October 26, 2017

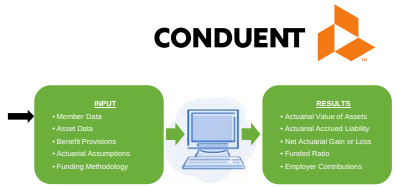
Firefighters' and Rescue Squad Workers' Pension Fund
Principal Results of Actuarial Valuation
as of December 31, 2016

Board of Trustees Meeting
David Driscoll and Mike Ribble

Conduent Human Resource Services

Valuation Input

Membership Data



Number as of	12/31/2016	12/31/2015
Active members	25,210	25,526
Lapsed members	17,235	17,295
Terminated members and survivors of deceased members entitled to benefits but not yet receiving benefits	139	146
Retired members and survivors of deceased members killed in the Line of Duty currently receiving benefits	13,940	13,463
Total	56,524	56,430

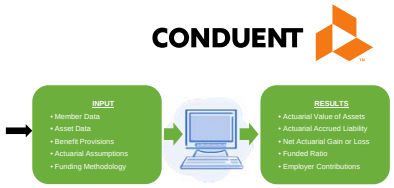
The number of active members decreased by 1.2% from the previous valuation date. The decrease in active members results in less benefits accruing, but also fewer contributions supporting the system.

The number of retired members and survivors of deceased members currently receiving benefits increased by 3.5% from the previous valuation. The increase in retiree population is consistent with expectations.

A detailed summary of the membership data used in this valuation is provided in Section 3 and Appendix B of the actuarial report.

Valuation Input

Asset Data: Market Value of Assets



Asset Data as of	12/31/2016	12/31/2015
Beginning of Year Market Value of Assets	$ 372,572,223	$ 383,327,980
Contributions	18,070,953	16,727,357
Benefit Payments	(29,675,409)	(28,816,779)
Investment Income	22,897,796	1,333,665
Net Increase/(Decrease)	11,293,340	(10,755,757)
End of Year Market Value of Assets	$ 383,865,563	$ 372,572,223
Estimated Net Investment Return on Market Value (Annualized)	6.24%	0.35%

The Market Value of Assets is $384 million as of December 31, 2016, and was $373 million as of December 31, 2015. The investment return for the market value of assets for calendar year 2016 was 6.24%.

The market value of assets is provided in Section 4 of the actuarial report.

Valuation Results

Net Actuarial Gain or Loss: Reconciliation of Unfunded Actuarial Accrued Liability

(in millions)	
Unfunded Actuarial Accrued Liability (UAAL) as of 12/31/2015	$ 47.4
Normal Cost during 2016	8.8
Reduction due to Actual Contributions during 2016	(18.1)
Interest on UAAL, Normal Cost, and Contributions	3.4
Asset (Gain)/Loss	7.5
Actuarial Accrued Liability (Gain)/Loss	(1.9)
Impact of Assumption Changes	2.5
Impact of Legislative Changes	0.0
Unfunded Actuarial Accrued Liability (UAAL) as of 12/31/2016	$ 49.6

During 2016, the UAAL increased faster than expected due to asset losses that were offset by a liability gain.

The asset loss of $7.5 million means that the asset valuation method resulted in a recognition of $7.5 million of asset losses from 2016.

The change in interest rate from 7.25% to 7.20% from the prior valuation increased the unfunded actuarial accrued liability (UAAL), or pension debt, by $2.5 million.

The accrued liability gain of $1.9 million means that the actuarial accrued liability was $1.9 million lower than we would have expected based on the current assumptions.

The net actuarial gain/(loss) is provided in Section 5 of the actuarial report.

Valuation Results

Reconciliation of the Change in Actuarially Determined Employer Contribution (ADEC)

Fiscal year ending June 30, 2018 Preliminary ADEC (estimated based on December 31, 2015 Valuation)	14,287,301
Impact of Legislative Changes	0
Fiscal year ending June 30, 2018 Final ADEC	14,287,301
Change Due to Demographic (Gain)/Loss	(1,146,481)
Change Due to Investment (Gain)/Loss	1,019,624
Change Due to Contributions Greater than ADEC	(14,636)
Impact of Assumption Changes	398,275
Fiscal year ending June 30, 2019 Preliminary ADEC (estimated based on December 31, 2016 Valuation)	14,544,083

Demographic gain primarily due to salary increases less than assumed based on the assumptions adopted with the experience study.

Investment loss is a recognition of asset losses from 2015 and 2016.

A detailed summary of the actuarially determined employer contribution rates is provided in Section 6 of the actuarial report.

State Contribution Rate Stabilization Policy

- Session Law 2016-108 requires that the Board develop a State Contribution Rate Stabilization Policy (SCRSP) for the FRSWPF
- Below is a summary of the SCRSP that the Board adopted on January 26, 2017
  - State Contributions
    - Board will recommend to the General Assembly the higher of the underlying ADEC or $350,000 greater than the current year's appropriation
    - SCRSP Minimum Contribution Rate for FYE 2019 is $18,302,208 (Greater of ADEC of $14,544,083 and FYE 2018 appropriation of $17,952,208 plus $350,000)
  - Benefit Increases and Member Contribution Increases
    - The cost of benefit improvements under the SCRSP are to be paid for by undistributed investment gains
    - With a goal of a 50/50 split between member and state contributions toward the normal cost portion of the annual contribution, monthly member contributions will be increased by $5 in any year that a benefit increase is granted AND the member's share of the Fund's normal cost is less than 50%
    - See next slides for metrics the Board must use to recommend benefit and/or member contribution increases

State Contribution Rate Stabilization Policy (continued)

- Metrics the Board must use in recommending benefit increases and/or member contribution increases based on the December 31, 2016 valuation are as follows:
  - Undistributed investment gains to reserve for benefit increases: $0.00
  - Amount of benefit increase to be paid with undistributed investment gains: N/A
  - Year-over-year increase in CPI-U as of December, 2016: 2.1%
  - State's share of normal cost per active member: $240.77
  - Member's share of normal cost per active member: $120.00
  - Member percent share of total normal cost: 33.26%
  - Would a benefit increase trigger a member contribution increase? Yes
  - Amount of monthly increase in member contribution (to nearest $5) to make member's share 50%: $5.00

Key Takeaways

Key results of the December 31, 2016 valuation were:

- Market value returns of 6.24% compared to 7.25% assumed
- Change in discount rate from 7.25% to 7.20% as of December 31, 2016

When compared to the December 31, 2015 valuation, the above resulted in:

- A lower funded ratio (89.0% in the December 31, 2016 valuation compared to 89.2% in the December 31, 2015 valuation)
- A higher actuarially determined employer contribution ($14,544,083 for fiscal year ending June 30, 2019 compared to the preliminary contribution of $14,287,301 calculated in the December 31, 2015 valuation for fiscal year ending June 30, 2018)

Key Takeaways (continued)

FRSWPF is well funded compared to its peers. This is due to:

- Stakeholders working together to keep FRSWPF well-funded since inception
- A history of appropriating and contributing the recommended contribution requirements
- Assumptions that in aggregate are more conservative than peers
- A funding policy that aggressively pays down unfunded liability over a 12-year period
- Modest changes in benefits when compared to peers

Continued focus on these measures will be needed to maintain the sustainability of FRSWPF well into the future.

