



**Cavanaugh Macdonald**  
CONSULTING, LLC

*The experience and dedication you deserve*

***MISSOURI STATE EMPLOYEES'  
RETIREMENT SYSTEM - JUDGES***

**ACTUARIAL VALUATION REPORT  
as of June 30, 2018**

**Contribution Rates for Fiscal Year Ending  
June 30, 2020**





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# Cavanaugh Macdonald

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September 7, 2018

Board of Trustees  
Missouri State Employees' Retirement System  
907 Wildewood Drive  
Jefferson City, MO 65102

Dear Members of the Board:

At your request, we performed an actuarial valuation of the Missouri State Employees' Retirement System (MOSERS) as of June 30, 2018 for the purpose of determining the employer required contribution rate for the plan year ending June 30, 2020. This report provides valuation results for the Missouri State Employees' Retirement System - Judges (Judges). The major findings of the valuation are contained in this report, which reflects the benefit provisions in place on June 30, 2018.

There have been no new plan provisions reflected since the prior valuation. However, in July 2018 after extensive analysis, the MOSERS Board adopted a 7.25% assumed nominal rate of investment return, effective with the June 30, 2018 actuarial valuation, along with a schedule to systematically lower the assumed nominal rate of investment return by 15 basis points per year until reaching 6.95% in the June 30, 2020 actuarial valuation. These changes are discussed in further detail in the Executive Summary section of this report.

In preparing our report, we relied, without audit, on information (some oral and some in writing) supplied by the System's staff. This information includes, but is not limited to, statutory provisions, member data and financial information. We found this information to be reasonably consistent and comparable with the information received in the prior year. The valuation results depend on the integrity of this information. If any of this information is inaccurate or incomplete, our results may be different and our calculations may need to be revised.

We further certify that all costs, liabilities, rates of interest and other factors for Judges have been determined on the basis of actuarial assumptions and methods which are individually reasonable (taking into account the experience of each Plan and reasonable expectations); and which, in combination, offer the best estimate of anticipated experience affecting Judges. Nevertheless, the emerging costs will vary from those presented in this report to the extent actual experience differs from that projected by the actuarial assumptions. The MOSERS Board has the final decision regarding the appropriateness of the assumptions and adopted them as indicated in Appendix C.



Board of Trustees  
September 7, 2018  
Page 2

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

The actuarial computations presented in this report are for purposes of determining the funding amounts for Judges as set out in the Missouri state statutes. The calculations in the enclosed report have been made on a basis consistent with our understanding of MOSERS' funding requirements and goals. Determinations for purposes other than meeting these requirements may be significantly different from the results contained in this report. Accordingly, additional determinations may be needed for other purposes. For example, actuarial computations for purposes of fulfilling financial accounting requirements for the System under Governmental Accounting Standards No. 67 and No. 68 will be presented in completely separate reports.

The consultants who worked on this assignment are pension actuaries. Cavanaugh Macdonald's advice is not intended to be a substitute for qualified legal or accounting counsel.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices. We are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein. We are available to answer any questions on the material contained in the report or to provide explanations or further details as may be appropriate.

We respectfully submit the following report and look forward to discussing it with you.

Sincerely,

A handwritten signature in blue ink that reads 'Patrice Beckham'.

Patrice A. Beckham, FSA, EA, FCA, MAAA  
Principal and Consulting Actuary

A handwritten signature in blue ink that reads 'Bryan K. Hoge'.

Bryan K. Hoge, FSA, EA, FCA, MAAA  
Senior Actuary



## SECTION 1 – EXECUTIVE SUMMARY

This report presents the results of the June 30, 2018 actuarial valuation of the Missouri State Employees’ System – Judges (Judges). The primary purposes of performing this actuarial valuation are to:

- Determine the employer contribution rate, as defined in the Missouri state statutes and set out in the Board’s funding policy, for the fiscal year ending June 30, 2020;
- Disclose asset and liability measurements as well as the current funded status of Judges on the valuation date;
- Compare the actual and expected experience of Judges during the plan year ended June 30, 2018; and
- Analyze and report on trends in Judges’ contributions, assets and liabilities over the past several years.

### Changes Since the Prior Valuation

In July 2018 after extensive analysis, the MOSERS Board adopted a new set of economic assumptions that included an investment return assumption of 7.25%, effective with the June 30, 2018 actuarial valuation, along with a schedule to systematically lower the assumed nominal rate of investment return by 15 basis points per year, as shown in the table below, until reaching 6.95% in the June 30, 2020 actuarial valuation. The scheduled decline will occur absent a vote of the Board otherwise. Since such schedule is subject to potential modification by a future board, the assumed investment return in the current actuarial valuation applies to all future years until such time as the rate changes per the schedule or other Board action occurs.

