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Consolidated Judicial Retirement System of North Carolina

Report on the Actuarial Valuation Prepared as of December 31, 2015

October 2016

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October 12, 2016

Board of Trustees
Consolidated Judicial
Retirement System of North Carolina
3200 Atlantic Avenue
Raleigh, NC 27604

Members of the Board:

We submit herewith our report on the actuarial valuation of the Consolidated Judicial Retirement System of North Carolina (referred to as "CJRS" or the "Judicial Plan") prepared as of December 31, 2015. The report has been prepared in accordance with North Carolina General Statute 135-50 through 135-75.

The primary purpose of the valuation report is to determine the required member and employer contribution rates, to describe the current financial condition of CJRS, and to analyze changes in such condition. In addition, the report provides information that the Office of the State Controller (OSC) requires for its Comprehensive Annual Financial Report (CAFR) and it summarizes census data. Use of this report for any other purposes or by anyone other than OSC and its auditors may not be appropriate and may result in mistaken conclusions because of failure to understand applicable assumptions, methods, or inapplicability of the report for that purpose. The attached pages should not be provided without a copy of this cover letter. Because of the risk of misinterpretation of actuarial results, you should ask Buck to review any statement you wish to make on the results contained in this report. Buck will not accept any liability for any such statement made without prior review.

The valuation is based upon membership data and financial information as furnished by the Retirement Systems Division and the Financial Operations Division and as summarized in this report. Although reviewed for reasonableness and consistency with the prior valuation, these elements have not been audited by Buck and we cannot certify as to the accuracy and completeness of the data supplied. The valuation is also based on benefit and contribution provisions as presented in this report. If you have reason to believe that the plan provisions are incorrectly described, that important plan provisions relevant to this valuation are not described, or that conditions have changed since the calculations were made, you should contact the authors of this actuarial report prior to relying on this information.

The valuation is further based on the actuarial valuation assumptions, approved by the Board of Trustees, as presented in this report. We believe that these assumptions are appropriate and reasonable and also comply with the requirements of GASB Statement No. 67. We prepared this valuation in accordance with the requirements of this standard and in accordance with all applicable ASOPs.

The latest assumptions were adopted for use with the December 31, 2015 actuarial valuation, based on the experience study prepared as of December 31, 2014 and adopted by the Board of Trustees on January 21, 2016. The economic assumptions with respect to investment yield, salary increase and inflation have been based upon a review of the existing portfolio structure as well as recent and anticipated experience.

Where presented, references to “funded ratio” and “unfunded accrued liability” typically are measured on an actuarial value of assets basis. It should be noted that the same measurements using market value of assets would result in different funded ratios and unfunded accrued liabilities. Moreover, the funded ratio presented is appropriate for evaluating the need and level of future contributions but makes no assessment regarding the funded status of the plan if the plan were to settle (i.e. purchase annuities) for a portion or all of its liabilities. In various places in the report the results also show funded ratios and unfunded liabilities based upon varying sets of assumptions as well as market values of assets as that is required for certain disclosure information required per accounting rules or statutes. Where this has been done it has been clearly indicated.

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. Because of limited scope, Buck performed no analysis of the potential range of such future differences, except for some limited analysis in financial projections or required disclosure information.

The undersigned meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained in this report. This report has been prepared in accordance with all applicable Actuarial Standards of Practice, and we are available to answer questions about it.

Respectfully submitted,

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

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Principal, Consulting Actuary

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Executive Summary

Overview

The North Carolina Retirement Systems Division (RSD) was established in 1941 to provide retirement benefits for public servants in the State of North Carolina. Today, under the management of the Department of State Treasurer, RSD administers eight public pension plans (defined benefit plans), three supplemental retirement plans (voluntary defined contributions plans), a health trust fund, a disability income plan, death benefit funds and a number of other benefit programs. As of December 31, 2015, the Retirement Systems defined benefit plans cover about 980,000 current and prior public servants in the state of North Carolina. During the fiscal year ending June 30, 2016, the Systems paid $5.7 billion in pensions to about 280,000 retirees. And as of June 30, 2016, the Systems' assets were valued at $87 billion.

Under the supplemental retirement plans, the amount of contributions in any given year is defined by law. The amount of benefits derived is dependent on the investment returns the individual achieves. Conversely, under the pension plans, the amount of the benefit paid to a member upon retirement, termination, death or disability is defined by law. The amount of contributions needed to fund these benefits cannot be known with certainty. In North Carolina, like other states, these contributions are paid during a public servant's career so that upon retirement, termination, death, or disability, there are funds available to pay these benefits. These amounts are determined through an actuarial valuation. Actuarial valuations are performed for each of the pension plans administered by RSD and the results are contained in actuarial valuation reports like this.

In 1985, the Consolidated Judicial Retirement System (referred to as "CJRS" or the "Judicial Plan") was established. CJRS provides benefits to the elected judges and justices, district attorneys, clerks of superior court of the general court of justice and public defenders. CJRS has approximately $521 million in assets and over 1,200 members. This actuarial valuation report is our annual analysis of the financial health of CJRS. This report, prepared as of December 31, 2015, presents the results of the actuarial valuation of CJRS.

Purpose

An actuarial valuation is performed on CJRS annually as of the end of the calendar year. The actuary determines the amount of contributions to be made to CJRS during each member's career that, when combined with investment return, will be sufficient to pay for retirement benefits.

In addition, the annual actuarial valuation is performed to:

- Determine the progress on funding CJRS,
- Explore why the results of the current valuation differ from the results of the valuation of the previous year, and
- Satisfy regulatory and accounting requirements.

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

Executive Summary

Key Takeaways

The actuarial valuation is performed each year to replace the estimates the actuary assumed for the prior valuation with the actual events that happened. This past year, as expected, some of the assumptions used in the prior valuation were not realized. Key results of the December 31, 2015 valuation as compared to the December 31, 2014 valuation were:

- Market value returns of 0.35% compared to 7.25% assumed
- Increase in covered payroll of 1.0% compared to approximately 3% expected
- Recent legislation signed into law since the prior valuation
    - One-time pension supplement in the amount of 1.6% of the annualized benefit in effect on September 1, 2016 to be paid on or before October 31, 2016
- Changes in actuarial assumptions and methods in accordance with the latest experience study prepared as of December 31, 2014 and adopted by the Board of Trustees on January 21, 2016

When compared to the December 31, 2014 valuation, the above resulted in:

- Lower funded ratio (89.4% in the December 31, 2015 valuation compared to 94.3% in the December 31, 2014 valuation)
- Higher actuarially determined employer contribution rate (30.23% for fiscal year ending June 30, 2018 compared to the preliminary contribution of 25.09% calculated in the December 31, 2014 valuation for fiscal year ending June 30, 2017)
- Lower projected benefit amounts being accrued by active members

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

- Stakeholders working together to keep CJRS 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
- An ad hoc cost-of-living adjustment that supports the health of the system
- Modest changes in benefits when compared to peers

Continued focus on these measures will be needed to maintain the solid status of CJRS well into the future.

More details can be found later in this report. We encourage readers to start with Sections 1 and 2 and refer to other sections for additional details as needed.

Section 1: Principal Results

This report, prepared as of December 31, 2015, presents the results of the actuarial valuation of the system. The principal results of the valuation and a comparison with the preceding year's results are summarized below.

Table 1: Summary of Principal Results

Valuation results as of	12/31/2015	12/31/2014
Active Members		
Number	561	566
Reported Compensation	$ 68,245,416	$ 67,562,225
Valuation Compensation*	$ 70,467,331	$ 71,429,321
Retired Members and Survivors of Deceased Members Currently Receiving Benefits		
Number	647	610
Annual Allowances	$ 40,036,451	$ 37,376,920
Assets		
Actuarial Value (AVA)	$ 550,050,200	$ 534,299,602
Market Value	$ 520,979,678	$ 534,452,795
Actuarial Accrued Liability (AAL)	$ 615,599,280	$ 566,830,508
Unfunded Accrued Liability (AAL-AVA)	$ 65,549,080	$ 32,530,906
Funded Ratio (AVA/AAL)**	89.4%	94.3%
Results for Fiscal Year Ending	**6/30/2018**	**6/30/2017**
Actuarially Determined Employer Contribution (ADEC), as a percentage of payroll		
Normal Cost	15.58%	17.60%
Death Benefit	0.37%	0.35%
Accrued Liability	14.28%	7.14%
Total	30.23%	25.09%
Impact of Experience Study	N/A	3.44%
Impact of Legislative Changes	N/A	0.93%
Final ADEC	N/A	29.46%
Appropriations Act for Fiscal Year Ending	**6/30/2017**	**6/30/2016**
Employer Contribution Rate as a percentage of payroll		
Normal Cost	15.58%	17.60%
Death Benefit	0.37%	0.35%
Accrued Liability	13.51%	9.26%
Total	29.46%	27.21%
Preliminary Reserve for Undistributed Gains/(Losses)	(0.77)%	2.12%

* Reported compensation adjusted to reflect the assumed rate of pay increase prior to the valuation date.

** The Funded Ratio on a Market Value of Assets basis is 84.6% at December 31, 2015.

Section 2: The Valuation Process

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

A more detailed description of the valuation process is provided in Appendix A.

Valuation Input: Membership Data

As with any estimate, the actuary collects information that we know now. Under the actuarial valuation process, current information about CJRS members is collected annually by the Retirement Systems Division staff at the direction of the actuary. Membership data will assist the actuary in estimating benefits that could be paid in the future. Information about benefit provisions and assets held in the trust as of the valuation date is also collected.

The member information the actuary collects includes data elements such as current service, salary and benefit group identifier for members that have not separated service, and actual benefit amounts and form of payment for members that have separated service. Data elements such as gender and date of birth are used to determine when a benefit might be paid and for how long.

Section 2: The Valuation Process

Valuation Input: Membership Data (continued)

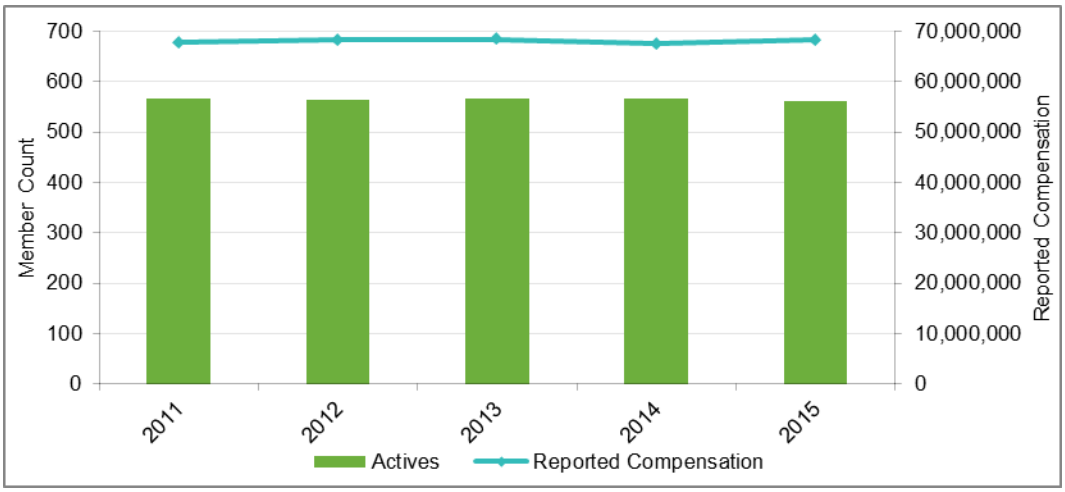
The table below provides a summary of the membership data used in this valuation compared to the prior valuation.

Number as of	12/13/2015	12/13/2014
Active members	561	566
Terminated members and survivors of decreased members entitled to benefits but not yet receiving benefits	45	50
Retired members and survivors of deceased members currently receiving benefits	647	610
Total	1,253	1,226

Commentary: The number of active members has decreased by 0.9% from the previous valuation date. A 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 6.1% from the previous valuation date. The increase in retiree population is consistent with expectations.

Graph 1: Active Members

The graph below provides a history of the number of active members and reported compensation over the past five years.



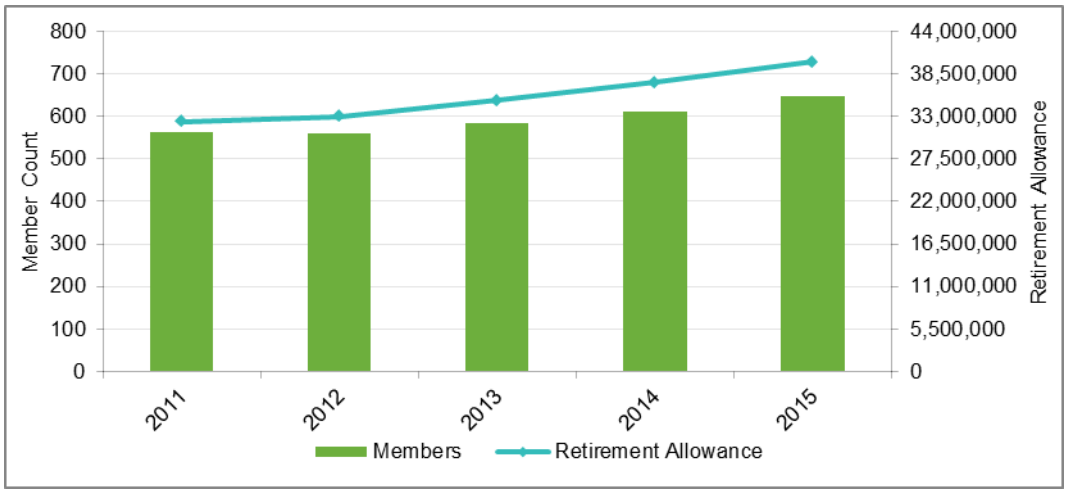
Commentary: Reported compensation has increased by 1.0% and has remained relatively stable over the past five years. Covered payroll is expected to increase by approximately 3% annually in the future. Payroll that is not increasing as fast as assumed results in less benefits accruing but also fewer contributions supporting the system.

Section 2: The Valuation Process

Valuation Input: Membership Data (continued)

Graph 2: Retired Members and Survivors of Deceased Members

The graph below provides a history of the number of retired members and survivors of deceased members and benefit amounts payable over the past five years.



Commentary: 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 this report.