Certification

The assumptions, methods, and plan provisions used in the results presented in this presentation were provided in October 2017 in the "Report on the Actuarial Valuation of the North Carolina Firefighters' and Rescue Squad Workers' Fund prepared as of December 31, 2016."

The results were prepared under the direction of Michael Ribble and David Driscoll who meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. These results have been prepared in accordance with all applicable Actuarial Standards of Practice, and we are available to answer questions about them.

Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and demographic assumptions, increases or decreases expected as part of the natural operation of the methodology used for these measurements, and changes in plan provisions or applicable law.

Michael A. Ribble, FSA, EA, MAAA
Principal, Consulting Actuary

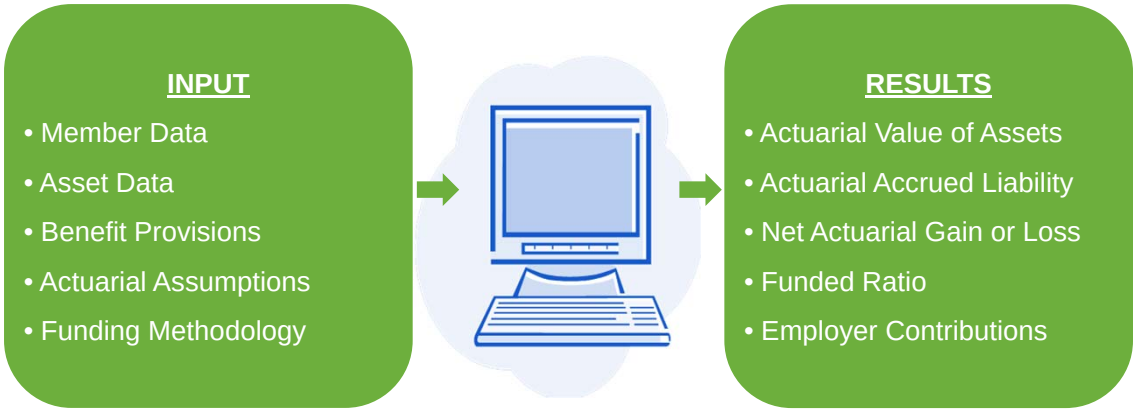
David Driscoll, FSA, EA, MAAA, FCA
Principal, Consulting Actuary

Appendix: Purpose of the Annual Actuarial Valuation

- As of the end of each calendar year:
  - An annual actuarial valuation is performed on FRSWPF
  - The actuary determines the amount of employer contributions to be made to FRSWPF during each member's career that, when combined with investment return and member contributions, are expected to be sufficient to pay for retirement benefits.
- In addition, the annual actuarial valuation is performed to:
  - Determine the progress on funding FRSWPF
  - Explore why the results of the current valuation differ from the results of the valuation of the previous year
  - Satisfy regulatory and accounting requirements

Appendix: The Valuation Process

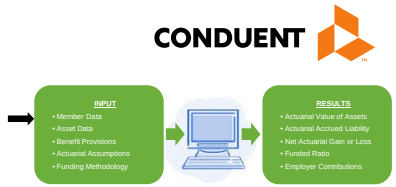
The following diagram summarizes the inputs and results of the actuarial valuation process.

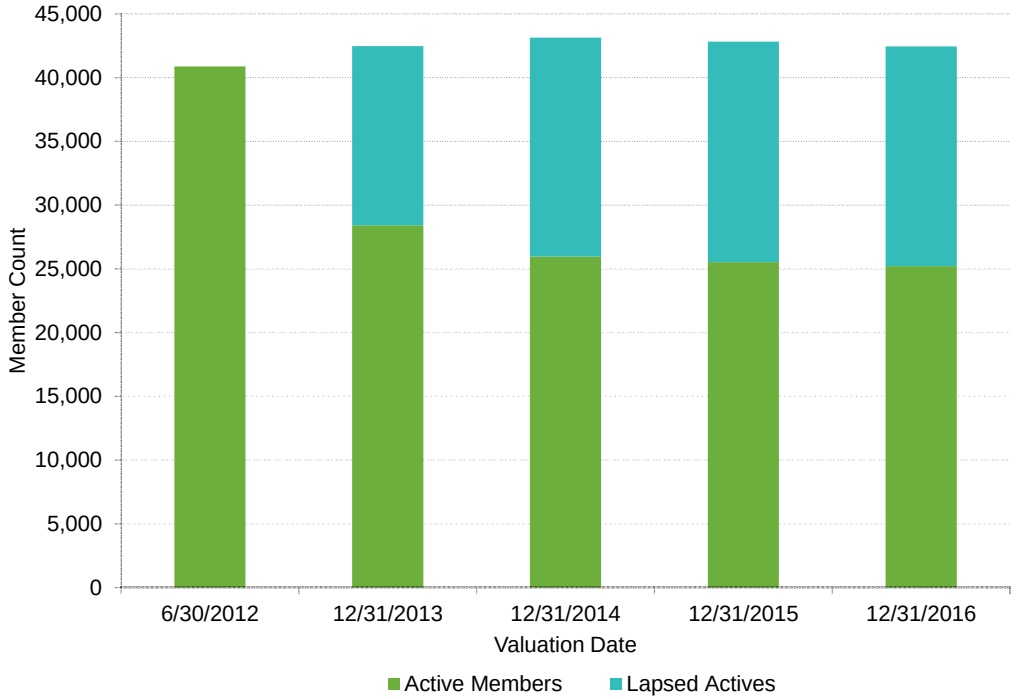


A detailed summary of the valuation process and a glossary of actuarial terms are provided in Appendix A of the actuarial report.

