES
EARLY RETIREMENT EXPERIENCE
DURING CALENDAR YEAR 2016**

Female Age-Based Reduced Retirement Experience

Age	Retirements	Exposure	Crude Rates	Current Rates	Expected Retirements
55	115	2,601	0.0442	0.0700	182
56	123	2,681	0.0459	0.0700	188
57	85	2,272	0.0374	0.0500	114
58	100	2,144	0.0466	0.0600	129
59	123	2,089	0.0589	0.0600	125
60	140	1,856	0.0754	0.0850	158
61	137	1,704	0.0804	0.0850	145
62	219	1,552	0.1411	0.1600	248
63	196	1,261	0.1554	0.1600	202
64	160	1,009	0.1586	0.1600	161
Totals	1,398	19,169	0.0729	0.0862	1,652

**PUBLIC SCHOOL MALES
NORMAL RETIREMENT EXPERIENCE
DURING CALENDAR YEAR 2016**

Male Age-Based Retirement Experience

Age	Retirements	Exposure	Crude Rates	Current Rates	Expected Retirements
57	49	132	0.3712	0.3600	48
58	25	98	0.2551	0.3100	30
59	23	91	0.2527	0.2400	22
60	18	61	0.2951	0.3000	18
61	16	73	0.2192	0.2800	20
62	11	36	0.3056	0.3700	13
63	7	26	0.2692	0.3200	8
64	9	25	0.3600	0.2700	7
65	22	118	0.1864	0.2900	34
66	23	77	0.2987	0.3300	25
67	12	57	0.2105	0.2700	15
68	1	38	0.0263	0.2400	9
69	7	37	0.1892	0.2400	9
70	5	25	0.2000	0.2000	5
71	1	20	0.0500	0.2000	4
72	1	19	0.0526	0.2000	4
73	2	6	0.3333	0.2000	1
74	2	9	0.2222	0.2000	2
Totals	234	948	0.2468	0.2890	274
75 & Over	4	23			23
Totals	238	971			297

**PUBLIC SCHOOL MALES
EARLY RETIREMENT EXPERIENCE
DURING CALENDAR YEAR 2016**

Male Age-Based Reduced Retirement Experience

Age	Retirements	Exposure	Crude Rates	Current Rates	Expected Retirements
55	55	526	0.1046	0.1300	68
56	46	472	0.0975	0.1300	61
57	22	310	0.0710	0.1200	37
58	30	275	0.1091	0.1300	36
59	28	204	0.1373	0.1400	29
60	27	161	0.1677	0.1400	23
61	27	142	0.1901	0.1500	21
62	28	138	0.2029	0.2100	29
63	24	98	0.2449	0.2100	21
64	18	104	0.1731	0.2100	22
Totals	305	2,430	0.1255	0.1428	347

**PUBLIC SCHOOL FEMALES
NORMAL RETIREMENT EXPERIENCE
DURING CALENDAR YEAR 2016**

Female Age-Based Retirement Experience

Age	Retirements	Exposure	Crude Rates	Current Rates	Expected Retirements
57	85	308	0.2760	0.2800	86
58	70	242	0.2893	0.2800	68
59	50	198	0.2525	0.2800	55
60	38	152	0.2500	0.2800	43
61	34	139	0.2446	0.2800	39
62	40	107	0.3738	0.3600	39
63	24	69	0.3478	0.3000	21
64	20	68	0.2941	0.2700	18
65	92	273	0.3370	0.3500	96
66	65	180	0.3611	0.3500	63
67	25	108	0.2315	0.3000	32
68	16	78	0.2051	0.3000	23
69	14	70	0.2000	0.3000	21
70	6	35	0.1714	0.3500	12
71	5	29	0.1724	0.3000	9
72	2	16	0.1250	0.2200	4
73	-	12	0.0000	0.2200	3
74	1	16	0.0625	0.2200	4
Totals	587	2,100	0.2795	0.3029	636
75 & Over	3	40			40
Totals	590	2,140			676