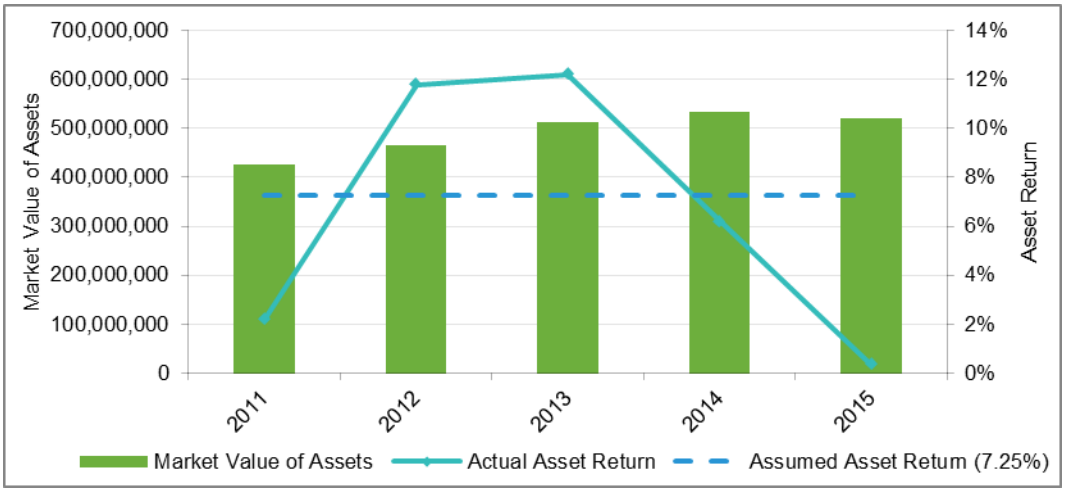
Section 2: The Valuation Process

Valuation Input: Asset Data

CJRS assets are held in trust and are invested for the exclusive benefit of plan members. The Market Value of Assets is $521 million as of December 31, 2015 and $534 million as of December 31, 2014. The investment return for the market value of assets for calendar year 2015 was 0.35%.

Graph 3: Market Value of Assets and Asset Returns

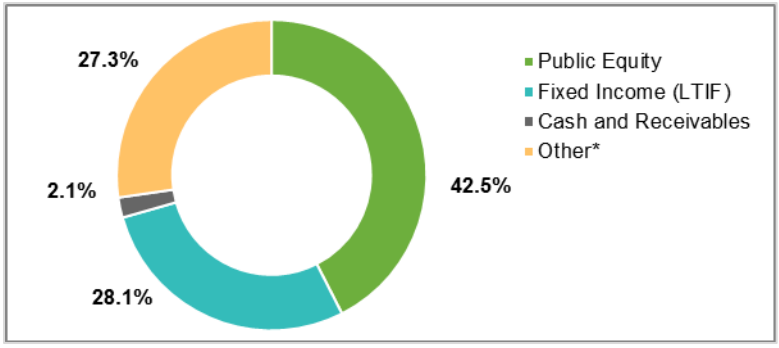
The graph below provides a history of the market value of assets and asset returns over the past five years.



Commentary: Returns were less than the 7.25% assumed rate of return, resulting in higher contributions and lower funded ratio than anticipated, all else being equal.

Graph 4: Allocation of Investments by Category

The graph below provides the breakdown of the market value of assets at December 31, 2015 by asset category.



* Real Estate, Alternatives, Inflation and Credit

Commentary: 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 7.25% 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 this report.

Section 2: The Valuation Process

Valuation Input: Benefit Provisions

Benefit provisions are described in North Carolina General Statues, Chapter 135.

This valuation reflects the following change in benefit provisions from the prior year's valuation:

- One-time supplement in the amount of 1.6% of the annualized benefit in effect on September 1, 2016 to be paid on or October 31, 2016.

Highlights of the benefit provisions are described below.

- An unreduced retirement allowance is payable to members who retire from service:
  - after attaining age 65 and five years of creditable service; or
  - after attaining age 50 and 24 years of creditable service
- The unreduced retirement allowance is equal to:
  - 4.02% of a member's final average compensation multiplied by the number of years of creditable service rendered as a Justice of the Supreme Court or Judge of the Court of Appeals, plus
  - 3.52% of a member's final average compensation multiplied by the number of years of creditable service rendered as a Judge of the Superior Court or as Administrative Officer of the Courts, plus
  - 3.02% of a member's final average compensation multiplied by the number of years of creditable service rendered as a Judge of the District Court, District Attorney, Public Defender, or Clerk of the Superior Court
- A reduced retirement allowance is payable to members who retire from service after attaining age 50 and five years of creditable service
- Ancillary benefits are also payable upon the death or disability of a member.
- CJRS does not provide for explicit cost of living increases as part of the benefit package. Instead, increases may be provided if certain financial conditions are met and/or the legislature passes a budget that provides for a cost-of-living adjustment.

Commentary: Many Public Sector Retirement Systems in the United States have undergone pension reform where the benefits of members (current retirees and active or future members) have been reduced. Because of the well-funded status of CJRS due to the legislature contributing the actuarially determined employer contribution, benefit cuts have not been needed in North Carolina. Instead, we have seen a modest expansion of benefits in recent years based on sound plan design.

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

Section 2: The Valuation Process

Valuation Input: Actuarial Assumptions

Actuarial assumptions bridge the gap between the information that we know with certainty as of the valuation date (age, gender, service, pay, and benefits of the members) and what may happen in the future. The actuarial assumptions of CJRS are reviewed at least every five years. Based on this review, the actuary will make recommendations on the demographic and economic assumptions.

Demographic assumptions describe future events that relate to people such as retirement rates, termination rates, disability rates, and mortality rates. Economic assumptions describe future events that relate to the assets of CJRS such as the interest rate, salary increases, the real return, and payroll growth.

The latest assumptions were adopted for use with the December 31, 2015 actuarial valuation, based on the experience study prepared as of December 31, 2014 and adopted by the Board of Trustees on January 21, 2016.

Valuation Input: Funding Methodology

The Funding Methodology is the payment plan for CJRS 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
- 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.

Commentary: When compared to other Public Sector Retirement Systems in the United States, the funding policy for CJRS 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.

Section 2: The Valuation Process

Valuation Input: Funding Methodology (continued)

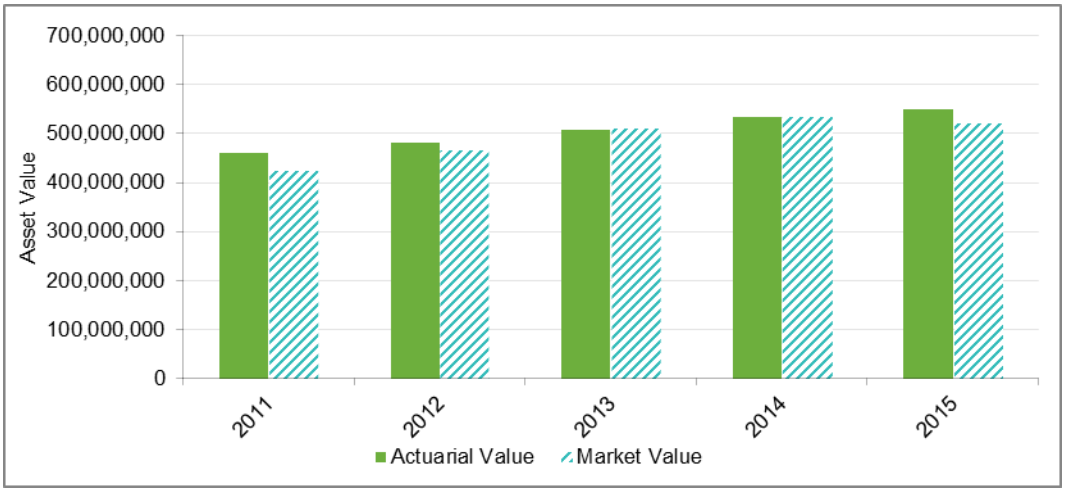
The actuarial assumptions, actuarial cost method and asset valuation method were updated since the prior year's valuation in accordance with the latest experience study prepared as of December 31, 2014 and adopted by the Board of Trustees on January 21, 2016. A detailed summary of the actuarial assumptions and methods is provided in Appendix D of this report.

Valuation Results: Actuarial Value of Assets

In order to reduce the volatility that investment gains and losses can have on required contributions and funded status of CJRS, the Board adopted an asset valuation method to determine the Actuarial Value of Assets used for funding purposes. The Actuarial Value of Assets is $550.1 million as of December 31, 2015 and $534.3 million as of December 31, 2014.

Graph 5: Actuarial Value and Market Value of Assets

The graph below provides a history of the market value and actuarial value of assets over the past five years.



Commentary: 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.

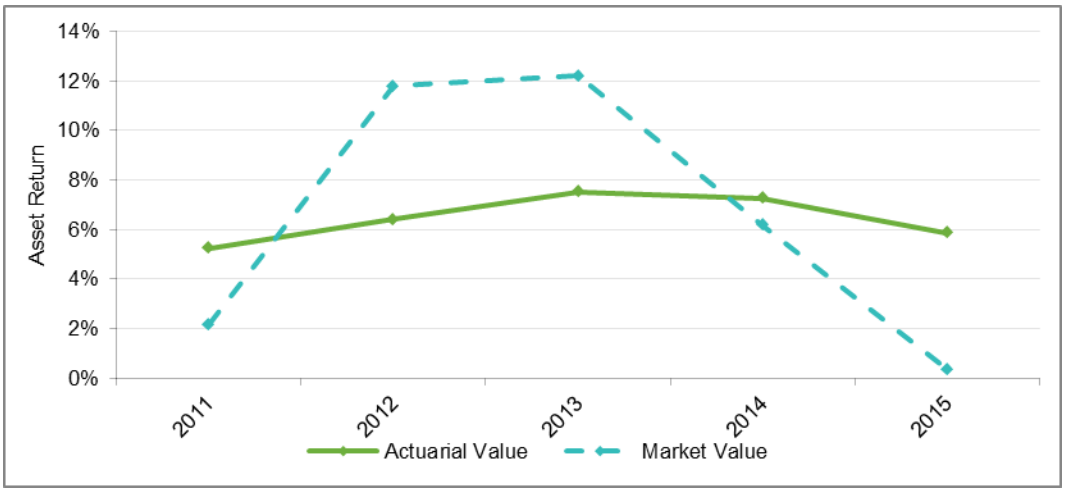
The actuarial value of assets would have been $549.9 million as of December 31, 2015 under the asset valuation method used in the prior valuation.

Section 2: The Valuation Process

Valuation Results: Actuarial Value of Assets (continued)

Graph 6: Asset Returns

The graph below provides a history of the market value and actuarial value of asset returns over the past five years.



Commentary: The investment return for the market value of assets for calendar year 2015 was 0.35%. The actuarial value of assets smooths investment gains and losses. The new asset valuation method adopted with the experience study assumptions re-set the actuarial value of assets to the market value of assets at December 31, 2014, effective for the December 31, 2015 valuation. Lower than expected market returns in 2015 resulted in an actuarial value of asset return for calendar year 2015 of 5.87% and an asset loss of $7.3 million during 2015.

The actuarial value of asset return for calendar year 2015 prior to the asset valuation method change was 5.88%, which would have resulted in an asset loss of $7.2 million during 2015.

A detailed summary of the Actuarial Value of Assets is provided in Section 4 of this report.

Section 2: The Valuation Process

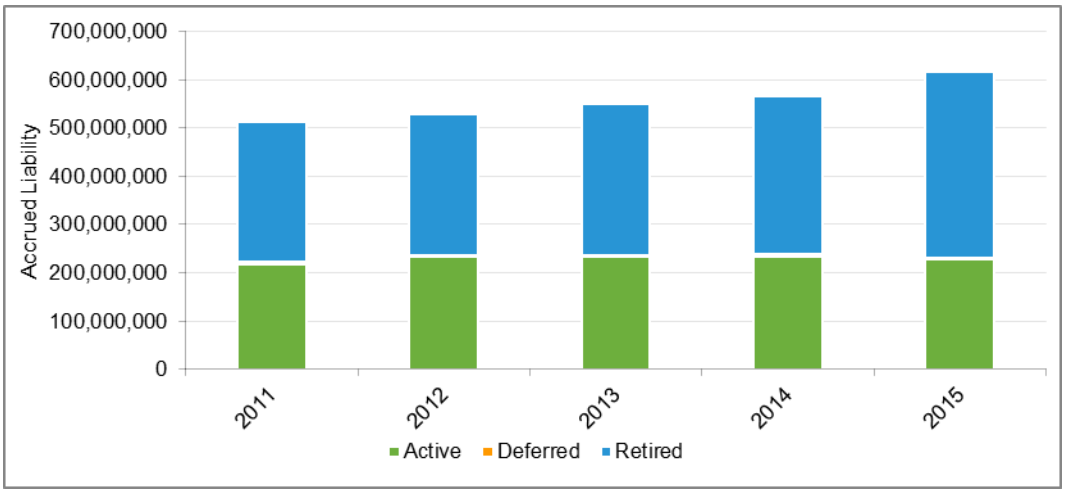
Valuation Results: Actuarial Accrued Liability

Using the provided membership data, benefit provisions, and actuarial assumptions, future benefit payments of CJRS are estimated. These projected future benefit payments are discounted into today's dollars using the assumed rate of investment return assumption to determine the Present Value of Future Benefits (PVFB) of CJRS. The PVFB is an estimate of the current value of the benefits promised to all members as of a valuation date.

Once the PVFB is developed, an actuarial cost method is used to allocate the PVFB. Under the actuarial cost method, the PVFB is allocated to past, current and future service, respectively known as the actuarial accrued liability (AAL), normal cost (NC) and present value of future normal costs (PVFNC). The AAL is also referred to as the amount of money CJRS should ideally have in the trust. The NC is also referred to as the cost of benefits accruing during the year.

Graph 7: Actuarial Accrued Liability

The graph below provides a history of the actuarial accrued liability over the past five years.



Commentary: The AAL increased from $567 million to $616 million during 2015. CJRS 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. Assumption changes increased the AAL by $29.8 million at December 31, 2014. The AAL prior to legislative changes was $0.5 million higher than expected, which resulted in a demographic loss of $0.5 million during 2015. Legislation increased the AAL by $0.6 million.

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

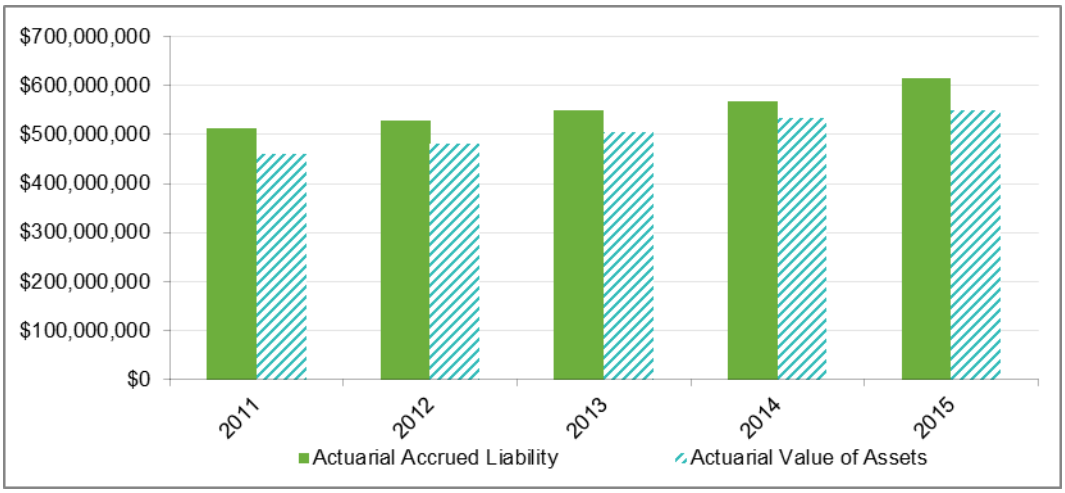
Section 2: The Valuation Process

Valuation Results: Funded Ratio

The funded ratio is a measure of the progress that has been made in funding the plan as of the valuation date. It is the ratio of how much money CJRS actually has in the fund to the amount CJRS should have in the fund.