Appendix: Valuation Input

Membership Data: Active Members and Lapsed Members



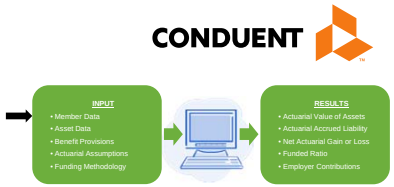


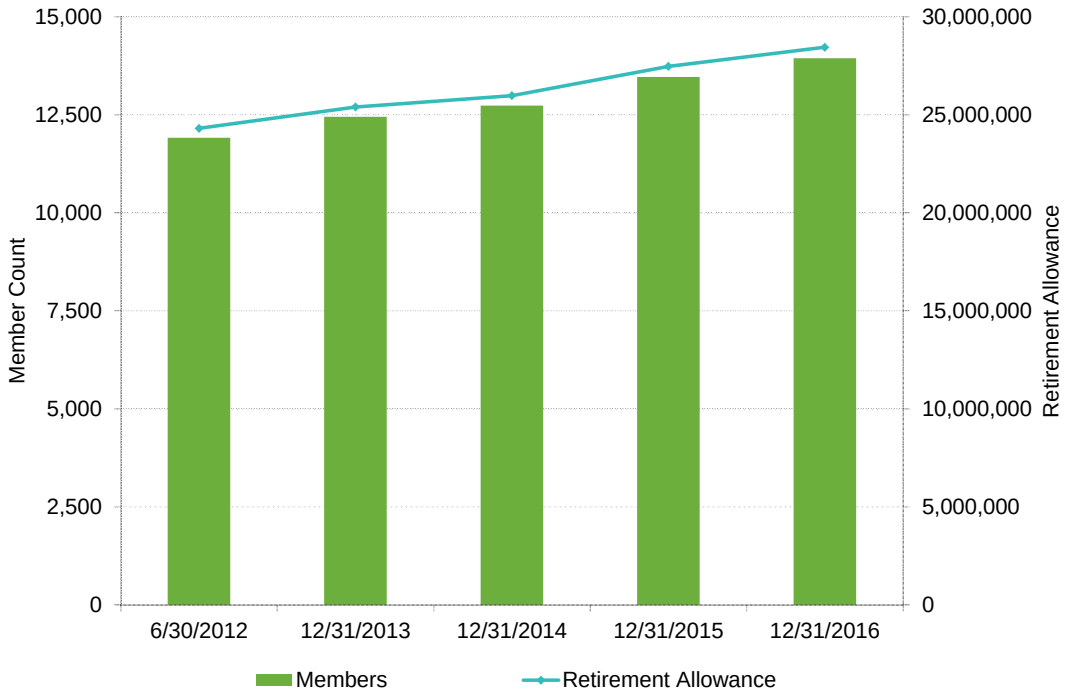
Since the December 31, 2013 valuation, members who are not in receipt of benefit and who have not received a refund of employee contributions are split into active members and lapsed members. Lapsed members include members who did not accrue a year of service in the past year. The return to service assumption, which was implemented on a preliminary basis for the December 31, 2013 valuation was finalized for the December 31, 2015 valuation, assumes that a lapsed member returns to active service at a rate based on the number of years that the member has been lapsed.

A detailed summary of the membership data used in this valuation is provided in Section 3 and Appendix B of the actuarial report.

Appendix: Valuation Input

Membership Data: Retired Members



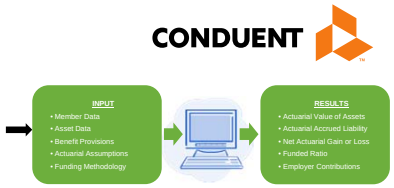


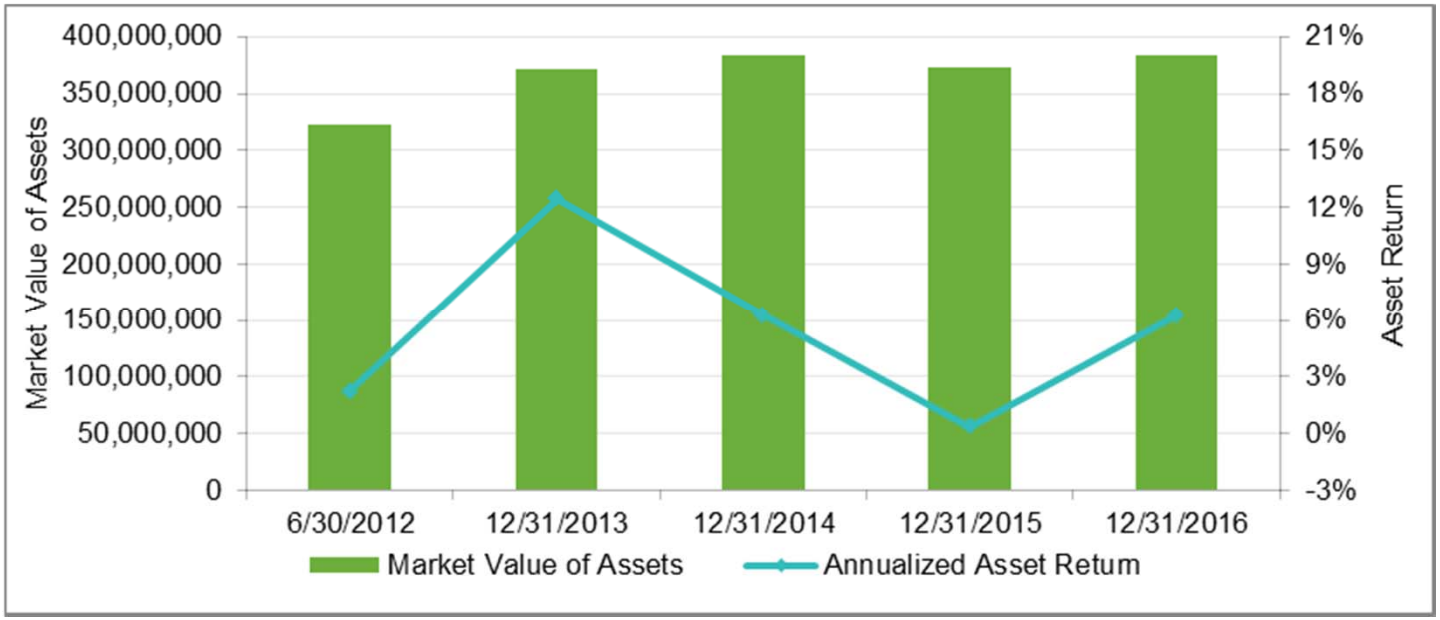
The number of retired members and survivors of deceased members and the benefits paid to these members has been increasing steadily, as expected based on plan assumptions.