**PUBLIC SCHOOL FEMALES
EARLY RETIREMENT EXPERIENCE
DURING CALENDAR YEAR 2016**

Female Age-Based Reduced Retirement Experience

Age	Retirements	Exposure	Crude Rates	Current Rates	Expected Retirements
55	128	1,430	0.0895	0.1200	172
56	124	1,321	0.0939	0.1200	159
57	76	970	0.0784	0.1200	116
58	76	798	0.0952	0.1200	96
59	72	647	0.1113	0.1300	84
60	95	631	0.1506	0.1700	107
61	70	438	0.1598	0.1700	74
62	93	440	0.2114	0.2300	101
63	63	332	0.1898	0.2300	76
64	48	275	0.1745	0.2300	63
Totals	845	7,282	0.1160	0.1439	1,048

**UNIVERSITY MALES
NORMAL RETIREMENT EXPERIENCE
DURING CALENDAR YEAR 2016**

Male Age-Based Retirement Experience

Age	Retirements	Exposure	Crude Rates	Current Rates	Expected Retirements
57	7	16	0.4375	0.1200	2
58	3	22	0.1364	0.1200	3
59	4	30	0.1333	0.1200	4
60	10	45	0.2222	0.1200	5
61	2	40	0.0500	0.1200	5
62	12	58	0.2069	0.1200	7
63	7	57	0.1228	0.1200	7
64	5	46	0.1087	0.1200	6
65	32	197	0.1624	0.1500	30
66	33	152	0.2171	0.1700	26
67	23	107	0.2150	0.1600	17
68	19	84	0.2262	0.1600	13
69	13	86	0.1512	0.1600	14
70	18	69	0.2609	0.1600	11
71	10	47	0.2128	0.1800	8
72	9	41	0.2195	0.1400	6
73	5	28	0.1786	0.1400	4
74	5	21	0.2381	0.1000	2
Totals	217	1,146	0.1894	0.1483	170
75 & Over	13	63			63
Totals	230	1,209			233

**UNIVERSITY MALES
EARLY RETIREMENT EXPERIENCE
DURING CALENDAR YEAR 2016**

Male Age-Based Reduced Retirement Experience

Age	Retirements	Exposure	Crude Rates	Current Rates	Expected Retirements
55	2	206	0.0097	0.0400	8
56	7	212	0.0330	0.0300	6
57	6	212	0.0283	0.0250	5
58	10	205	0.0488	0.0250	5
59	9	216	0.0417	0.0300	6
60	14	189	0.0741	0.0425	8
61	12	186	0.0645	0.0500	9
62	24	179	0.1341	0.0600	11
63	14	144	0.0972	0.0700	10
64	15	132	0.1136	0.0700	9
Totals	113	1,881	0.0601	0.0409	77

**UNIVERSITY FEMALES
NORMAL RETIREMENT EXPERIENCE
DURING CALENDAR YEAR 2016**

Female Age-Based Retirement Experience

Age	Retirements	Exposure	Crude Rates	Current Rates	Expected Retirements
57	4	28	0.1429	0.1400	4
58	5	25	0.2000	0.1200	3
59	2	22	0.0909	0.1000	2
60	10	36	0.2778	0.1150	4
61	9	35	0.2571	0.1600	6
62	9	38	0.2368	0.1400	5
63	4	26	0.1538	0.1850	5
64	10	41	0.2439	0.1300	5
65	29	136	0.2132	0.1800	24
66	23	95	0.2421	0.2200	21
67	17	75	0.2267	0.1700	13
68	11	49	0.2245	0.1550	8
69	13	43	0.3023	0.1350	6
70	7	27	0.2593	0.1800	5
71	9	29	0.3103	0.1800	5
72	3	12	0.2500	0.1800	2
73	2	10	0.2000	0.1800	2
74	1	9	0.1111	0.1800	2
Totals	168	736	0.2283	0.1658	122
75 & Over	7	24			24
Totals	175	760			146