Graph 8: Actuarial Accrued Liability and Actuarial Value of Assets

The graph below provides a history of the actuarial accrued liability and actuarial value of assets.



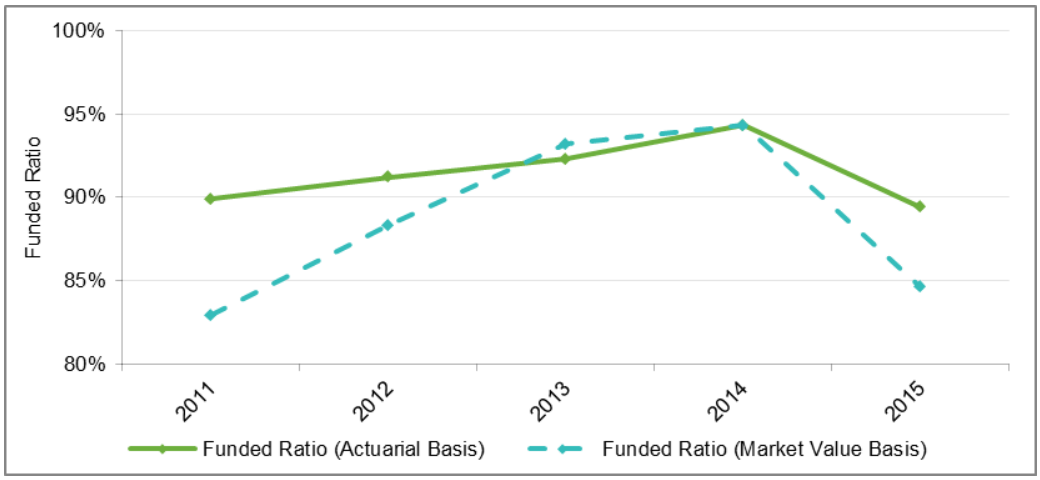
Commentary: The actuarial value of assets basis is used for computing contributions to alleviate contribution volatility. The difference in the actuarial accrued liability and the actuarial value of assets is the amount of pension debt to be paid off in 12 years.

Section 2: The Valuation Process

Valuation Results: Funded Ratio

Graph 9: Funded Ratios

The graph below provides a history of the funded ratio on a market and actuarial basis over the past five years.



Commentary: 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 94.3% at December 31, 2014 to 89.4% at December 31, 2015.

Section 2: The Valuation Process

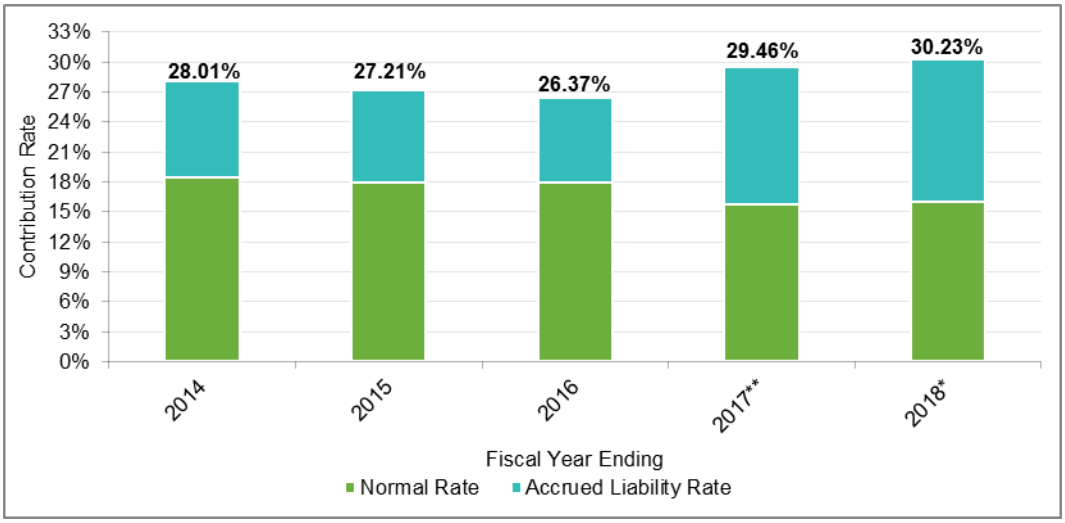
Valuation Results: Employer Contributions

G.S. 135-69 of the North Carolina General Statutes provides that the state shall make a normal contribution and an unfunded accrued liability contribution.

The December 31, 2014 valuation suggested that the preliminary total employer contribution rate be set at 25.09% of payroll for the fiscal year ending June 30, 2017. Subsequently, the 2015 Appropriations Act (Session Laws 2016-94) set contributions at 29.46% of payroll effective for the fiscal year ending June 30, 2017 in order to account for the experience study and recent legislation passed in law. As a result of this December 31, 2015 valuation, the preliminary actuarially determined employer contribution rate is 30.23% of payroll for the fiscal year ending June 30, 2018, subject to the impact of any future legislative changes effective during that fiscal year. On this basis, there is no preliminary reserve from undistributed gains that could be used for a cost-of-living adjustment or other benefit improvements.

Graph 10: Actuarially Determined Employer Contribution Rates

The graph below provides a history of actuarially determined employer contribution rates over the past five years. The rates are split into the normal rate and the accrued liability rate. The normal rate is the employer's portion of the cost of benefits accruing after reducing for the member contribution. The accrued liability rate is the payment toward the unfunded liability.



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

Commentary: The actuarially determined employer required contribution rate 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 6% of pay contribution the members make. The 12-year period is a short period for Public Sector Retirement Systems in the United States, with most Systems using a period of 30 years or more to pay off the pension debt. The shorter period results in higher contributions and more benefit security.

A detailed summary of the employer required contributions rates is provided in Section 6 of this report.

Section 2: The Valuation Process

Valuation Results: Accounting Information

The Governmental Account Standards Board (GASB) issues statements which establish financial reporting standards for defined benefit pension plans and accounting for pension expenditures and expenses for governmental employers.

The valuation has been prepared in accordance with the parameters of Statement No. 67 of the GASB and all applicable Actuarial Standards of Practice. The Net Pension Liability (Asset) under GASB 67 for the fiscal year ending June 30, 2016, is $95,402,000 (compared to $44,232,000 for fiscal year ending June 30, 2015). The required financial reporting information for CJRS under GASB No. 67 can be found in Section 8 of this report.

Section 3: Membership Data

The Retirement Systems Division provided membership data as of the valuation date for each member of CJRS. The membership data assists the actuary in estimating benefits that could be paid in the future. The tables below provide a summary of the membership data used in this valuation. Detailed tabulations of data are provided in Appendix B.

Table 2: Active Member Data

	Member Count	Average Age	Average Service	Reported Compensation
Justices of Supreme Court and Judges of Court of Appeals	22	58.58	10.61	$ 3,181,903
Judges of the Superior Court and Administrative Officers of the Court	109	58.52	15.91	15,491,318
Judges of the District Court, District Attorneys, Clerks of the Superior Court, and Public Defenders	430	53.32	12.21	49,572,195
Total	561	54.54	12.87	$ 68,245,416

The table above includes members not in receipt of benefits who had reported compensation in 2015.

Section 3: Membership Data

Table 3: Terminated Vested Member Data

	Member Count	Average Age	Average Service	Accumulated Contributions	Final Reported Compensation
Justices of Supreme Court and Judges of Court of Appeals	1	59.08	1.75	$ 17,200	$ 129,771
Judges of the Superior Superior Court and Administrative Officers of the Court	3	46.45	4.69	131,484	366,559
Judges of the District Court, District Attorneys, Clerks of the Superior Court, and Public Defenders	41	53.42	3.97	1,400,479	3,456,179
Total	45	53.08	3.97	$ 1,549,163	$ 3,952,509

The table above includes members not in receipt of benefits who did not have reported compensation in 2015.

Section 3: Membership Data

Table 4: Data for Members Currently Receiving Benefits

	Member Count	Average Age	Annual Retirement Allowances
Retired Members (Healthy at Retirement)			
Male	362	71.74	$ 26,449,839
Female	138	69.21	8,123,981
Total	500	71.04	$ 34,573,820
Retired Members (Disabled at Retirement)*			
Male	2	66.67	$ 114,759
Female	2	71.46	83,437
Total	4	69.07	$ 198,196
Survivors of Deceased Members			
Male	13	74.96	$ 386,521
Female	130	77.34	4,877,914
Total	143	77.12	$ 5,264,435
Grand Total	647	72.37	$ 40,036,451

* Includes retired members reported as disabled in a prior valuation and not subsequently reported as returned to work.

Section 4: Asset Data

Assets are held in trust and are invested for the exclusive benefit of CJRS members. The tables below provides the details of the Market Value of Assets for the current and prior year's valuations.

Table 5: Market Value of Assets

Asset Data as of	12/31/2015	12/31/2014
Beginning of Year Market Value of Assets	$ 534,452,795	$ 511,969,020
Contributions	24,978,524	27,157,042
Benefit Payments	(40,305,705)	(36,101,522)
Investment Income	1,854,064	31,428,255
Net Increase/(Decrease)	(13,473,117)	22,483,775
End of Year Market Value of Assets	$ 520,979,678	$ 534,452,795
Estimated Net Investment Return on Market Value	0.35%	6.19%

Table 6: Allocation of Investments by Category of the Market Value of Assets

Asset Data as of	12/31/2015	12/31/2014
Allocation by Dollar Amount		
Public Equity	$ 221,173,042	$ 234,492,032
Fixed Income (LTIF)	146,531,256	159,022,137
Cash and Receivables	10,729,615	9,378,462
Other*	142,545,765	131,560,164
Total Market Value of Assets	$ 520,979,678	$ 534,452,795
Allocation by Percentage of Asset Value		
Public Equity	42.5%	43.9%
Fixed Income (LTIF)	28.1%	29.8%
Cash and Receivables	2.1%	1.8%
Other*	27.3%	24.5%
Total Market Value of Assets	100.0%	100.0%

* Real Estate, Alternatives, Inflation and Credit

Section 4: Asset Data

In order to reduce the volatility that investment gains and losses can have on the required contributions and funded status of CJRS, the Board adopted an asset valuation method to determine the Actuarial Value of Assets used for funding purposes. The table below provides the calculation of the Actuarial Value of Assets at the valuation date.

Table 7: Actuarial Value of Assets

Asset Data as of	12/31/2015
(a) Beginning of Year Market Value of Assets	$ 534,452,795
(b) Contributions	24,978,524
(c) Benefit Payments	(40,305,705)
(d) Net Cash Flow	(15,327,181)
(e) Expected Investment Return	38,192,217
(f) Expected End of Year Market Value of Assets	557,317,831
(g) End of Year Market Value of Assets	520,979,678
(h) Excess of Market Value over Expected Market Value of Assets	(36,338,153)
(i) 80% of 2015 Asset Gain/(Loss)	(29,070,522)
(j) 60% of 2014 Asset Gain/(Loss)	N/A
(k) 40% of 2013 Asset Gain/(Loss)	N/A
(l) 20% of 2012 Asset Gain/(Loss)	N/A
(m) Total Deferred Asset Gain/(Loss)	(29,070,522)
(n) Preliminary End of Year Actuarial Value of Assets	550,050,200
(o) Final End of Year Actuarial Value of Assets (not less than 80% and not greater than 120% of Market Value)	550,050,200
(p) Estimated Net Investment Return on Actuarial Value	5.87%

Commentary: The actuarial value of assets smooths investment gains/losses, resulting in less volatility in the employer contribution. The asset valuation method was changed during the experience study from a method that calculated the actuarial value of assets as 20% of the market value of assets plus 80% of the expected actuarial value of assets to a method that recognizes asset returns in excess of or less than the expected return on the market value of assets over a five-year period.

The new asset valuation method re-set the actuarial value of assets to the market value of assets at December 31, 2014, effective for the December 31, 2015 valuation. Lower than expected market returns in 2015 resulted in an actuarial value of asset return for calendar year 2015 of 5.87% and an asset loss of $7.3 million during 2015.

The actuarial value of assets would have been $549,918,761 as of December 31, 2015 under the asset method used in the prior valuation.

Section 4: Asset Data

The valuation assumes that the funds will earn a 7.25% asset return. The table below provides a history of the Actuarial Value and Market Value of Asset returns.

Table 8: Historical Asset Returns

Calendar Year	Actuarial Value of Asset Return	Market Value of Asset Return
2006	9.17%	11.35%
2007	9.04%	8.35%
2008	3.01%	-19.39%
2009	4.88%	14.83%
2010	6.01%	11.49%
2011	5.25%	2.18%
2012	6.42%	11.79%
2013	7.52%	12.19%
2014	7.26%	6.19%
2015	5.87%	0.35%
Average	6.43%	5.45%
Range	6.16%	34.22%

Commentary: 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 6.43% tracks average market return of 5.45% rather well. But the range of returns is markedly less – 6.16% versus 34.22%. This results in much lower employer contribution volatility using the actuarial value of assets versus market, while ensuring that the actuarial needs of CJRS are met.

Section 5: Liability Results

Using the provided membership data, benefit provisions, and actuarial assumptions, future benefit payments of CJRS are estimated. These projected future benefit payments are discounted into today's dollars using the assumed rate of investment return assumption to determine the Present Value of Future Benefits. The Present Value of Future Benefits is allocated to past, current and future service, respectively known as the actuarial accrued liability, normal cost and present value of future normal costs. The table below provides these liability numbers for the current and prior year's valuations.

Table 9: Liability Summary

Valuation Results as of	12/31/2015	12/31/2014
(a) Present Value of Future Benefits		
(1) Active Members	$ 364,256,139	$ 393,442,371
(2) Terminated Members	2,403,740	3,507,279
(3) Members Currently Receiving Benefits	386,097,159	329,042,332
(4) Total	$ 752,757,038	$ 725,991,982
(b) Present Value of Future Normal Costs	$ 137,157,758	$ 159,161,474
(c) Actuarial Accrued Liability: (a4) - (b)	$ 615,599,280	$ 566,830,508
(d) Actuarial Value of Assets	$ 550,050,200	$ 534,299,602
(e) Unfunded Accrued Liability: (c) - (d)	$ 65,549,080	$ 32,530,906

Section 5: Liability Results

The table below provides a reconciliation of the prior year's unfunded actuarial accrued liability to the current year's unfunded actuarial accrued liability.