A detailed summary of the membership data used in this valuation is provided in Section 3 and Appendix B of the actuarial report.

Appendix: Valuation Input

Asset Data: Market Value of Assets and Asset Returns



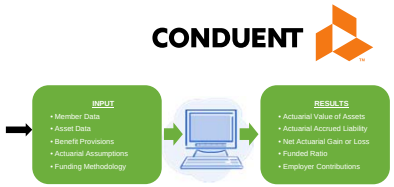


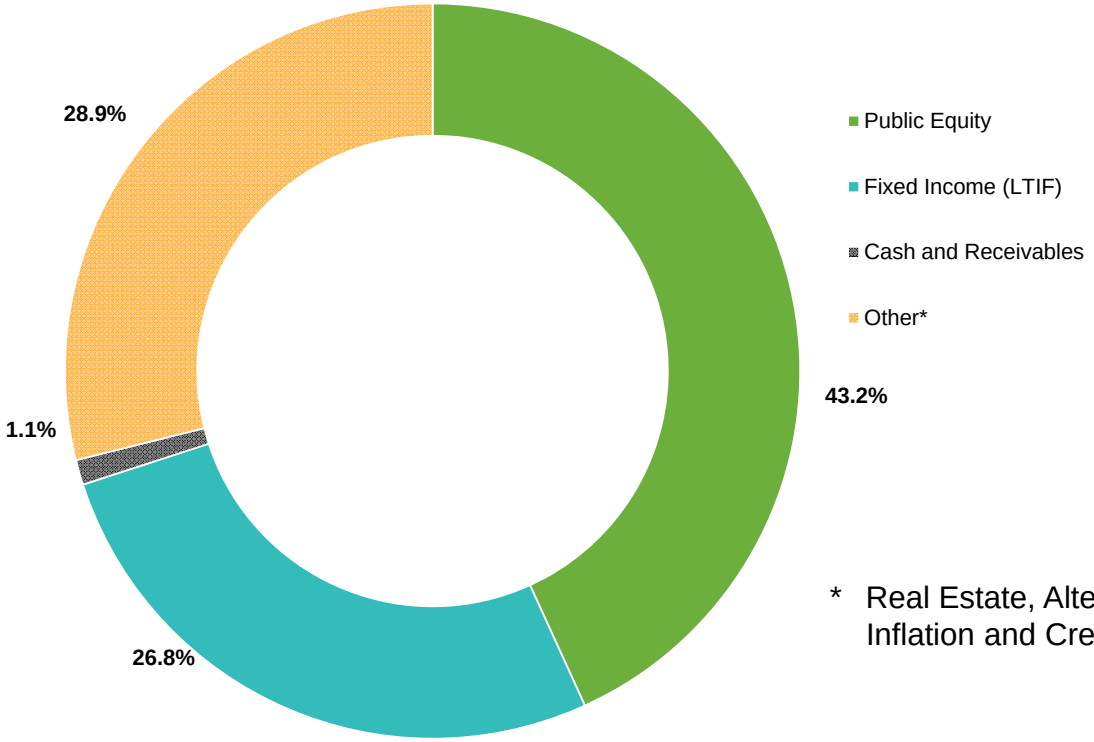
Returns were less than the 7.25% assumed rate of return (as of the prior valuation), resulting in higher contributions an lower funded ratio than anticipated, all else being equal.

A detailed summary of the market value of assets is provided in Section 4 of the actuarial report.

Appendix: Valuation Input

Asset Data: Allocation of Investments by Category





* Real Estate, Alternatives, Inflation and Credit

Based on historical market returns, the current asset allocation, the current investment policy, and the expectation of future asset returns, as reviewed in the last experience study, the 7.20% discount rate used in this valuation is reasonable and appropriate.

A detailed summary of the market value of assets is provided in Section 4 of the actuarial report.

Appendix: Valuation Input

Benefit Provisions

Benefit provisions are described in North Carolina General Statues, Chapter 58.

There were no changes in benefit provisions since the prior year's valuation.

Highlights of the benefit provisions are described below.

- An unreduced retirement allowance is payable to members who retire from service after attaining age 55 and 20 years of service as an eligible firefighter or eligible rescue squad worker.
- The unreduced retirement allowance is equal to $170 per month.

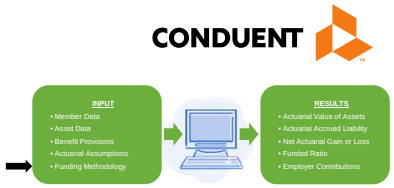
Many Public Sector Retirement Systems in the United States have undergone pension reform where the benefits of members (active or future members) have been reduced.

If North Carolina's investment policy shifts substantively, the system should review likely impacts of the shift and consider corresponding changes to actuarial assumptions, funding policy and/or benefit levels.

A detailed summary of the benefit provisions is provided in Appendix C of the actuarial report.

Appendix: Valuation Input

Actuarial Assumptions



- Demographic (future events that relate to people)
  - Retirement
  - Termination
  - Disability
  - Death

- Economic (future events that relate to money)
  - Interest rate – 7.20% per year

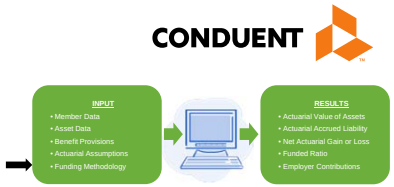
The assumptions used for the December 31, 2016 actuarial valuation are based on the experience study prepared as of December 31, 2014 and adopted by the Board of Trustees on January 21, 2016, and an interest rate of 7.20% as adopted by the Board of Trustees on April 20, 2017.

- The interest rate was decreased from 7.25% to 7.20% as adopted by the Board of Trustees on April 20, 2017

A detailed summary of the actuarial assumptions and methods is provided in Appendix D of the actuarial report.