**UNIVERSITY FEMALES
EARLY RETIREMENT EXPERIENCE
DURING CALENDAR YEAR 2016**

Female Age-Based Reduced Retirement Experience

Age	Retirements	Exposure	Crude Rates	Current Rates	Expected Retirements
55	7	252	0.0278	0.0550	14
56	13	259	0.0502	0.0550	14
57	12	229	0.0524	0.0400	9
58	12	169	0.0710	0.0550	9
59	13	201	0.0647	0.0650	13
60	19	173	0.1098	0.0800	14
61	16	157	0.1019	0.0600	9
62	24	182	0.1319	0.1200	22
63	21	139	0.1511	0.1200	17
64	12	99	0.1212	0.1200	12
Totals	149	1,860	0.0801	0.0715	133

**PROTECTIVE WITH SOCIAL SECURITY
NORMAL RETIREMENT EXPERIENCE
DURING CALENDAR YEAR 2016**

Male and Female Age-Based Retirement Experience

Age	Retirements	Exposure	Crude Rates	Current Rates	Expected Retirements
50	42	380	0.1105	0.0575	22
51	36	360	0.1000	0.0700	25
52	35	323	0.1084	0.0900	29
53	85	316	0.2690	0.2300	73
54	70	367	0.1907	0.1900	70
55	60	313	0.1917	0.1900	59
56	52	244	0.2131	0.1900	46
57	34	202	0.1683	0.1900	38
58	33	187	0.1765	0.1750	33
59	22	135	0.1630	0.1600	22
60	29	142	0.2042	0.2000	28
61	15	119	0.1261	0.2000	24
62	22	93	0.2366	0.2200	20
63	14	57	0.2456	0.2600	15
64	17	45	0.3778	0.1700	8
65	17	40	0.4250	0.3000	12
66	14	23	0.6087	0.2500	6
67	5	11	0.4545	0.3000	3
68	2	11	0.1818	0.3000	3
69	1	3	0.3333	0.3000	1
70	2	5	0.4000	1.0000	5
71	-	-	N/A	1.0000	-
72	1	2	0.5000	1.0000	2
73	-	1	0.0000	1.0000	1
74	-	1	0.0000	1.0000	1
Totals	608	3,380	0.1799	0.1615	546
75 & Over	-	4			4
Totals	608	3,384			550

**PROTECTIVE WITHOUT SOCIAL SECURITY
NORMAL RETIREMENT EXPERIENCE
DURING CALENDAR YEAR 2016**

Male and Female Age-Based Retirement Experience

Age	Retirements	Exposure	Crude Rates	Current Rates	Expected Retirements
50	1	62	0.0161	0.0350	2
51	4	72	0.0556	0.0375	3
52	3	86	0.0349	0.0450	4
53	15	72	0.2083	0.1700	12
54	15	70	0.2143	0.2500	18
55	15	58	0.2586	0.2100	12
56	6	44	0.1364	0.2700	12
57	6	31	0.1935	0.3000	9
58	3	15	0.2000	0.3000	5
59	2	16	0.1250	0.3000	5
60	-	5	0.0000	0.2600	1
61	2	11	0.1818	0.1500	2
62	5	9	0.5556	0.2000	2
63	2	6	0.3333	0.4000	2
64	-	1	0.0000	0.4000	-
65	-	1	0.0000	0.4000	-
66	-	-	N/A	0.4000	-
67	-	-	N/A	0.4000	-
68	-	-	N/A	0.4000	-
69	-	-	N/A	0.4000	-
70	-	-	N/A	1.0000	-
71	-	-	N/A	1.0000	-
72	-	-	N/A	1.0000	-
73	-	-	N/A	1.0000	-
74	-	-	N/A	1.0000	-
Totals	79	559	0.1413	0.1592	89
75 & Over	-	-	N/A		-
Totals	79	559			89