Table 10: Reconciliation of Unfunded Actuarial Accrued Liability

(in millions)	
Unfunded Actuarial Accrued Liability (UAAL) as of 12/31/2014	$ 32.5
Impact of Experience Study	29.7
Normal Cost during 2015	15.2
Reduction due to Actual Contributions during 2015	(25.0)
Interest on UAAL, Normal Cost, and Contributions	4.7
Asset (Gain)/Loss	7.3
Actuarial Accrued Liability (Gain)/Loss	0.5
Impact of Legislative Changes	0.6
Unfunded Actuarial Accrued Liability (UAAL) as of 12/31/2015	$ 65.5

Commentary: The changes in assumptions and methods from the experience study increased the unfunded actuarial accrued liability (UAAL), or pension debt, by $29.7 million at December 31, 2014. During 2015, the UAAL increased faster than expected primarily due to asset losses. Additionally, the one-time pension supplement increased the UAAL by $0.6 million.

Section 6: Actuarially Determined Employer Contribution

The actuarially determined employer contribution consists of a normal cost rate and an accrued liability rate. The normal cost rate is the employer's portion of the cost of benefits accruing during the year after reducing for the member contribution. The death benefit normal rate is the rate necessary to provide the one year's compensation upon death in active service. This rate is calculated to provide the death benefit on a one-year term basis and is payable to the Death Benefit Fund. The accrued liability rate is the payment toward the unfunded accrued liability in order to pay off the unfunded accrued liability over 12 years.

The table below provides the calculation of the actuarially determined employer contribution for the current and prior years' valuations.

Table 11: Calculation of the Actuarially Determined Contribution (ADEC)

Valuation Date ADEC for Fiscal Year Ending	12/31/2015 6/30/2018	12/31/2014 6/30/2017
Normal Cost Rate Calculation		
(a) Normal Cost*	$ 15,205,707	$ 16,855,751
(b) Valuation Compenation	70,467,331	71,429,321
(c) Normal Cost Rate: (a) / (b)	21.58%	23.60%
(d) Employee Contribution Rate	6.00%	6.00%
(e) Total Normal Cost Rate: (c) - (d)	15.58%	17.60%
Death Benefit Rate Calculation		
(f) Death Benefit Normal Cost	$ 257,894	$ 252,501
(g) Valuation Compenation	70,467,331	71,429,321
(h) Death Benefit Rate: (f) / (g)	0.37%	0.35%
Accrued Liability Rate Calculation		
(i) Total Annual Amortization Payments**	$ 10,064,594	$ 5,101,505
(j) Valuation Compensation	70,467,331	71,429,321
(k) Accrued Liability Rate: (i) / (j)	14.28%	7.14%
Total ADEC (e) + (h) + (k)	30.23%	25.09%
Impact of Experience Study	N/A	3.44%
Impact of Legislative Changes	N/A	0.93%
Final ADEC	N/A	29.46%

* Includes assumed administrative expenses.
** See Table 14 for more detail.

Section 6: Actuarially Determined Employer Contribution

The table below provides a reconciliation of the actuarially determined employer contribution.

Table 12: Reconciliation of the Change in the ADEC

Fiscal year ending June 30, 2017 Preliminary ADEC (based on December 31, 2014 valuation)	25.09%
Impact of Experience Study	3.44%
Impact of Legislative Changes*	0.00%
Fiscal year ending June 30, 2017 Final ADEC	28.53%
Change Due to Demographic (Gain)/Loss	0.41%
Change Due to Investment (Gain)/Loss	1.34%
Change Due to Contributions Less (Greater) than ADEC	(0.05%)
Fiscal year ending June 30, 2018 Preliminary ADEC (based on December 31, 2015 valuation)	30.23%

* The impact of legislative changes does not reflect the cost of the one-time pension supplement to be paid in October 2016, as the entire cost of this supplement was funded in the appropriated contribution for fiscal year ending June 30, 2017 and will not be reflected in the ADEC for fiscal year ending June 30, 2018.

Section 6: Actuarially Determined Employer Contribution

Amortization methods determine the payment schedule for the unfunded actuarial accrued liability. CJRS adopted a 12-year closed amortization period for fiscal year ending 2012. A new amortization base is created each year based on the prior years' experience. The tables below provide the calculation of the new amortization base and the amortization schedule for the current year's valuation.

Table 13: Calculation of the New Amortization Base

Calculation as of	12/31/2015	12/31/2014
(a) Unfunded Actuarial Accrued Liability*	$ 64,895,030	$ 32,530,906
(b) Prior Years' Outstanding Balances	$ 28,623,826	$ 39,009,284
(c) New Amortization Base: (a) - (b)	$ 36,271,204	$ (6,478,378)
(d) New Amortization Payment	$ 4,963,089	$ (886,454)

* The unfunded actuarial accrued liability at December 31, 2015 does not reflect the cost of the one-time pension supplement to be paid on or before October 31, 2016, as the entire cost of this supplement was funded in the appropriated contribution for fiscal year ending June 30, 2017.

Table 14: Amortization Schedule for Unfunded Accrued Liability

Date Established	Original Balance	12/31/2015 Outstanding Balance	Annual Payment
December 31, 2009	$ 34,962,037	$ 27,909,244	$ 4,783,952
December 31, 2010	3,913,729	3,430,139	535,526
December 31, 2011	10,017,079	9,509,392	1,370,665
December 31, 2012	(4,239,030)	(4,312,247)	(580,038)
December 31, 2013	(892,665)	(964,642)	(122,146)
December 31, 2014	(6,478,378)	(6,948,060)	(886,454)
December 31, 2015	36,271,204	36,271,204	4,963,089
Total		$ 64,895,030	$ 10,064,594

Commentary: This is the payment schedule for the pension debt of CJRS.

Section 6: Actuarially Determined Employer Contribution

The table below provides a history of the actuarially determined employer contribution and the corresponding appropriated rate.

Table 15: History of Actuarially Determined Employer Contributions and Appropriated Rates

Valuation Date	Fiscal Year Ending	Normal Rate*	Accrued Liability Rate	Change due to Legislation**	Final ADEC	Appropriated Rate
12/31/2015	6/30/2018	15.95%	14.28%	N/A	N/A	N/A
12/31/2014	6/30/2017	17.95%	7.14%	4.37%	29.46%	29.46%
12/31/2013	6/30/2016	17.97%	8.40%	0.00%	26.37%	27.21%
12/31/2012	6/30/2015	17.91%	8.64%	0.66%	27.21%	27.21%
12/31/2011	6/30/2014	18.48%	9.53%	0.00%	28.01%	28.01%

* Includes Death Benefit rate

** The change due to legislation for the contribution for fiscal year ending 6/30/2017 includes a 3.44% increase in the ADEC due to the experience study and a 0.93% increase in the ADEC due to the one-time pension supplement to be paid on or before October 31, 2016.

Table 16: Cost of Benefit Enhancements

Calculation as of	12/31/2015	12/31/2014
Increase in ADEC for a 1% COLA*	0.82%	0.69%

* The 1% COLA calculated at the December 31, 2015 valuation would be effective July 1, 2017. The COLA would be paid in full to retired members and survivors of deceased members on the retirement roll on July 1, 2016 and would be prorated for retired members and survivors of deceased members who commence benefits after July 1, 2016 but before June 30, 2017.

Section 7: Valuation Balance Sheet

The valuation balance sheet shows the assets and liabilities of CJRS. The items shown in the balance sheet are present values actuarially determined as of the relevant valuation date. The table below provides the valuation balance sheet for the current year and prior year.

Table 17: Valuation Balance Sheet

Balance Sheet as of	12/31/2015	12/31/2014
Assets		
Current Actuarial Value of Assets		
Annuity Savings Fund	$ 59,036,814	$ 60,853,053
Pension Accumulation Fund	491,013,386	473,446,549
Total	$ 550,050,200	$ 534,299,602
Future Member Contributions to the Annuity Savings Fund	$ 37,344,879	$ 37,953,529
Prospective Contributions to the Pension Accumulation Fund		
Normal Contributions	$ 100,466,929	$ 121,207,945
Unfunded Accrued Liability Contributions	64,895,030	32,530,906
Undistributed Gain Contributions	(3,510,580)	9,647,031
Total	$ 161,851,379	$ 163,385,882
Total Assets	$ 749,246,458	$ 735,639,013
Liabilities		
Annuity Savings Fund		
Past Member Contributions	$ 59,036,814	$ 60,853,053
Future Member Contributions	37,344,879	37,953,529
Total Contributions	$ 96,381,693	$ 98,806,582
Pension Accumulation Fund		
Benefits Currently in Payment	$ 385,443,109	$ 329,042,332
Benefits to be Paid to Current Active Members	270,278,186	298,143,068
Reserve for Increases in Retirement Allowances effective July 1, 2016 (July 1, 2015 for December 31, 2014)	654,050	0
Reserve for Undistributed Gains/(Losses)	(3,510,580)	9,647,031
Total Benefits Payable	$ 652,864,765	$ 636,832,431
Total Liabilities	$ 749,246,458	$ 735,639,013

Section 8: Accounting Results

This section contains the accounting information for Governmental Accounting Standards Board (GASB) Statement No. 67 for fiscal year ending June 30, 2016 based on a valuation date of December 31, 2015.

Please note that GASB Statement No. 67 (*Financial Reporting for Pension Plans)* is applicable for fiscal years ending 2014 and later.

The June 30, 2016 total pension liability presented in this section was determined by an actuarial valuation as of December 31, 2015, based on the assumptions, methods and plan provisions described in this report. The actuarial cost method used to develop the total pension liability is the Entry Age Normal Cost method, as required by GASB Statement No. 67.

GASB Statement No. 67 set forth certain items of information to be disclosed in the financial statements of the Plan. The tables below provide a distribution of the number of employees by type of membership.

Table 18: Number of Active and Retired Members as of December 31, 2015

Group	Number
Retired members and survivors of deceased members currently receiving benefits	647
Terminated members and survivors of deceased members entitled to benefits but not yet receiving benefits	45
Active members	561
Total	1,253

Section 8: Accounting Results

GASB Statement No. 67 set forth certain items of information to be disclosed in the financial statements of the Plan. The tables below provide the schedule of changes in Net Pension Liability (Asset).

Table 19: Schedule of Changes in Net Pension Liability (Asset)

Calculation as of	June 30, 2016
Total Pension Liability	
Service Cost	$ 16,904,000
Interest	42,009,000
Changes of Benefit Terms	332,000
Difference between Expected and Actual Experience	(4,295,000)
Change of Assumptions	26,588,000
Benefit Payments, including Refund of Member Contributions	(40,462,000)
Net Change in Total Pension Liability	$ 41,076,000
Total Pension Liability - Beginning of Year	$ 582,766,000
Total Pension Liability - End of Year	$ 623,842,000
Plan Fiduciary Net Position	
Employer Contributions	$ 18,908,000
Member Contributions	7,561,000
Net Investment Income	3,972,000
Benefit Payments, including Refund of Member Contributions	(40,462,000)
Administrative Expenses	(73,000)
Other	0
Net Change in Fiduciary Net Position	$ (10,094,000)
Plan Fiduciary Net Position - Beginning of Year	$ 538,534,000
Plan Fiduciary Net Position - End of Year	$ 528,440,000

Table 20: Net Pension Liability (Asset)

Calculation as of	June 30, 2016	June 30, 2015
Total Pension Liability	$ 623,842,000	$ 582,766,000
Plan Fiduciary Net Position	528,440,000	538,534,000
Net Pension Liability (Asset)	$ 95,402,000	$ 44,232,000
Plan Fiduciary Net Position as a Percentage of the Total Pension Liability	84.71%	92.41%

Section 8: Accounting Results

The table below is the sensitivity of the net pension liability to changes in the discount rate.

Table 21: Sensitivity of the Net Pension Liability at June 30, 2016 to Changes in the Discount Rate

	1% Decrease	Current	1% Increase
Discount Rate	6.25%	7.25%	8.25%
Net Pension Liability (Asset)	158,863,000	95,402,000	41,098,000

The discount rate used to measure the total pension liability was 7.25%. The projection of cash flows used to determine the discount rate assumed that System contributions will continue to follow the current funding policy. Based on those assumptions, the System's fiduciary net position was projected to be available to make all projected future benefit payments of current plan members. Please see Appendix E for additional detail.

The table below provides the methods and assumptions used to calculate the actuarially determined contribution rate.

Table 22: Additional Information for GASB Statement No. 67

Valuation Date	12/31/2015
Actuarial Cost Method	Entry Age
Amortization Method	Level dollar closed
Amortization Period	12 years
Asset Valuation Method	Asset returns in excess of or less than the expected return on market value of assets reflected over a five-year period (not greater than 120% of market value and not less than 80% of market value)
Actuarial Assumptions	
Investment Rate of Return*	7.25%
Projected Salary Increases**	3.50% - 5.50%
*Includes Inflation of	3.00%
**Includes Inflation and Productivity of	3.50%
Cost-of-living Adjustments	N/A

Appendix A: Valuation Process and Glossary of Actuarial Terms

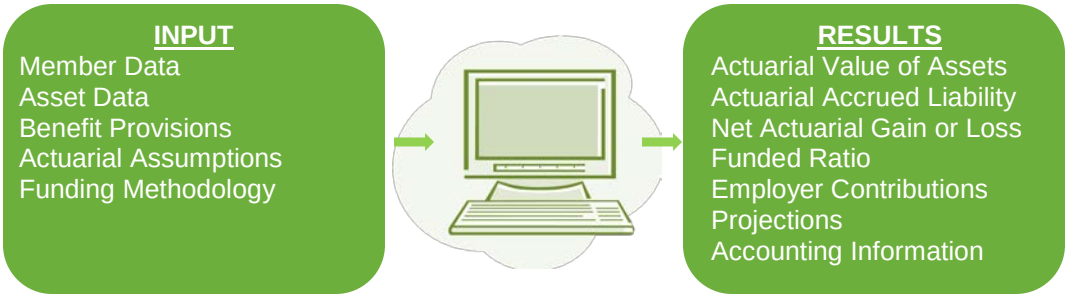
Purpose of an Actuarial Valuation

The majority of Public Sector Retirement Systems in the State of North Carolina are defined benefit (DB) retirement systems. Under a DB Retirement System, the amount of benefits payable to a member upon retirement, termination, death or disability is defined in various contracts and legal instruments and is based, in part, on the member's years of credited service and final compensation. The amount of contribution needed to fund these benefits cannot be known with certainty. A primary responsibility of the Board of Trustees of a Retirement System is to establish and monitor a funding policy for the contributions made to the Retirement System.

While somewhat uncommon, in some jurisdictions, contributions are made by the plan sponsor as benefits come due. This is known as pay-as-you-go financing. More commonly, contributions for benefits are made in advance during the course of active employment of the members. This is known as actuarial pre-funding. For example, the State of North Carolina mandates for the Teachers' and State Employees' Retirement System (the "State Plan") that "on account of each member there shall be paid into the pension accumulation fund by employers an amount equal to a certain percentage of the actual compensation of each member to be known as the 'normal contribution'…" and further "the normal rate of contribution shall be determined by the actuary after each valuation."