Appendix: Valuation Input

Funding Methodology



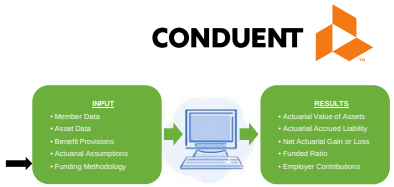
The Funding Methodology is the payment plan for FRSWPF and is composed of the following three components:

- Actuarial Cost Methods allocate costs to the actuarial accrued liability (i.e. the amount of money that should be in the fund) for past service and normal cost (i.e. the cost of benefits accruing during the year) for current service.
  - The Board of Trustees has adopted Entry Age Normal as its actuarial cost method
  - Develops normal costs that stay level as a percent of payroll
- Asset Valuation Methods smooth or average the market value returns over time to alleviate contribution volatility that results from market returns.
  - Asset returns in excess of or less than the expected return on market value of assets reflected over a five-year period
  - Assets corridor: not greater than 120% of market value and not less than 80% of market value

A detailed summary of the actuarial assumptions and methods is provided in Appendix D of the actuarial report.

Appendix: Valuation Input

Funding Methodology (continued)



- Amortization Methods determine the payment schedule for unfunded actuarial accrued liability (i.e. the difference between the actuarial accrued liability and actuarial value of assets)
  - Payment level: the payment is determined as a level dollar amount, similar to a mortgage payment
  - Payment period: a 12-year closed amortization period was adopted for fiscal year ending 2012. A new amortization base is created each year based on the prior years' experience.

When compared to other Public Sector Retirement Systems in the United States, the funding policy for FRWPF is quite aggressive in that the policy pays down the pension debt over a much shorter period of time (12 years) compared to the national average of around 24 years. As such it is a best practice in the industry.

A detailed summary of the actuarial assumptions and methods is provided in Appendix D of the actuarial report.

Appendix: Valuation Results

Actuarial Value of Assets

Asset Data as of	12/31/2016
Beginning of Year Market Value of Assets	$ 372,572,223
Contributions	18,070,953
Benefit Payments	(29,675,409)
Net Cash Flow	(11,604,456)
Expected Investment Return	26,590,825
Expected End of Year Market Value of Assets	387,558,592
End of Year Market Value of Assets	383,865,563
Excess of Market Value over Expected Market Value of Assets	(3,693,029)
80% of 2016 Asset Gain/(Loss)	(2,954,423)
60% of 2015 Asset Gain/(Loss)	(15,611,623)
40% of 2014 Asset Gain/(Loss)	N/A
20% of 2013 Asset Gain/(Loss)	N/A
Total Deferred Asset Gain/(Loss)	(18,566,046)
Preliminary End of Year Actuarial Value of Assets	402,431,609
Final End of Year Actuarial Value of Assets (not less than 80% and not greater than 120% of Market Value)	402,431,609
Estimated Net Investment Return on Actuarial Value	5.33%

CONDUENT

The actuarial value of assets smooths investment gains/ losses, resulting in less volatility in the employer contribution.

Lower than expected returns in 2015 and 2016 resulted in an actuarial value of asset return for calendar year 2016 of 5.33% and a recognized actuarial asset loss of $7.5 billion during 2016.

The actuarial value of assets is provided in Section 4 of the actuarial report.

Appendix: Valuation Results

Historical Asset Returns

Year*	Actuarial Value of Asset Return	Market Value of Asset Return
2006	8.63%	7.24%
2007	9.98%	14.85%
2008	7.43%	(1.92%)
2009	3.09%	(14.15%)
2010	4.47%	12.09%
2011	6.88%	18.47%
2012	5.96%	2.25%
2013	7.43%	12.42%
2014	7.42%	6.24%
2015	5.87%	0.35%
2016	5.33%	6.24%
Average	6.57%	5.45%
Range	6.89%	32.62%

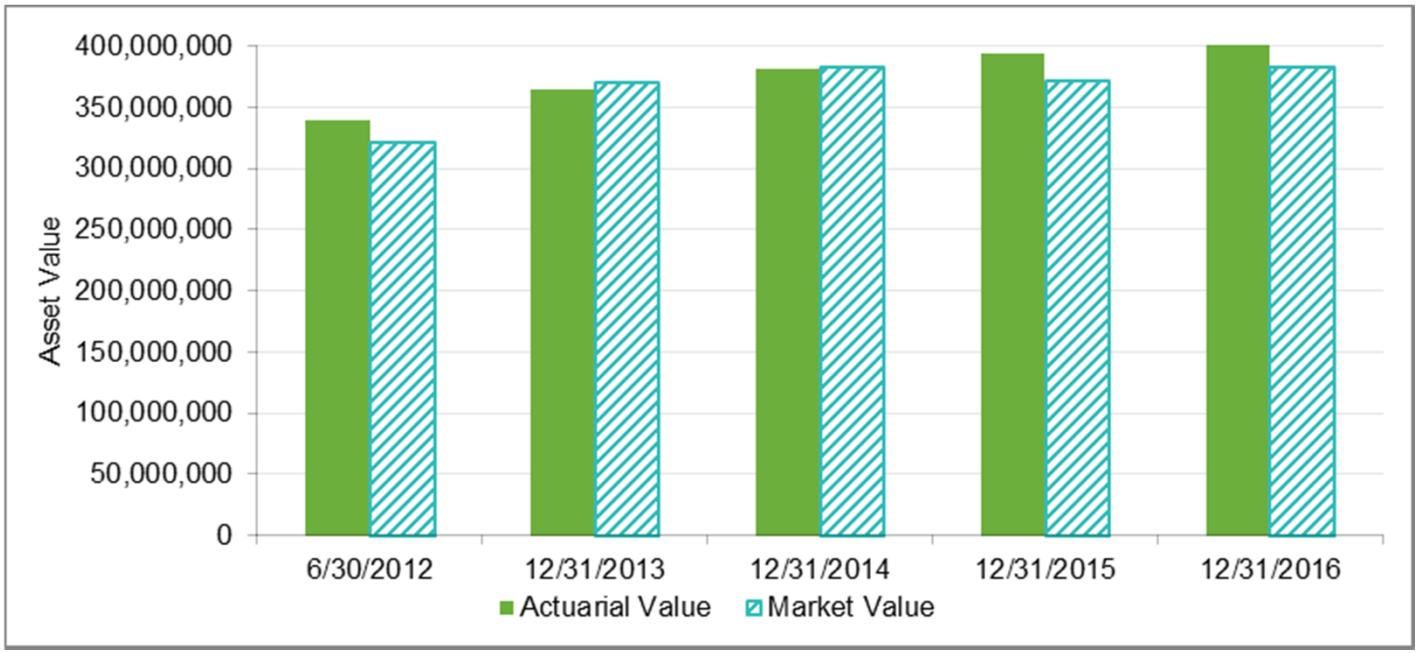
The average investment return recognized for purposes of determining the annual change in contribution each year is the actuarial value of assets return.