**EXECUTIVE AND ELECTED
NORMAL RETIREMENT EXPERIENCE
DURING CALENDAR YEAR 2016**

Male and Female Age-Based Retirement Experience

Age	Retirements	Exposure	Crude Rates	Current Rates	Expected Retirements
57	1	7	0.1429	0.1200	1
58	-	11	0.0000	0.1200	1
59	2	17	0.1176	0.1200	2
60	-	10	0.0000	0.1200	1
61	2	10	0.2000	0.1200	1
62	7	51	0.1373	0.1200	6
63	2	39	0.0513	0.1200	5
64	5	41	0.1220	0.1200	5
65	6	42	0.1429	0.1200	5
66	4	33	0.1212	0.2000	7
67	2	17	0.1176	0.1500	3
68	3	18	0.1667	0.1500	3
69	4	28	0.1429	0.1000	3
70	3	10	0.3000	0.1000	1
71	3	10	0.3000	0.1000	1
72	2	7	0.2857	0.1500	1
73	1	12	0.0833	0.1500	2
74	1	7	0.1429	0.1500	1
Totals	48	370	0.1297	0.1324	49
75 & Over	5	26			26
Totals	53	396			75

**EXECUTIVE AND ELECTED
EARLY RETIREMENT EXPERIENCE
DURING CALENDAR YEAR 2016**

Male and Female Age-Based Reduced Retirement Experience

Age	Retirements	Exposure	Crude Rates	Current Rates	Expected Retirements
55	-	42	0.0000	0.0300	1
56	-	53	0.0000	0.0300	2
57	-	27	0.0000	0.0300	1
58	3	40	0.0750	0.0300	1
59	1	30	0.0333	0.0300	1
60	-	28	0.0000	0.0500	1
61	-	18	0.0000	0.0500	1
62	-	10	0.0000	0.0200	-
63	-	12	0.0000	0.0200	-
64	-	9	0.0000	0.0200	-
Over 64	1	59	0.0169		
Totals	5	328			8

**DEATH-IN-SERVICE
DURING CALENDAR YEAR 2016**

Male

Age	Deaths	Exposure	Crude Rates	Current Rates	Expected Deaths
Under 20	-	16	0.0000	0.0001	-
20-24	2	1,294	0.0015	0.0002	-
25-29	1	7,303	0.0001	0.0002	1
30-34	7	10,336	0.0007	0.0003	3
35-39	7	11,887	0.0006	0.0004	5
40-44	5	12,084	0.0004	0.0005	7
45-49	9	14,019	0.0006	0.0007	10
50-54	16	14,190	0.0011	0.0012	18
55-59	5	12,748	0.0004	0.0024	31
60-64	11	8,356	0.0013	0.0032	27
65-69	6	2,953	0.0020	0.0054	16
70-74	1	763	0.0013	0.0088	7
75 and over	4	1	4.0000	0.0154	-
Totals	74	95,950	0.0008	0.0013	125

Female

Age	Deaths	Exposure	Crude Rates	Current Rates	Expected Deaths
Under 20	-	30	0.0000	0.0001	-
20-24	-	2,595	0.0000	0.0001	-
25-29	-	13,353	0.0000	0.0001	1
30-34	-	16,554	0.0000	0.0002	3
35-39	1	18,531	0.0001	0.0002	4
40-44	5	18,854	0.0003	0.0004	7
45-49	10	22,411	0.0004	0.0005	12
50-54	12	24,114	0.0005	0.0009	21
55-59	12	23,263	0.0005	0.0014	33
60-64	13	13,874	0.0009	0.0021	29
65-69	7	4,030	0.0017	0.0032	13
70-74	2	806	0.0025	0.0058	5
75 and over	-	-	N/A	0.0106	-
Totals	62	158,415	0.0004	0.0008	128