The Actuarial Valuation Process

The following diagram summarizes the inputs and results of the actuarial valuation process. A narrative of the process follows the diagram. The reader may find it worthwhile to refer to the diagram from time to time.



Under the actuarial valuation process, current information about Retirement System members is collected annually by staff at the direction of the actuary, namely member data, asset data and information on benefit provisions. Member data is collected for each member of the Retirement System. The member data will assist the actuary in estimating benefits that could be paid in the future. The member information the actuary collects to estimate the amount of benefit includes elements such as current service, salary and benefit group identifier for members that have not separated service; for those that have, the actual benefit amounts are collected. The actuary collects information such as gender and date of birth to determine when a benefit might be paid and for how long. The actuary collects summary information about assets as of the valuation date and information on cash flows for the year ending on the valuation date. Information about

Appendix A: Valuation Process and Glossary of Actuarial Terms

benefit provisions as of the valuation date is also collected. To bridge the gap between the information collected and potential benefits to be paid in the future, the actuary must make assumptions about future activities. These assumptions are recommended by the actuary to the Boards based on the results of an experience review. An experience review is a review of the Retirement System over a period of time, typically five years, where the actuary analyzes the demographic and economic assumptions of the Retirement System. Based on this review, the actuary will make recommendations on the demographic assumptions, such as when members will be projected to retire, terminate, become disabled and/or die in the future, as well as the economic assumptions, such as what rate of return is projected to be earned by the fund based on the Retirement System investment policy and what level of future salary increases is expected for members. To maintain the assumptions, the Board should adopt a prudent policy of having an experience review being performed every five years. The next experience review for the North Carolina Retirement Systems will be based on the five-year period ending on December 31, 2019 and will be presented during 2020. Using these assumptions, the actuary is able to use the member data, asset data and benefit provision information collected to project the benefits that will be paid from the Retirement System to current members. These projected future benefit payments are based not only on service and pay through the valuation date but includes future pay and service, which has not yet been earned by the members but is expected to be earned.

These projected future benefit payments are discounted into today's dollars using the assumed rate of investment return assumption to determine the Present Value of Future Benefits (PVFB) of the Retirement System. The PVFB is an estimate of the value of the benefits promised to all members as of a valuation date. If the Retirement System held assets equal to the PVFB and all the assumptions were realized, there would be sufficient funds to pay off all the benefits to be paid in the future for members in the Retirement System as of the valuation date.

The PVFB is a large sum of money, typically much larger than the amount of Retirement System assets held in the trust. The next step is for the actuary to apply the Funding Policy as adopted by the Board to determine the employer contributions to be made to the Retirement System so that the gap between the PVFB and assets is systematically paid off over time. The Funding Policy is adopted by the Board based on discussions with the actuary. When the Board develops a funding policy, a balance between contributions which are responsive to the needs of the Retirement System yet stable should be struck. There are many different funding policies for the Board to consider, and the actuary is responsible for discussing the various features of the funding policies under consideration. Funding Policies are generally reviewed during an experience review, but it is not uncommon to review a funding policy in between, particularly during period where large increases or decreases in contributions are expected. The Funding Policy is composed of three components: the actuarial cost method, the asset valuation method, and the amortization method.

Once the PVFB is developed, an actuarial cost method is used to allocate the PVFB. Under the actuarial cost method, the PVFB is allocated to past, current and future service, respectively known as the actuarial accrued liability (AAL), normal cost (NC) and present value of future normal costs (PVFNC). The actuary computes the liability components (PVFB, NC, AAL, and PVFNC) for each participant in the Retirement

Appendix A: Valuation Process and Glossary of Actuarial Terms

System at the valuation date. These liability components are then totaled for the Retirement System. There are many actuarial cost methods. Different actuarial methods will produce different contribution patterns, but do not change the ultimate cost of the benefits. The entry age normal cost method is the most prevalent method used for public sector plans in the United States, because the expected normal cost is calculated in such a way that it will tend to stay level as a percent of pay over a member's career. Most of the North Carolina Retirement Systems use the entry age normal cost method.

The actuarial accrued liability (AAL) is also referred to as the amount of money the Retirement System should ideally have in the trust. The unfunded actuarial accrued liability (UAAL) is the portion of actuarial accrued liability that is not covered by the assets of the Retirement System. The UAAL can be a negative number, which means that the Retirement System has more assets than actuarial accrued liability. We refer to this condition as overfunded liability in this summary. Having UAAL does not indicate that the Retirement System is in failing actuarial health. UAAL is a common occurrence. Currently, many Retirement Systems in the United States have UAAL as a result of the Great Recession of 2008. Another related statistic of the Retirement System is the funded ratio. The funded ratio is the percent of the actuarial accrued liabilities covered by the actuarial value of assets. The assets used for these purposes are an actuarial value of assets (AVA), not market. The actuarial value of assets is based on the asset valuation method as recommended by the actuary and adopted by the Board. An actuarial value of assets is a smoothed, or averaged, value of assets, which is used to limit employer contribution volatility. Typically, assets are smoothed, or averaged, over a period of 3 to 5 years, although longer periods are becoming more common. By averaging returns, the UAAL is not as volatile, which we will see later results in contributions that are not as volatile as well. The North Carolina Retirement Systems use an actuarial value of assets with a smoothing period of 5 years.

While having UAAL is common, it is acceptable only if it is systematically being paid off. The method by which the UAAL is paid off is known as the amortization method. The concept is similar to that of a mortgage payment. The Board adopts the amortization method used to pay off the UAAL over a period of time. The amortization method is composed of the amortization period, the amount of payment increase, whether the period is open or closed and by the amount of amortization schedules. The amortization period is the amount of time over which the UAAL will be paid off. This is generally a period of thirty years or less, but actuaries are beginning to recommend shorter periods. The payments can be developed to stay constant from year to year like a mortgage, but often they are developed to increase each year at the same level payroll increases. Amortization type can be closed or open. Under a closed period, the UAAL is expected to be paid off over the amortization period. This is similar to a typical mortgage. Under an open period, the amortization period remains unchanged year after year. The concept is similar to re-mortgaging annually. In many instances, an amortization schedule is developed, whereby the UAAL is amortized over a closed period from the point the UAAL is incurred. Finally, some amortization methods are defined by a schedule of payments, where a new schedule of payments is added with each valuation. Regardless of the amortization type or period, the funding policy should generate a contribution that pays off the UAAL, which results in the funded ratio trending to 100% over time. Caution should be used when an open method is used, because typically an open amortization policy does not result in the UAAL being paid off. North Carolina pays off a much larger

Appendix A: Valuation Process and Glossary of Actuarial Terms

amount of UAAL compared to other states. While many states struggle to pay a 30-year level percent of pay UAAL contribution, which doesn't even reduce the amount of UAAL, North Carolina pays down the UAAL with level dollar payments over 12 years. This aggressive payment of UAAL results in North Carolina being home to many of the best funded Public Retirement Systems in the United States.

To satisfy the requirements of the State of North Carolina, the actuary calculates the total annual contribution to the Retirement System as the normal cost plus a contribution towards UAAL. Said another way, this contribution is sufficient to pay for the cost of benefits accruing during the year (normal cost) plus the mortgage payment (UAAL payment). The total contribution is reduced by the amount of member contributions, if any, to arrive at the employer contribution. For the aggressive North Carolina contribution policy to be effective, the amounts that Buck calculates need to be contributed. With very limited exception, North Carolina has contributed the amounts that Buck has calculated, which has resulted in the North Carolina Retirements Systems being among the best funded in the United States.

An actuarial valuation report is produced annually, which contains the contribution for the fiscal year as well as the funded ratio of the Retirement System. The primary purpose of performing an actuarial valuation annually is to replace the estimated activities from the previous valuation, which were based on assumptions, with the actual experience of the Retirement System for the prior year. The experience gain (loss) is the difference between the expected and the actual UAAL of the Retirement System. An experience loss can be thought of as the amount of additional UAAL over and above the amount that was expected from the prior year due to deviation of actual experience from the assumption. Similarly, an experience gain can be thought of as having less UAAL than that which was expected from the prior year assumptions. As an example, if the Retirement System achieves an asset return of 15% when the assumption was a 7.25% return, an actuarial gain is said to have happened, which typically results in lower contributions and higher funded ratio, all else being equal. Alternatively, a return of 2% under the same circumstances would result in an actuarial loss, requiring an increase in contributions and a funded ratio that is lower than anticipated. Experience gains and losses are common within the valuation process. Typically gains and losses offset each other over time. To the extent that does not occur, the reasons for the gains and losses should be understood, and appropriate recommendations should be made by the actuary after an experience review to adjust the assumptions.

The actuarial valuation report will contain histories of key statistics from prior actuarial valuation reports. In particular, a history of the funded ratio of the Retirement System is an important exhibit. Trustees should understand the reason for the trend of the funded ratio of the Retirement System over time. The actuary will discuss the reasons for changes in the funded ratio of the Retirement System with each valuation report. To the extent that there are unexplained changes in funded ratio corrective action should be explored and the actuary will make recommendations as to whether there should be changes in the assumptions, funding policy, or some other portion of the actuarial valuation process.

In addition to historical information, projections of contributions and funded ratio based on current assumptions can sometimes be found in an actuarial valuation report. Projections of contributions can allow the employer to plan their budget accordingly.

Appendix A: Valuation Process and Glossary of Actuarial Terms

Surprises in Retirement System contributions to be paid by the employer serve no one. A one-year projection based on “bad” asset returns can provide ample time for the employer to plan, or allow for a discussion of changing the funding policy to occur. Contribution surprises are a primary contributor to employers considering pension reform. It is important to keep the employer apprised of future contribution requirements. A projection of funded ratio can serve the Trustees by illustrating the trend of the funded ratio over time. The funded ratio, under a prudent funding policy, should trend to 100% over a period of less than 30 years. (It is worthwhile to note that while 30 years has served as an industry standard for the longest period over which 100% funding should be achieved, that period is coming under scrutiny by the actuarial community and will likely be shortened.) If a projection of funded ratio does not trend to 100% over time, consideration should be given to fixing the funding policy to achieve this goal. For the North Carolina Retirement Systems, projections are generally performed for the January Board meetings. While the projection period has tended to be limited to five years, a longer projection would show the funded ratio trend to 100% much faster than other Public Retirement Systems.

The actuarial report will contain schedules of information about the census, plan and asset information submitted by Retirement System staff upon which the actuarial valuation is based. It is important that the Board of Trustees review that information and determine if the information is consistent with their understanding of the Retirement System. If after questioning staff, the Board of Trustees is not comfortable that the information provided is correct, the actuary should be notified to determine if the actuarial valuation report should be corrected.

Finally, the valuation report and/or presentation should contain sufficient information in an understandable fashion to allow the Board to take action and adopt the contribution rate for the upcoming year. It should also allow stakeholders to understand key observations over the past year that resulted in contributions increasing (or decreasing) and where contributions are headed. The actuary is always open to making the results understandable. Buck works with the North Carolina Retirement Division to make your reports and presentations understandable and actionable. If something doesn’t make sense – speak up!!

Appendix A: Valuation Process and Glossary of Actuarial Terms

Glossary

Note that the first definitions given are the "official" definitions of the term. For some terms there is a second definition, in italics, which is the unofficial definition.

Actuarial Accrued Liability (AAL). The portion of the Present Value of Projected Benefits (PVFB) allocated to past service. Also difference between (i) the actuarial present value of future benefits, and (ii) the present value of future normal cost. Sometimes referred to as "accrued liability" or "past service liability." *The amount of money that should be in the Fund. The funding target.*

Actuarial Assumptions. Estimates of future plan experience with respect to rates of mortality, disability, retirement, investment income and salary increases. Demographic ("people") assumptions (rates of mortality, separation, and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic ("money") assumptions (salary increases and investment income) consist of an underlying rate appropriate in an inflation-free environment plus a provision for a long-term average rate of inflation. *Estimates of future events used to project what we know now- current member data, assets, and benefit provisions – into an estimate of future benefits.*

Actuarial Cost Method. A mathematical budgeting procedure for allocating the dollar amount of the Present Value of Projected Benefits (PVFB) between the normal costs to be paid in the future and the actuarial accrued liability. Sometimes referred to as the "actuarial funding method."

Actuarial Methods. The collective term for the Actuarial Cost Method, the Amortization Payment for UAAL Method, and the Asset Valuation Method used to develop the contribution requirements for the Retirement System. *The Funding Policy*.

Actuarial Equivalent. Benefits whose actuarial present values are equal.

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.

Actuarial Value of Assets (AVA). A smoothed value of assets which is used to limit contribution volatility. Also known as the funding value of assets. *Smoothed value of assets.*

Appendix A: Valuation Process and Glossary of Actuarial Terms

Amortization Payment for UAAL. Payment of the unfunded actuarial accrued liability by means of periodic contributions of interest and principal, as opposed to a lump sum payment. The components of the amortization payment for UAAL includes:

- Amortization Period Length – Amortization Period Length – Generally amortization periods of up to 15 to 20 years (and certainly not longer than 25) are allowed. Similar to a mortgage, the shorter the amortization period, the higher the payment and the faster the UAAL is paid off.
- Amortization payment increases – Future payments can be level dollar, like a mortgage, or as a level percent of pay. Most Retirement Systems amortize UAAL as a level percent of pay which when combined with the employer normal cost that is developed as a level percent of pay can result in contributions that are easier to budget.
- Amortization type Amortization schedule can be closed or open. A closed amortization schedule is similar to a mortgage – at the end of the amortization period the UAAL is designed to be paid off. An open amortization period is similar to refinancing the UAAL year after year.
- Amortization schedule UAAL can be amortized over a single amortization period, or it can be amortized over a schedule.

The amortization payment for UAAL can be thought of as the UAAL mortgage payment.

Asset Valuation Method. The components of how the actuarial value of assets is to be developed.

Experience Gain Loss. A measure of the difference between actual experience and experience anticipated by a set of actuarial assumptions during the period between two actuarial valuation dates, in accordance with the actuarial cost method being used. *The experience Gain (Loss) represents how much the actuary missed the mark in a given year.*

Funded Ratio. The percent of the actuarial accrued liabilities covered by the actuarial value of assets. Also known as the funded status. *The ratio of how much money you actually have in the fund to the amount you should have in the fund.*

Normal Cost. The annual cost assigned, under the actuarial funding method, to current and subsequent plan years. Sometimes referred to as “current service cost.” An amortization payment toward the unfunded actuarial accrued liability is paid in addition to the normal cost to arrive at the total contribution in a given year. *The cost of benefits accruing during the year*.