Currently, the average actuarial return of 6.57% tracks average market return of 5.45% relatively well. But the range of returns is markedly less – 6.89% versus 32.62%. This results in much lower actuarially determined employer contribution volatility using the actuarial value of assets versus market, while ensuring that the actuarial needs of FRSWPF are met.

The valuation assumes that the funds will earn a 7.20% asset return. This table provides a history of the actuarial value and market value of asset returns.

Appendix: Valuation Results

Actuarial Value of Assets: Compared to Market Value

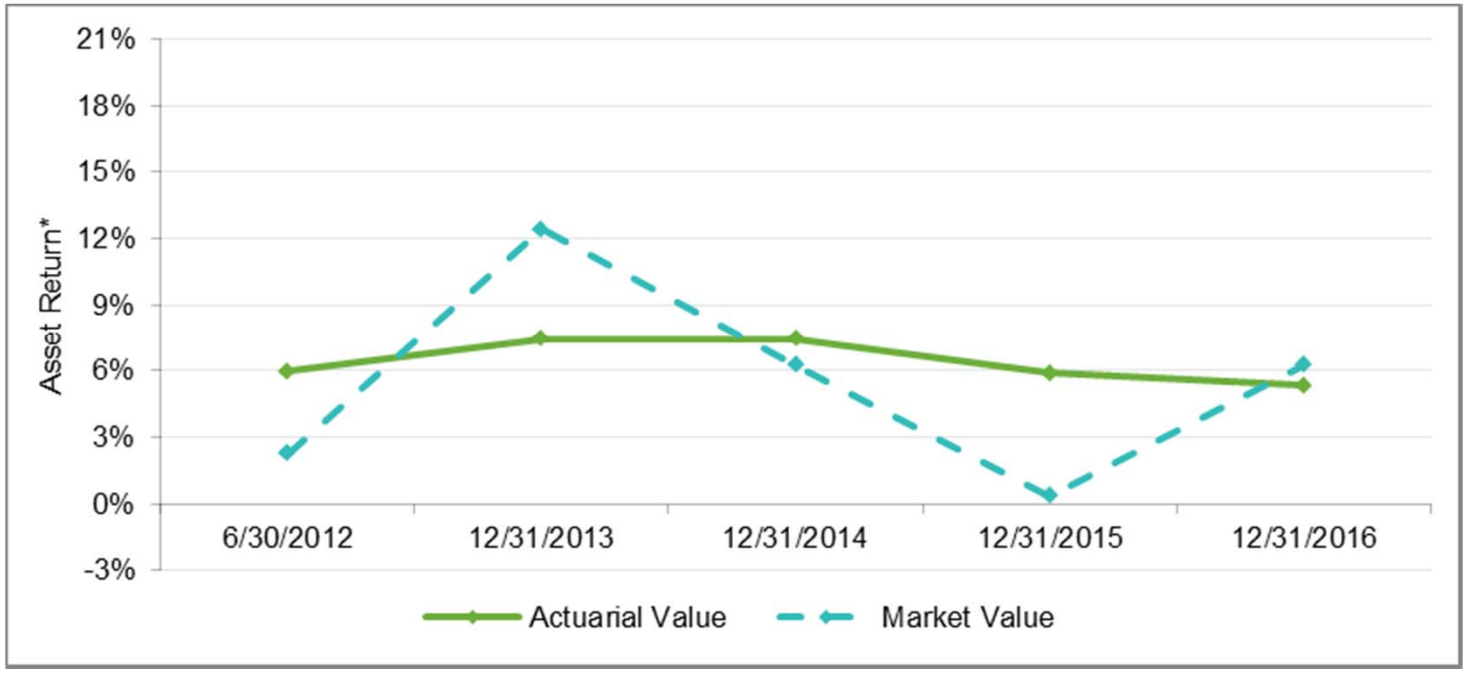


The market value of assets is lower than the actuarial value of assets, which is used to determine employer contributions. This indicates that there are unrecognized asset losses to be recognized in future valuations.

A detailed summary of the actuarial value of assets is provided in Section 4 of the actuarial report.