Present Value of Future Normal Cost (PVFNC). The portion of the Present Value of Projected Benefits (PVFB) allocated to future service. *The value in today’s dollars of the amount of contribution to be made in the future for benefits accruing for members in the Retirement System as of the valuation date. Note that in practice, this number is rarely discussed.*

Appendix A: Valuation Process and Glossary of Actuarial Terms

Present Value of Future Benefits (PVFB). The projected future benefit payments of the plan are discounted into today's dollars using an assumed rate of investment return assumption to determine the Present Value of Future Benefits (PVFB) of the Retirement System. The PVFB is the discounted value of the projected benefits promised to all members as of a valuation date, including future pay and service for members which has not yet been earned. *If the Retirement System held assets equal to the PVFB and all the assumptions were realized, there would be sufficient funds to pay off all the benefits to be paid in the future for members in the Retirement System as of the valuation date.*

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 (UAAL). The difference between the actuarial accrued liability (AAL) and actuarial value of assets (AVA). The UAAL is sometimes referred to as "unfunded accrued liability." *Funding shortfall, or prefunded amount if negative.*

Valuation Date. The date that the actuarial valuation calculations are performed as of. *Also known as the "snapshot date".*

Appendix B: Detailed Tabulations of Member Data

Table B-1: The Number and Average Reported Compensation of Active Members Distributed by Age and Service as of December 31, 2015

Age	Years of Service										
	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 & Up	Total
Under 25	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
25 to 29	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
30 to 34	2	4	0	0	0	0	0	0	0	0	6
	9,943	115,658	0	0	0	0	0	0	0	0	80,420
35 to 39	0	15	6	0	0	0	0	0	0	0	21
	0	112,191	114,366	0	0	0	0	0	0	0	112,812
40 to 44	1	14	22	7	1	0	0	0	0	0	45
	8,093	107,387	118,807	122,166	139,756	0	0	0	0	0	113,782
45 to 49	2	31	28	15	18	6	2	0	0	0	102
	35,507	111,290	115,741	118,884	129,965	134,192	90,468	0	0	0	116,377
50 to 54	1	23	30	11	19	7	12	2	0	0	105
	40,850	109,895	119,263	126,812	127,226	145,926	125,486	114,771	0	0	121,099
55 to 59	0	19	17	16	12	18	12	7	1	1	103
	0	108,890	117,563	127,165	121,626	136,476	129,106	100,420	90,131	104,646	121,021
60 to 64	0	13	17	8	17	14	12	4	7	2	94
	0	113,873	119,580	127,461	133,308	128,172	144,198	148,006	131,532	96,546	127,976
65 to 69	0	4	13	14	6	14	1	9	4	2	67
	0	120,184	125,050	130,665	135,099	149,749	161,812	134,480	125,431	98,568	133,041
70 & Up	0	0	7	2	1	3	0	0	2	3	18
	0	0	114,016	139,055	143,020	132,346	0	0	161,812	113,066	126,617
Total	6	123	140	73	74	62	39	22	14	8	561
	23,307	111,028	118,384	125,960	129,402	138,244	131,493	124,310	131,157	104,259	121,650

Appendix B: Detailed Tabulations of Member Data

Table B-2: The Number and Reported Compensation of Active Members Distributed by Age as of December 31, 2015

	Men		Women	
Age	Number	Compensation	Number	Compensation
31	1	$ 111,684	1	$ 111,684
32	1	5,260		
33	1	14,625	1	111,684
34	1	127,581		
35	3	283,440		
36	2	234,096		
37	3	334,629	2	245,109
38	3	350,526	3	335,052
39	3	362,841	2	223,368
40	3	307,758	4	484,569
41	5	571,020	2	196,074
42			4	477,130
43	6	587,270	5	579,876
44	12	1,422,308	4	494,162
45	11	1,141,377	11	1,265,914
46	9	1,077,541	8	922,952
47	12	1,383,835	12	1,389,561
48	12	1,323,903	7	801,830
49	11	1,443,949	9	1,119,592
50	16	2,012,245	9	1,126,488
51	9	1,118,117	10	1,126,280
52	6	722,762	9	1,002,230
53	14	1,787,777	11	1,215,436
54	10	1,259,675	11	1,344,387
55	12	1,506,457	9	1,060,669
56	13	1,592,114	9	966,553
57	9	1,136,614	7	799,791
58	13	1,659,943	5	529,419
59	16	2,183,415	10	1,030,220
60	13	1,680,015	6	749,533
61	16	2,053,187	5	614,159
62	11	1,400,286	4	455,291
63	18	2,361,395	4	437,725
64	15	1,973,595	2	304,559
65	12	1,618,161	1	140,541

Appendix B: Detailed Tabulations of Member Data

Table B-2: The Number and Reported Compensation of Active Members Distributed by Age as of December 31, 2015 (continued)

	Men		Women	
Age	Number	Compensation	Number	Compensation
66	15	$ 1,937,383	3	$ 385,222
67	11	1,527,478	4	495,161
68	11	1,444,812	2	281,181
69	8	1,083,837		
70	7	978,850	1	104,646
71	7	885,467	1	117,048
77	1	88,446		
85			1	104,646
Total	362	$ 45,095,674	199	$ 23,149,742

Appendix B: Detailed Tabulations of Member Data

Table B-3: The Number and Reported Compensation of Active Members Distributed by Service as of December 31, 2015

	Men		Women	
Service	Number	Compensation	Number	Compensation
0	6	$ 139,842		
1	38	4,234,103	20	$ 2,087,534
2	14	1,624,358	5	516,662
3	20	2,321,685	18	1,956,192
4	3	380,668	5	535,260
5	27	3,267,379	18	1,994,402
6	7	895,777	5	575,275
7	16	1,987,683	15	1,724,781
8	8	938,023	7	822,615
9	26	3,087,150	11	1,280,680
10	10	1,257,924	2	257,747
11	19	2,398,967	9	1,176,469
12	2	214,890	2	214,890
13	12	1,551,379	10	1,196,842
14	5	686,550	2	239,448
15	17	2,152,467	8	1,053,277
16	8	1,052,299	2	277,022
17	11	1,379,646	4	528,185
18	4	539,235	4	511,056
19	9	1,191,473	7	891,108
20	4	522,805	5	660,611
21	22	2,986,462	2	314,763
22	10	1,477,402	4	492,316
23	6	875,649	3	444,808
24	4	564,373	2	231,959
25	9	1,327,031	2	248,432
26	5	560,448	3	343,526
27	11	1,602,156	4	429,245
29	4	500,338	1	117,048
30	3	392,105	2	216,210
31	5	736,817	4	394,497
32	1	161,812		
33	1	150,957	1	126,782
34	2	197,136	3	358,511
35	2	312,769	1	117,048

Appendix B: Detailed Tabulations of Member Data

Table B-3: The Number and Reported Compensation of Active Members Distributed by Service as of December 31, 2015 (continued)

	Men		Women	
Service	Number	Compensation	Number	Compensation
36	6	$ 863,527	2	$ 201,180
37			1	90,131
38	1	150,957		
39	1	100,590		
40	1	88,446	3	313,938
43	2	222,396		
44			1	104,646
47			1	104,646
Total	362	$ 45,095,674	199	$ 23,149,742

Appendix B: Detailed Tabulations of Member Data

Table B-4: The Number and Accumulated Contributions of Terminated Vested Members Distributed by Age as of December 31, 2015

	Men		Women	
Age	Number	Contributions	Number	Contributions
33	1	$ 3,053		
39			1	$ 10,208
41			1	4,197
44	3	118,039		
45	3	24,684		
46	1	42,673	1	44,132
47			1	52,028
48	3	149,025		
49	1	6,334	2	80,330
50	1	5,346	1	4,518
51	1	31,402	1	44,357
52	1	13,495	1	4,841
53	1	33,341		
54			1	84,562
55	2	90,000		
56	1	38,154		
58	2	104,224	2	240,877
59	1	17,200		
62	2	67,378	1	1,344
63	2	110,969		
65	2	22,082	1	40,458
66	1	28,295		
68	1	16,874		
69	1	14,743		
Total	31	$ 937,311	14	$ 611,852

Appendix B: Detailed Tabulations of Member Data

Table B-5: The Number and Annual Retirement Allowances of Retired Members (Healthy at Retirement) and Survivors of Deceased Members Distributed by Age as of December 31, 2015

	Men		Women	
Age	Number	Allowances	Number	Allowances
49			3	$ 102,290
51			4	103,586
52	2	$ 80,813		
53	1	28,003	2	36,923
54	1	38,557	2	88,212
55	1	21,257	2	98,318
56	3	229,873		
57	1	6,235	2	145,149
58			3	157,963
59	5	370,940	10	587,725
60	1	94,095	8	518,954
61	13	974,306	8	457,061
62	11	756,222	8	424,930
63	9	625,076	6	314,021
64	18	1,125,492	11	589,860
65	11	791,348	11	814,910
66	22	1,632,147	11	694,070
67	21	1,461,684	7	459,857
68	17	1,226,207	5	340,891
69	27	2,081,138	7	353,821
70	24	1,674,532	16	885,133
71	14	1,019,976	5	269,352
72	18	1,356,038	5	206,189
73	23	1,620,281	9	695,822
74	12	935,133	10	375,485
75	10	864,235	3	55,917
76	12	1,115,557	8	489,969
77	9	806,063	6	269,737
78	9	625,308	6	218,125
79	12	942,811	7	358,433
80	11	644,866	6	247,225
81	5	264,274	7	274,383
82	7	510,668	3	90,918
83	6	421,431	9	435,526
84	4	325,188	6	377,891

Appendix B: Detailed Tabulations of Member Data

Table B-5: The Number and Annual Retirement Allowances of Retired Members (Healthy at Retirement) and Survivors of Deceased Members Distributed by Age as of December 31, 2015 (continued)

	Men		Women	
Age	Number	Allowances	Number	Allowances
85	7	$ 476,043	4	$ 155,924
86	6	332,433	6	235,785
87	7	432,640	6	99,716
88	1	10,865	9	259,132
89	2	80,575	4	157,095
90	4	301,114	3	92,468
91	1	103,985	2	36,286
92	1	99,760	4	68,933
93	3	197,561	4	94,319
94	1	35,909		
95	1	24,038	3	47,359
96	1	71,683	2	57,313
97			2	96,329
98			1	49,260
99			1	847
100			1	12,483
Total	375	$ 26,836,360	268	$ 13,001,895

Appendix B: Detailed Tabulations of Member Data

Table B-6: The Number and Annual Retirement Allowances of Retired Members (Healthy at Retirement) and Survivors of Deceased Members Distributed by Annuity Type as of December 31, 2015

	Men		Women	
Annuity Type	Number	Allowances	Number	Allowances
Maximum	219	$ 16,381,685	112	$ 6,598,852
Option 1	4	329,866		
Option 2	30	1,391,057	4	218,531
Option 3	42	3,684,036	2	109,278
Option 4	3	247,284	8	408,711
Option 5-2				
Option 5-3				
Option 6-2	13	554,031	1	90,360
Option 6-3	47	3,771,729	10	645,724
Other	4	90,151	1	52,525
Survivors of Deceased Members	13	386,521	130	4,877,914
Total	375	$ 26,836,360	268	$ 13,001,895

Appendix B: Detailed Tabulations of Member Data

Table B-7: The Number and Annual Retirement Allowances of Retired Members (Disabled at Retirement) Distributed by Age of December 31, 2015

	Men		Women	
Age	Number	Allowances	Number	Allowances
59	1	$ 69,006		
67			1	$ 52,490
75	1	45,753		
76			1	30,947
Total	2	$ 114,759	2	$ 83,437

Appendix B: Detailed Tabulations of Member Data

Table B-8: The Number and Annual Retirement Allowances of Retired Members (Disabled at Retirement) Distributed by Annuity Type of December 31, 2015

	Men		Women	
Annuity Type	Number	Allowances	Number	Allowances
Maximum	1	$ 69,006	1	$ 30,947
Option 1	1	45,753		
Option 2				
Option 3			1	52,490
Option 4				
Option 5-2				
Option 5-3				
Option 6-2				
Option 6-3				
Other				
Total	2	$ 114,759	2	$ 83,437

Appendix C: Summary of Main Benefit and Contribution Provisions

All justices, judges, district attorneys, and public defenders of the General Court of Justice, and clerks of the Superior Court are eligible for membership.

"Final compensation" as used in the summary means the annual rate of compensation of the member at his date of termination or death. “Average final compensation” means the average annual compensation during the 48 consecutive calendar months of membership producing the highest average. "Creditable service" includes all service rendered as a justice of the Supreme Court, judge of the Court of Appeals, judge of the Superior Court, judge of the District Court Division of the General Court of Justice, Administrative Officer of the Courts, District Attorney, Public Defender or as a Clerk of the Superior Court.

BENEFITS

Service Retirement Allowance

Conditions for Allowance

A service retirement allowance is payable to any member who retires from service and:

(a) had attained age 50 and was in service on October 8, 1981; or

(b) has attained age 50 and completed five or more years of creditable service; or

Retirement is compulsory at age 72 if the member is a justice or judge of the Appellate, Superior, or District Divisions of the General Court of Justice and at age 70 for each other member.

Unreduced Allowance

An unreduced annual service retirement allowance is payable to a member who:

(a) has attained age 65 and completed five years of creditable service; or

(b) has attained age 50 and completed 24 years of creditable service.

The Service Retirement Allowance is equal to:

(i) 4.02% of final compensation multiplied by the number of years of creditable service rendered as a justice of the Supreme Court or judge of the Court of Appeals, plus

(ii) 3.52% of final compensation multiplied by the number of years of creditable service rendered

Appendix C: Summary of Main Benefit and Contribution Provisions

as a judge of the Superior Court or as Administrative Officer of the Courts, plus

(iii) 3.02% of final compensation multiplied by the number of years of creditable service rendered as a judge of the District Court, District Attorney, Public Defender, or Clerk of the Superior Court, plus

(iv) A service retirement allowance computed on average final compensation, service transferred from the Teachers' and State Employees' Retirement System or the Local Governmental Employees' Retirement System and the applicable formula accrual rate from the previous system.

Reduced Allowance	A reduced annual service retirement allowance is payable to a member who retires: (a) prior to the earlier of attainment of age 65 and completion of five years of creditable service; (b) prior to attainment of age 50 or the completion of 24 years of creditable service. The reduced amount is an allowance as computed above reduced by 3% for each year that the member's retirement date precedes the date upon which the member would have attained age 65 or completed 24 years of service had he remained in service, whichever is earlier.
Maximum Amount	The maximum annual service retirement allowance (on an unreduced basis) is the amount which, when added to the member's benefit payable from the Teachers' and State Employees' Retirement System, Local Governmental Employees' Retirement System, or Legislative Retirement System (all on an unreduced basis) would total 75% of the member's final compensation.

Appendix C: Summary of Main Benefit and Contribution Provisions

Minimum Amount	In no event will a member whose creditable service commenced prior to January 1, 1974 as a justice of the Supreme Court, as a judge of the Court of Appeals, as an Administrative Officer of the courts, or as a judge of the Superior Court, receive a smaller retirement allowance than he would have received under Chapter 7-A of the General Statutes.
Disability Retirement Allowance	
Condition for Allowance	Any member who becomes permanently and totally disabled prior to the attainment of age 65 and who has completed at least five years of creditable service may be retired by the Board of Trustees on a disability retirement allowance. Any retired member may also apply for a disability retirement allowance within the first three years of retirement.
Amount of Allowance	The disability retirement allowance is computed as a service retirement allowance based on the number of years of creditable service the member would have had had he remained in service to the earliest date he could have retired on an unreduced service retirement allowance.
Deferred Allowance	Any member who separates from service prior to age 50 and completion of five years of creditable service and who leaves his total accumulated contributions in the system may receive a deferred allowance, beginning at age 50, computed in the same way as a service retirement allowance on the basis of his creditable service and compensation to the date of separation.
Spouse Benefit	
Conditions for Benefit	Upon the death of a member in active service after his attainment of age 50 and completion of five years of creditable service a death benefit is payable to his surviving spouse.
Amount of Benefit	The surviving spouse receives a lump sum payment equal to the member's final compensation. In addition the surviving spouse receives an annual retirement allowance, until death or remarriage, equal to 50% of the service retirement allowance to which the member would have been entitled had he retired on the first day

Appendix C: Summary of Main Benefit and Contribution Provisions

	of the calendar month coincident with or next following his date of death reduced by 2% for each year that the member's age exceeds that of his spouse.
Lump Sum Death Benefit	Upon the death of a member in active service prior to his attainment of age 50 a lump sum payment equal to his accumulated contributions plus his final compensation is made to his designated beneficiary or estate.
Death after Retirement	Upon the death of a retired member while in receipt of a service retirement allowance or after age 65 if in receipt of a disability retirement allowance an allowance is paid to his spouse, until death or remarriage, equal to one-half the allowance which was payable to the member prior to his death reduced by 2% for each year that the member's age exceeds that of his spouse. Upon the death of a member in receipt of a disability retirement allowance prior to age 65, an allowance is paid to his spouse, until death or remarriage, equal to one-half the service retirement allowance he would have received had he remained in service up to his date of death reduced by 2% for each year that the member's age exceeds that of his spouse.
Other Death Benefits	Upon the death of a member in service, other benefits may be provided by the Death Benefit Plan.
Return of Contributions	Any member who terminates service other than by retirement or death is entitled to the return of his accumulated contributions. If the total retirement allowance payments to a retired member, spouse and/or beneficiary under option are less than the member's accumulated contributions at retirement, the excess is paid to the designated beneficiary or legal representatives. The current interest rate on member contributions is 4%.

Appendix C: Summary of Main Benefit and Contribution Provisions

Optional Allowances	In lieu of the full retirement allowance, any member may elect to receive a reduced retirement allowance equal in value to the full allowance, with the provision that: Option 1 - At the death of the member within 10 years from his retirement date, an amount equal to his accumulated contributions at retirement, less 1/120 for each month he has received a retirement allowance payment, is paid to his estate, or to a person designated by the member, or Option 2 - At the death of the member his allowance shall be continued throughout the life of such other person as the member shall have designated at the time of his retirement, or Option 3 - At the death of the member one-half of his allowance shall be continued throughout the life of such other person as the member shall have designated at the time of his retirement, or Option 4 - At retirement, any member may elect to receive a retirement allowance in such amount that, together with his Social Security benefit, he will receive approximately the same income per annum before and after the earliest age at which he becomes eligible to receive the Social Security benefit. A member who elects to receive his allowance under this option is deemed to have elected Option 1 also, or Option 5 - At retirement, the member may elect to receive a reduced retirement allowance during his life with some other benefit approved by the Board of Trustees payable after he dies, or he may elect to receive a reduced retirement allowance under the provisions of Option 2 or Option 3 in conjunction with the provisions of Option 1, or Option 6 - A member may elect either Option 2 or Option 3 with the added provision that in the event the designated beneficiary predeceases the member, the retirement allowance payable to the member after the designated beneficiary's death shall be equal to the retirement allowance which would have been payable had the member not elected the Option.

Appendix C: Summary of Main Benefit and Contribution Provisions

Unused Sick Leave	Unused sick leave counts as creditable service at retirement. Sick leave which was converted from unused vacation leave is also creditable. One month of credit is allowed for each 20 days of unused sick leave, plus an additional month for any part of 20 days left over.
Post-Retirement Increases in Allowance	Future increases in allowances may be granted at the discretion of the State.
Contributions	
Member Contributions	Each member contributes 6% of his annual compensation.
Employer Contributions	The State makes annual contributions consisting of a normal contribution and an accrued liability contribution. The normal contribution covers the liability on account of current service and is determined by the actuary after each valuation. The accrued liability contribution covers the liability on account of service rendered before the establishment of the retirement system and the liability on account of increases in benefits for service rendered prior to the effective date of any amendment.
Changes Since Prior Valuation	A one-time pension supplement in the amount of 1.6% of the annualized benefit in effect on September 1, 2016 was granted to be paid on or before October 31, 2016.

Appendix D: Actuarial Assumptions and Methods

Assumptions are based on the experience investigation prepared as of December 31, 2014 and adopted by the Board of Trustees on January 21, 2016 for use with the December 31, 2015 annual actuarial valuation.

Interest Rate: 7.25% per annum, compounded annually.

Inflation: Both general and wage inflation are assumed to be 3.00% per annum.

Real Wage Growth: 0.50% per annum.

Withdrawal: No termination of employment is assumed to occur prior to retirement, other than death or disability.

Separations Before Retirement: Representative values of the assumed annual rates of separation are as follows:

	Annual Rate of		
	Disability	Base Mortality*	
Age	Male & Female	Male	Female
25	.0001	.0005	.0002
30	.0001	.0005	.0002
35	.0003	.0005	.0003
40	.0007	.0006	.0004
45	.0014	.0010	.0007
50	.0023	.0017	.0011
55	.0047	.0028	.0017
60	.0077	.0047	.0024
64	.0098	.0074	.0034

* Base mortality rates as of 2014.

Service Retirement: Representative values of the assumed annual rates of service retirement are as follows:

	Service					
Age	5	10	15	20	25	30
50					.150	.150
55	.025	.025	.025	.025	.150	.150
60	.025	.025	.025	.025	.125	.125
65	.100	.100	.100	.100	.100	.100
70	.500	.500	.500	.500	.500	.500

Appendix D: Actuarial Assumptions and Methods

Salary Increases: Representative values of the assumed annual rates of salary increases are as follows:

Annual Rate of Salary Increase

Service	
0	.0550
5	.0500
10	.0450
15	.0405
20	.0375
25	.0350
30	.0350
35	.0350
40	.0350

Deaths After Retirement: Representative values of the assumed post-retirement mortality rates in 2014 prior to any mortality improvements are as follows:

Annual Rate of Death after Retirement
(Retired Members and Survivors of Deceased Members)

	Retirees (Healthy at Retirement)		Survivors of Deceased Members		Retirees (Disabled at Retirement)	
Age	Male	Female	Male	Female	Male	Female
55	.0057	.0036	.0057	.0036	.0234	.0145
60	.0078	.0052	.0078	.0052	.0266	.0170
65	.0110	.0080	.0110	.0080	.0317	.0209
70	.0168	.0129	.0168	.0129	.0403	.0282
75	.0268	.0209	.0268	.0209	.0543	.0410
80	.0447	.0348	.0447	.0348	.0766	.0610

Deaths After Retirement (Healthy Members at Retirement and Survivors of Deceased Members): Mortality rates are based on the RP-2014 Total Data Set for Healthy Annuitants Mortality Table. The RP-2014 annuitant tables have no rates prior to age 50. The RP-2014 Total Data Set Employee Mortality Table (with no adjustments) is used for ages less than 50.

Deaths After Retirement (Disabled Members at Retirement): Mortality rates are based on the RP-2014 Total Data Set for Disabled Annuitants Mortality Table.

Deaths Prior to Retirement: Mortality rates are based on the RP-2014 Total Data Set Employee Mortality Table.

Mortality Projection: All mortality rates are projected from 2014 using generational improvement with Scale MP-2015.

Appendix D: Actuarial Assumptions and Methods

Timing of Assumptions: All withdrawals, deaths, disabilities, retirements and salary increases are assumed to occur July 1 of each year.

Liability For Inactive Members: The liability for members who terminated prior to five years of creditable service is estimated to be 100% of the member's accumulated contributions. The liability for members who terminated after completing five years of creditable service is estimated based on the member's current age and the service and reported compensation at termination of employment.

Administrative Expenses: 0.75% of normal cost.

Marriage Assumption: 90% of male members married and 50% of female members married with the male spouses four years older than female spouses.

Reported Compensation: Calendar year compensation as furnished by the system's office.

Valuation Compensation: Reported compensation adjusted to reflect the assumed rate of pay as of the valuation date.

Actuarial Cost Method: Entry age normal cost method. Entry age is established on an individual basis.

Amortization Period: 12-year closed, level-dollar amount. The first amortization base was created for the contribution payable for fiscal year ending 2012.

Asset Valuation Method: Actuarial value, as developed in Table 7. Actuarial value of assets is based upon a smoothed market value method. Under this method, asset returns in excess of or less than the expected return on market value of assets will be reflected in the actuarial value of assets over a five-year period. The calculation of the Actuarial Value of Assets is based on the following formula:

$MV - 80\% \times G/(L)_1 - 60\% \times G/(L)_2 - 40\% \times G/(L)_3 - 20\% \times G/(L)_4$

MV = the market value of assets as of the valuation date

$G/(L)_i$ = the asset gain or (loss) for the i-th year preceding the valuation date

Changes Since Prior Valuation: The retirement rates, the mortality assumption, the annual rate of salary increase, the asset valuation method, and the actuarial cost method were changed based on the experience study prepared as of December 31, 2014 and adopted by the Board of Trustees on January 21, 2016.

Appendix E: GASB 67 Fiduciary Net Position Projection

Table E-1: Projection of Fiduciary Net Positions
(in thousands)

Calendar Year	Beginning Fiduciary Position	Member Contributions	Employer Contributions	Benefit Payments	Administrative Expenses	Investment Earnings	Ending Fiduciary Position
2016	$ 520,980	$ 4,228	$ 17,052	$ 42,248	$ 117	$ 37,028	$ 536,923
2017	536,923	4,140	18,676	42,873	114	38,167	554,919
2018	554,919	4,051	21,421	44,615	111	39,535	575,200
2019	575,200	3,944	22,318	46,380	108	40,971	595,945
2020	595,945	3,834	23,141	48,213	105	42,435	617,037
2021	617,037	3,711	23,907	49,933	101	43,927	638,548
2022	638,548	3,599	24,110	51,508	98	45,444	660,095
2023	660,095	3,485	21,384	53,079	95	46,891	678,681
2024	678,681	3,365	18,359	54,526	91	48,038	693,826
2025	693,826	3,244	17,022	55,918	87	49,042	707,129
2026	707,129	3,115	16,260	57,218	83	49,911	719,114
2027	719,114	2,977	16,181	58,594	79	50,726	730,325
2028	730,325	2,832	16,254	59,858	75	51,487	740,965
2029	740,965	2,682	13,885	61,065	71	52,175	748,571
2030	748,571	2,536	10,448	62,136	66	52,530	751,883
2031	751,883	2,386	8,754	63,219	62	52,665	752,407
2032	752,407	2,224	7,100	64,353	57	52,597	749,918
2033	749,918	2,050	5,475	65,550	52	52,311	744,152
2034	744,152	1,865	4,448	66,577	47	51,803	735,644
2035	735,644	1,695	3,978	67,375	42	51,134	725,034
2036	725,034	1,530	3,544	67,918	38	50,326	712,478
2037	712,478	1,361	3,091	68,470	33	49,372	697,799
2038	697,799	1,196	2,619	68,955	28	48,270	680,901
2039	680,901	1,014	2,172	69,306	24	47,010	661,767
2040	661,767	838	1,775	69,326	19	45,600	640,635
2041	640,635	689	1,376	69,127	15	44,058	617,616
2042	617,616	538	1,047	68,574	12	42,390	593,005
2043	593,005	417	773	67,648	9	40,625	567,163
2044	567,163	318	617	66,151	7	38,796	540,736
2045	540,736	257	494	64,343	6	36,938	514,076
2046	514,076	205	405	62,338	5	35,072	487,415
2047	487,415	165	303	60,308	3	33,206	460,778
2048	460,778	127	223	58,169	3	31,347	434,303
2049	434,303	93	157	55,955	2	29,503	408,099
2050	408,099	65	104	53,669	1	27,681	382,279
2051	382,279	46	69	51,290	1	25,894	356,997
2052	356,997	31	54	48,837	1	24,145	332,389
2053	332,389	23	31	46,410	0	22,447	308,480
2054	308,480	14	21	43,962	0	20,801	285,354
2055	285,354	9	8	41,541	0	19,210	263,040
2056	263,040	4	3	39,123	0	17,678	241,602
2057	241,602	1	0	36,734	0	16,209	221,078
2058	221,078	0	0	34,360	0	14,804	201,522
2059	201,522	0	0	32,035	0	13,470	182,957
2060	182,957	0	0	29,761	0	12,204	165,400
2061	165,400	0	0	27,544	0	11,011	148,867
2062	148,867	0	0	25,390	0	9,888	133,365
2063	133,365	0	0	23,304	0	8,839	118,900
2064	118,900	0	0	21,292	0	7,862	105,470
2065	105,470	0	0	19,360	0	6,958	93,068

Appendix E: GASB 67 Fiduciary Net Position Projection

Table E-1: Projection of Fiduciary Net Positions (continued)

(in thousands)

Calendar Year	Beginning Fiduciary Position	Member Contributions	Employer Contributions	Benefit Payments	Administrative Expenses	Investment Earnings	Ending Fiduciary Position
2066	$ 93,068	$ 0	$ 0	$ 17,514	$ 0	$ 6,124	$ 81,678
2067	81,678	0	0	15,759	0	5,359	71,278
2068	71,278	0	0	14,101	0	4,666	61,843
2069	61,843	0	0	12,543	0	4,036	53,336
2070	53,336	0	0	11,090	0	3,472	45,718
2071	45,718	0	0	9,745	0	2,967	38,940
2072	38,940	0	0	8,509	0	2,521	32,952
2073	32,952	0	0	7,381	0	2,126	27,697
2074	27,697	0	0	6,360	0	1,782	23,119
2075	23,119	0	0	5,443	0	1,482	19,158
2076	19,158	0	0	4,625	0	1,224	15,757
2077	15,757	0	0	3,903	0	1,004	12,858
2078	12,858	0	0	3,269	0	816	10,405
2079	10,405	0	0	2,717	0	658	8,346
2080	8,346	0	0	2,240	0	525	6,631
2081	6,631	0	0	1,831	0	416	5,216
2082	5,216	0	0	1,483	0	326	4,059
2083	4,059	0	0	1,189	0	252	3,122
2084	3,122	0	0	943	0	193	2,372
2085	2,372	0	0	739	0	146	1,779
2086	1,779	0	0	572	0	108	1,315
2087	1,315	0	0	437	0	80	958
2088	958	0	0	328	0	58	688
2089	688	0	0	243	0	42	487
2090	487	0	0	176	0	29	340
2091	340	0	0	125	0	19	234
2092	234	0	0	87	0	14	161
2093	161	0	0	60	0	10	111
2094	111	0	0	40	0	7	78
2095	78	0	0	26	0	5	57
2096	57	0	0	16	0	3	44
2097	44	0	0	10	0	3	37
2098	37	0	0	6	0	3	34
2099	34	0	0	3	0	2	33
2100	33	0	0	2	0	2	33
2101	33	0	0	1	0	2	34
2102	34	0	0	1	0	3	36
2103	36	0	0	0	0	3	39
2104	39	0	0	0	0	2	41
2105	41	0	0	0	0	3	44
2106	44	0	0	0	0	3	47
2107	47	0	0	0	0	4	51
2108	51	0	0	0	0	3	54
2109	54	0	0	0	0	4	58
2110	58	0	0	0	0	5	63
2111	63	0	0	0	0	4	67
2112	67	0	0	0	0	5	72
2113	72	0	0	0	0	5	77
2114	77	0	0	0	0	6	83
2115	83	0	0	0	0	6	89