Appendix: Valuation Results

Asset Returns: Actuarial Value and Market Value

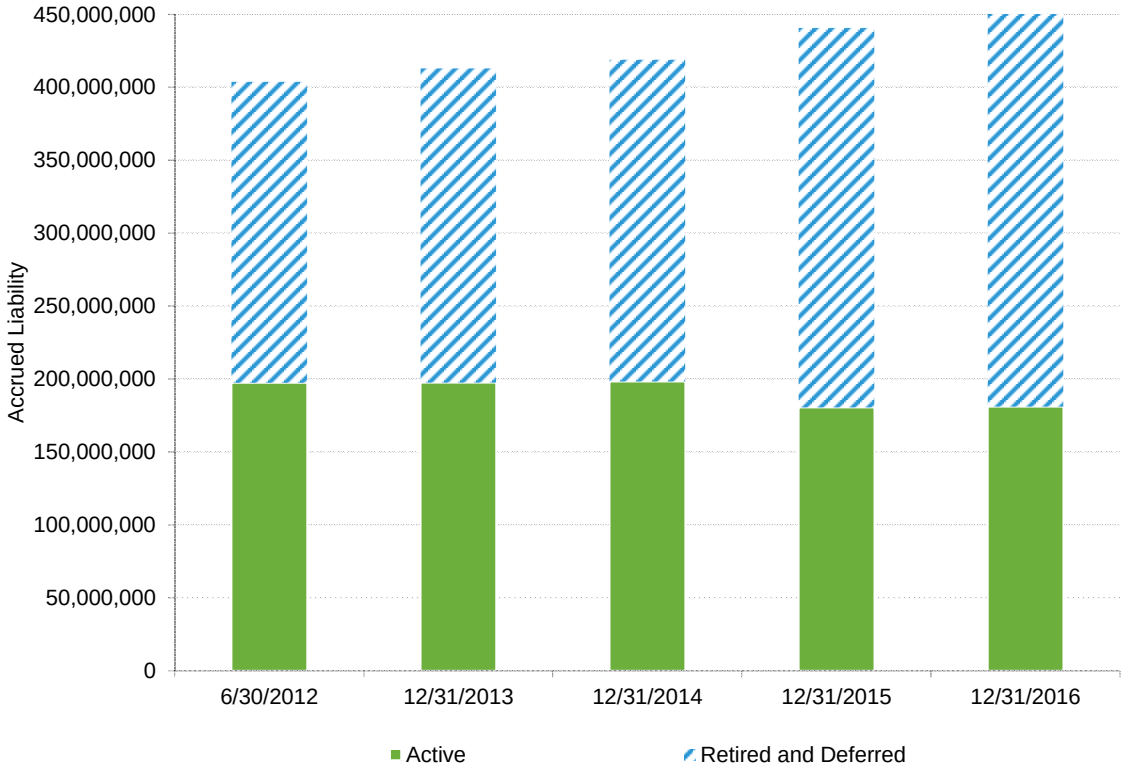


The actuarial value of assets smooths investment gains/losses, resulting in less volatility in the employer contribution.

A detailed summary of the actuarial value of assets is provided in Section 4 of the actuarial report.

Appendix: Valuation Results

Actuarial Accrued Liability (AAL)



The AAL increased from $441 million to $452 million in 2016. FRSWPF is an open plan, which means that new members enter the plan each year. In an open plan, liabilities are expected to grow from one year to next as more benefits accrue and the membership approaches retirement.

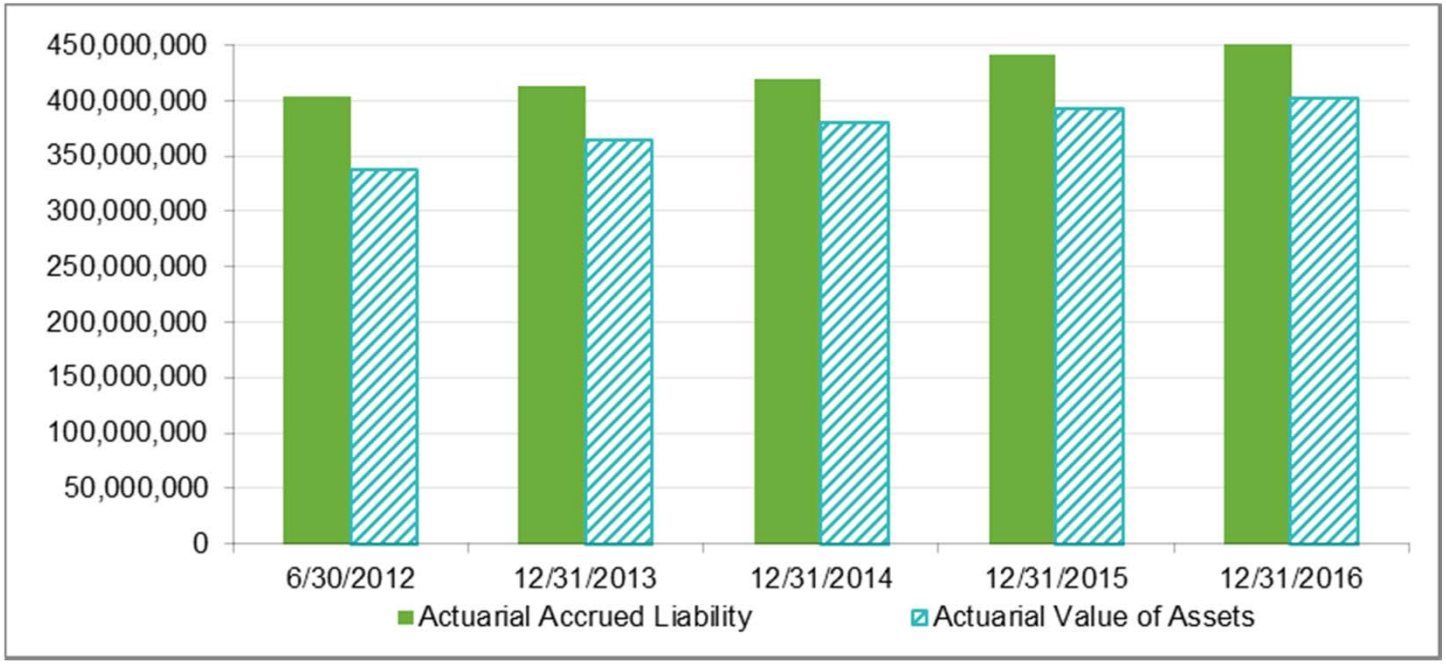
The AAL prior to assumption and legislative changes was $1.9 million lower than expected, which resulted in a demographic gain of $1.9 million during 2016.

Assumption changes increased the AAL by $2.5 million.

A detailed summary of the AAL is provided in Section 5 of the actuarial report.

Appendix: Valuation Results

Actuarial Accrued Liability (AAL) and Actuarial Value of Assets (AVA)



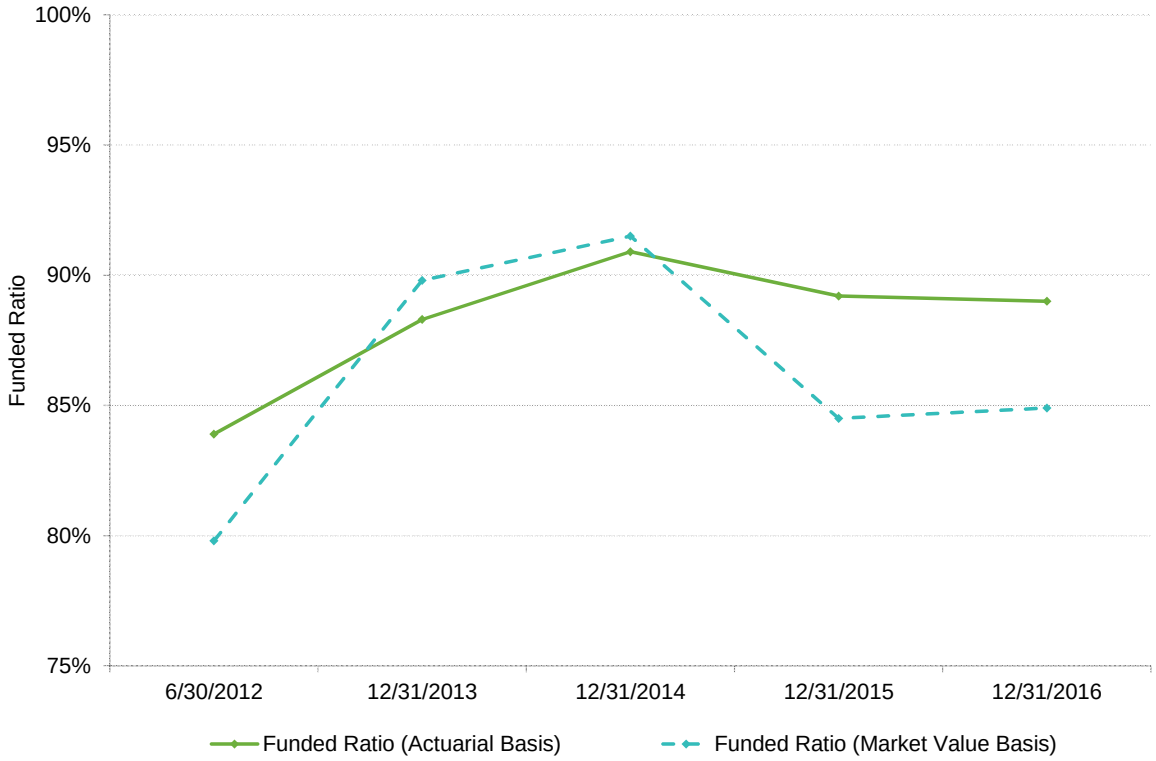
The AVA basis is used for computing contributions to alleviate contribution volatility.

The difference in the AAL and the AVA is the amount of pension debt to be paid off in 12 years.

A detailed summary of the AVA is provided in Section 4 of the actuarial report, and a detailed summary of the AAL is provided in Section 5 of the actuarial report.

Appendix: Valuation Results

Funded Ratio: AAL Divided by AVA

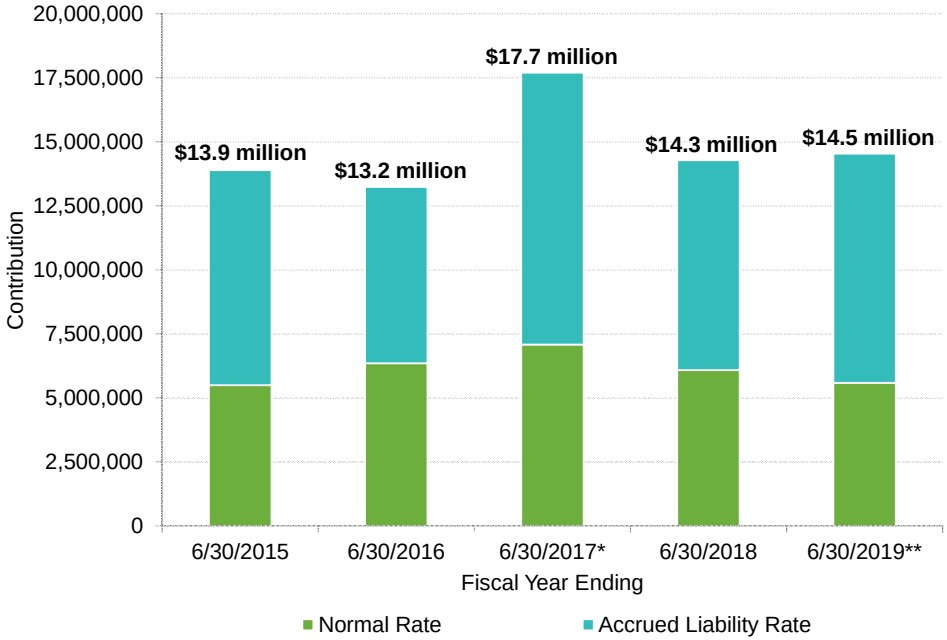


The ratio of assets to liabilities shows the health of the plan on an accrued basis.

The funded ratio on an actuarial basis decreased from 89.2% at December 31, 2015 to 89.0% at December 31, 2016.

Appendix: Valuation Results

Actuarially Determined Employer Contributions



* Includes impact of the experience study.

** Subject to the impact of future legislative changes effective during that fiscal year.

A detailed summary of the actuarially determined employer contribution rates is provided in Section 6 of the actuarial report.

The actuarially determined employer contribution is the amount needed to pay for the cost of the benefits accruing and to pay off the pension debt over 12 years, offset for the $10 monthly contribution the members make until the member attains 20 years of service.

The 12-year period is a short period for Public Sector Retirement Systems in the United States, with most Systems using a period of 25 years or more to pay off the pension debt. The shorter period results in higher contributions and more benefit security.

Appendix: Valuation Results

Actuarially Determined Employer Contribution (ADEC) Rates

Valuation Date	Fiscal Year Ending	Preliminary ADEC	Subsequent Changes to ADEC***	Final ADEC	Appropriated Rate
12/31/2016	6/30/2019	$14,544,083	N/A	N/A	N/A
12/31/2015	6/30/2018	14,287,301	$ -	$14,287,301	$17,952,208
12/31/2014	6/30/2017	12,830,706	4,874,502	17,705,208	17,602,208
12/31/2013	6/30/2016	13,240,552	-	13,240,552	13,550,000
6/30/2012*	6/30/2015	15,100,000	(1,200,000)**	13,900,000	13,900,000

* Because a valuation was not performed at June 30, 2013, the preliminary actuarially determined employer contribution was estimated to be $15,100,000 for fiscal year ending June 30, 2015 based on the June 30, 2012 valuation.

** Based on the findings in Phase One of the audit of the census data for lapsed members, the total employer contribution was estimated to decrease by $2,200,000. House Bill 1034 (Session Law 2014-64) increased the employer contribution by $1,000,000. Subsequently, the 2014 Appropriations Act (Session Laws 2014-100) set contributions at $13,900,000 effective for the fiscal year ending June 30, 2015.

*** The change due to legislation for the contribution for fiscal year ending 6/30/2017 includes a $4,771,502 increase in the ADEC due to the experience study and a $103,000 increase in the ADEC due to legislation passed in the past year that allows for the payment of line of duty death benefits.

The actuarially determined employer contribution rates are provided in Section 6 of the actuarial report.