Appendix E: GASB 67 Fiduciary Net Position Projection

Table E-2: Actuarial Present Value of Projected Benefit Payments
(in thousands)

Calendar Year	Beginning Fiduciary Position	Benefit Payments	Funded Benefit Payments	Unfunded Benefit Payments	Present Value of Benefit Payments: Funded Payments at 7.25%	Present Value of Benefit Payments: Unfunded Payments at 2.71%	Present Value of Benefit Payments: Using Single Discount Rate of 7.25%
2016	$ 520,980	$ 42,248	$ 42,248	$ 0	$ 40,795	$ 0	$ 40,795
2017	536,923	42,873	42,873	0	38,600	0	38,600
2018	554,919	44,615	44,615	0	37,453	0	37,453
2019	575,200	46,380	46,380	0	36,303	0	36,303
2020	595,945	48,213	48,213	0	35,187	0	35,187
2021	617,037	49,933	49,933	0	33,978	0	33,978
2022	638,548	51,508	51,508	0	32,681	0	32,681
2023	660,095	53,079	53,079	0	31,401	0	31,401
2024	678,681	54,526	54,526	0	30,076	0	30,076
2025	693,826	55,918	55,918	0	28,759	0	28,759
2026	707,129	57,218	57,218	0	27,439	0	27,439
2027	719,114	58,594	58,594	0	26,199	0	26,199
2028	730,325	59,858	59,858	0	24,955	0	24,955
2029	740,965	61,065	61,065	0	23,737	0	23,737
2030	748,571	62,136	62,136	0	22,521	0	22,521
2031	751,883	63,219	63,219	0	21,364	0	21,364
2032	752,407	64,353	64,353	0	20,277	0	20,277
2033	749,918	65,550	65,550	0	19,258	0	19,258
2034	744,152	66,577	66,577	0	18,238	0	18,238
2035	735,644	67,375	67,375	0	17,209	0	17,209
2036	725,034	67,918	67,918	0	16,175	0	16,175
2037	712,478	68,470	68,470	0	15,204	0	15,204
2038	697,799	68,955	68,955	0	14,277	0	14,277
2039	680,901	69,306	69,306	0	13,379	0	13,379
2040	661,767	69,326	69,326	0	12,478	0	12,478
2041	640,635	69,127	69,127	0	11,602	0	11,602
2042	617,616	68,574	68,574	0	10,731	0	10,731
2043	593,005	67,648	67,648	0	9,870	0	9,870
2044	567,163	66,151	66,151	0	8,999	0	8,999
2045	540,736	64,343	64,343	0	8,162	0	8,162
2046	514,076	62,338	62,338	0	7,373	0	7,373
2047	487,415	60,308	60,308	0	6,651	0	6,651
2048	460,778	58,169	58,169	0	5,981	0	5,981
2049	434,303	55,955	55,955	0	5,365	0	5,365
2050	408,099	53,669	53,669	0	4,798	0	4,798
2051	382,279	51,290	51,290	0	4,275	0	4,275
2052	356,997	48,837	48,837	0	3,795	0	3,795
2053	332,389	46,410	46,410	0	3,363	0	3,363
2054	308,480	43,962	43,962	0	2,970	0	2,970
2055	285,354	41,541	41,541	0	2,617	0	2,617
2056	263,040	39,123	39,123	0	2,298	0	2,298
2057	241,602	36,734	36,734	0	2,012	0	2,012
2058	221,078	34,360	34,360	0	1,755	0	1,755
2059	201,522	32,035	32,035	0	1,525	0	1,525
2060	182,957	29,761	29,761	0	1,321	0	1,321
2061	165,400	27,544	27,544	0	1,140	0	1,140
2062	148,867	25,390	25,390	0	980	0	980
2063	133,365	23,304	23,304	0	839	0	839
2064	118,900	21,292	21,292	0	714	0	714
2065	105,470	19,360	19,360	0	606	0	606

Appendix E: GASB 67 Fiduciary Net Position Projection

Table E-2: Actuarial Present Value of Projected Benefit Payments (continued)

(in thousands)

Calendar Year	Beginning Fiduciary Position	Benefit Payments	Present Value of Benefit Payments: Funded Benefit Payments	Unfunded Benefit Payments	Funded Payments at 7.25%	Unfunded Payments at 2.71%	Using Single Discount Rate of 7.25%
2066	$ 93,068	$ 17,514	$ 17,514	$ 0	$ 511	$ 0	$ 511
2067	81,678	15,759	15,759	0	429	0	429
2068	71,278	14,101	14,101	0	358	0	358
2069	61,843	12,543	12,543	0	297	0	297
2070	53,336	11,090	11,090	0	244	0	244
2071	45,718	9,745	9,745	0	200	0	200
2072	38,940	8,509	8,509	0	163	0	163
2073	32,952	7,381	7,381	0	132	0	132
2074	27,697	6,360	6,360	0	106	0	106
2075	23,119	5,443	5,443	0	85	0	85
2076	19,158	4,625	4,625	0	67	0	67
2077	15,757	3,903	3,903	0	53	0	53
2078	12,858	3,269	3,269	0	41	0	41
2079	10,405	2,717	2,717	0	32	0	32
2080	8,346	2,240	2,240	0	25	0	25
2081	6,631	1,831	1,831	0	19	0	19
2082	5,216	1,483	1,483	0	14	0	14
2083	4,059	1,189	1,189	0	11	0	11
2084	3,122	943	943	0	8	0	8
2085	2,372	739	739	0	6	0	6
2086	1,779	572	572	0	4	0	4
2087	1,315	437	437	0	3	0	3
2088	958	328	328	0	2	0	2
2089	688	243	243	0	1	0	1
2090	487	176	176	0	1	0	1
2091	340	125	125	0	1	0	1
2092	234	87	87	0	0	0	0
2093	161	60	60	0	0	0	0
2094	111	40	40	0	0	0	0
2095	78	26	26	0	0	0	0
2096	57	16	16	0	0	0	0
2097	44	10	10	0	0	0	0
2098	37	6	6	0	0	0	0
2099	34	3	3	0	0	0	0
2100	33	2	2	0	0	0	0
2101	33	1	1	0	0	0	0
2102	34	1	1	0	0	0	0
2103	36	0	0	0	0	0	0
2104	39	0	0	0	0	0	0
2105	41	0	0	0	0	0	0
2106	44	0	0	0	0	0	0
2107	47	0	0	0	0	0	0
2108	51	0	0	0	0	0	0
2109	54	0	0	0	0	0	0
2110	58	0	0	0	0	0	0
2111	63	0	0	0	0	0	0
2112	67	0	0	0	0	0	0
2113	72	0	0	0	0	0	0
2114	77	0	0	0	0	0	0
2115	83	0	0	0	0	0	0

Appendix F: Additional Disclosures

Table F-1 illustrates the sensitivity of certain valuation results to changes in the discount rate on a market value of assets basis. Table F-2 summarizes historical actuarial value and market value asset returns. Table F-3 provides an estimate of future market value of asset returns based on the current portfolio structure and summarized in our "TSERS Asset-Liability and Investment Strategy Project" report dated April 19th, 2016.

Section 6(c) of Session Law 2016-108 requires that the actuarial valuation report provide the valuation results using a 30-year treasury rate as of December 31 of the year of the valuation as the discount rate. This is 3.01% at December 31, 2015 and has been used as the lower bound of the sensitivity analysis presented. The range between the current discount rate (7.25%) and the 30-year treasury rate (3.01%) was used to establish an upper bound for sensitivity analysis (11.49%). The remaining rates illustrated represent mid-points between the selected rates. Table F-3 illustrates our best estimate of the plausibility of such rates. The lower bound of 3.01% falls below the 5th percentile of estimated future 30-year returns while the upper bound of 11.49% falls between the 75th and 95th percentiles of estimated future 30-year returns.

Table F-1: Sensitivity of Valuation Results as of December 31, 2015

Discount Rate	3.01%	5.13%	7.25%	9.37%	11.49%
Market Value of Assets	$ 520,979,678	$ 520,979,678	$ 520,979,678	$ 520,979,678	$ 520,979,678
Actuarial Accrued Liability	$ 973,056,526	$ 761,997,114	$ 615,599,280	$ 510,541,389	$ 432,886,402
Unfunded Accrued Liability (UAL)	$ 452,076,848	$ 241,017,436	$ 94,619,602	$ (10,438,289)	$ (88,093,276)
Funded Ratio	53.5%	68.4%	84.6%	102.0%	120.4%
20-Year Amortization of UAL	$ 31,330,205	$ 20,556,626	$ 9,765,780	N/A	N/A
(as % of general state revenue)	0.11%	0.07%	0.03%	N/A	N/A

Table F-2: Historical Asset Returns

Calendar Year	Actuarial Value of Asset Return	Market Value of Asset Return	Calendar Year	Actuarial Value of Asset Return	Market Value of Asset Return	Calendar Year	Actuarial Value of Asset Return	Market Value of Asset Return
1996	10.19%	9.32%	2003	8.44%	18.33%	2010	6.01%	11.49%
1997	10.19%	18.07%	2004	8.95%	10.73%	2011	5.25%	2.18%
1998	9.92%	16.61%	2005	8.56%	6.94%	2012	6.42%	11.79%
1999	15.74%	10.03%	2006	9.17%	11.35%	2013	7.52%	12.19%
2000	12.37%	2.60%	2007	9.04%	8.35%	2014	7.26%	6.19%
2001	9.07%	-1.74%	2008	3.01%	-19.39%	2015	5.87%	0.35%
2002	6.13%	-4.84%	2009	4.88%	14.83%			

The average investment return recognized for the purposes of determining the annual change in contribution each year is the Actuarial Value of Asset Return. The Actuarial Value of Assets smooths investment gains and losses over a five-year period and is used to reduce volatility that investment gains and losses can have on required contributions and the funded status of the Plan.

Table F-3: Estimate of Future Asset Returns

Horizon	5th Percentile	25th Percentile	50th Percentile	75th Percentile	95th Percentile
10 Years	0.2%	4.0%	5.9%	8.0%	11.5%
20 Years	2.2%	4.8%	6.7%	8.5%	11.8%
30 Years	3.1%	5.3%	7.1%	8.7%	12.0%

Appendix F: Additional Disclosures

Other than the discount rate, these results are based on the other economic and demographic assumptions presented in the report. For purposes of simplicity in this disclosure, no adjustments to the valuation assumption for inflation were reflected in the sensitivities above. The statute also requires that the actuarial valuation report show the results using a market value of assets basis. The "funded ratio" and "unfunded accrued liability" in Table F-1 are based upon the market value of assets. In order to alleviate volatility, future employer contributions are determined based on the actuarial value of assets, which smooths market value returns.

None of the liability amounts shown are intended to imply the amount that might represent the cost of any settlement of the plan's obligations. The various caveats, constraints, and discussions presented earlier in the report apply to these results as well.

Appendix G: Data for Section 2 Graphs

The tables below provide the numbers associated with the graphs in Section 2 of this report.

Graph 1: Active Members

	Active Member Count	Reported Compensation
2011	566	$ 67,814,831
2012	564	68,237,144
2013	566	68,456,637
2014	566	67,562,225
2015	561	68,245,416

Graph 2: Retired Members and Survivors of Deceased Members

	Retired and Survivors of Deceased Member Count	Retirement Allowance
2011	562	$ 32,328,918
2012	559	33,015,346
2013	584	35,111,390
2014	610	37,376,920
2015	647	40,036,451

Graph 3: Market Value of Assets and Asset Returns

	Market Value of Assets	Asset Return
2011	$ 425,132,791	2.18%
2012	466,099,097	11.79%
2013	511,969,020	12.19%
2014	534,452,795	6.19%
2015	520,979,678	0.35%

Appendix G: Data for Section 2 Graphs

Graph 5: Actuarial Value and Market Value of Assets

	Actuarial Value of Assets	Market Value of Assets
2011	$ 460,647,229	$ 425,132,791
2012	481,285,608	466,099,097
2013	506,787,899	511,969,020
2014	534,299,602	534,452,795
2015	550,050,200	520,979,678

Graph 6: Asset Returns

	Actuarial Value	Market Value
2011	5.25%	2.18%
2012	6.42%	11.79%
2013	7.52%	12.19%
2014	7.26%	6.19%
2015	5.87%	0.35%

Graph 7: Actuarial Accrued Liability

	Liability for Active Members	Liability for Deferred Members	Liability for Retired Members	Total Liability
2011	$ 217,836,826	$ 3,993,174	$ 290,812,885	$ 512,642,885
2012	232,560,316	2,743,231	292,281,547	527,585,094
2013	232,783,711	3,393,117	313,168,240	549,345,068
2014	234,280,897	3,507,279	329,042,332	566,830,508
2015	227,098,381	2,403,740	386,097,159	615,599,280

Appendix G: Data for Section 2 Graphs

Graph 8: Actuarial Accrued Liability and Actuarial Value of Assets

	Actuarial Accrued Liability	Actuarial Value of Assets
2011	$ 512,642,885	$ 460,647,229
2012	527,585,094	481,285,608
2013	549,345,068	506,787,899
2014	566,830,508	534,299,602
2015	615,599,280	550,050,200

Graph 9: Funded Ratios

	Funded Ratio (Actuarial Basis)	Funded Ratio (Market Value Basis)
2011	89.9%	82.9%
2012	91.2%	88.3%
2013	92.3%	93.2%
2014	94.3%	94.3%
2015	89.4%	84.6%

Graph 10: Actuarially Determined Employer Contribution Rates

Fiscal Year Ending	Normal Rate	Accrued Liability Rate	Total Rate
2014	18.48%	9.53%	28.01%
2015	17.91%	9.30%	27.21%
2016	17.97%	8.40%	26.37%
2017	15.70%	13.76%	29.46%
2018*	15.95%	14.28%	30.23%

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