Economic Assumption	Effective June 30, 2018	Effective June 30, 2019	Effective June 30, 2020
1. Investment Return	7.25%	7.10%	6.95%
2. Inflation	2.50%	2.35%	2.25%
3. Cost-of-Living Adjustment (COLA)	2.00%	1.88%	1.80%
4. General Wage Growth	2.75%	2.60%	2.50%
5. Payroll Growth	2.50%	2.35%	2.25%

In addition to the economic assumption changes listed above, the Board also adopted two changes to the actuarial methods used in the valuation, the asset smoothing method and the amortization of the unfunded actuarial accrued liability (UAAL).

**Asset Smoothing Method:** A new asset smoothing method will be used to determine the actuarial value of assets (AVA). Beginning with the fiscal year ending June 30, 2018, the dollar amount of the difference between the actual investment return and the expected actuarial investment return on the market value of assets each year shall be recognized annually in level amounts over closed five-year periods. Due to the change in the asset smoothing method, a plan was necessary to transition from the prior smoothing method. Therefore, the existing unrecognized investment experience (difference between the actuarial and market value of assets) of \$14.2 million, as of June 30, 2017, will be recognized annually in level amounts over a closed seven-year period starting with the June 30, 2018 valuation. This approach was utilized because it provides a systematic method to reflect the existing deferred experience that results in more stable and predictable contribution rates than other alternatives.

**Amortization of UAAL:** Under the current UAAL amortization method, the UAAL is amortized as one amortization base over a closed 30-year period that began June 30, 2014. The new method adopted by the Board uses “layered amortization” and is first effective with the June 30, 2018



## SECTION 1 – EXECUTIVE SUMMARY

valuation. The “Legacy UAAL”, as determined in the June 30, 2018 valuation, is amortized over a closed 30-year period. Subsequent changes in the UAAL due to actuarial gains/losses or assumption changes are separately financed by establishing amortization bases and payments, as a level percentage of payroll, over closed 30-year periods. Any change in the System’s benefit structure shall be amortized over a closed period of 20 years, as set out in state statutes. The total UAAL amortization payment is the sum of the payments for each of the amortization bases.

The impact of the assumption and method changes are summarized in the following table:

	Prior Assumptions and Methods	Current Assumptions and Methods	Difference
Actuarial Accrued Liability	\$581,456,550	\$593,788,592	\$12,332,042
Actuarial Value of Assets	<u>162,176,660</u>	<u>162,135,045</u>	<u>(41,615)</u>
Unfunded Actuarial Accrued Liability	\$419,279,890	\$431,653,547	\$12,373,657
Funded Ratio	27.9%	27.3%	(0.6%)
Normal Cost	21.97%	22.52%	0.55%
UAAL Amortization	<u>43.21%</u>	<u>42.76%</u>	<u>(0.45%)</u>
Actuarial Contribution	65.18%	65.28%	0.10%
Member Contribution Rate	<u>(1.48%)</u>	<u>(1.48%)</u>	0.00%
Employer Contribution Rate	63.70%	63.80%	0.10%

The change in the actuarial methods did not impact the actuarial accrued liability or the normal cost rate. Those changes are driven by changes in the actuarial assumptions. However, the change in actuarial methods did impact the actuarial value of assets and, therefore, the amount of the UAAL and the UAAL contribution rate. As shown above, the change in the asset smoothing method decreased the actuarial value of assets by \$41,615, which was not significant enough to have an impact on the employer contribution rate. The change in the UAAL amortization policy, including 30-year amortization of the June 30, 2018 UAAL, decreased the employer contribution rate by 3.16%.

### Key Results

The actuarial valuation results provide a “snapshot” view of the System’s financial condition on June 30, 2018. The Judges funded ratio increased from 26.9% to 27.3% despite an increase in the UAAL from \$412.6 million last year to \$431.7 million this year because actuarial assets increased more, as a percentage, than actuarial liability. In addition, the employer actuarial contribution rate increased slightly from 63.71% of pay last year to 63.80% of pay in this year’s valuation, an increase of 0.09% of pay.

The most significant impact on the June 30, 2018 valuation results was the change in the economic assumptions and actuarial methods which increased the UAAL by \$12.4 million, the normal cost rate by 0.55% and the employer contribution rate by 0.10%. The valuation results also reflect net unfavorable experience for the past plan year as demonstrated by an UAAL that was higher than expected (actual UAAL of \$431.7 million compared to an expected UAAL of \$430.0 million). The unfavorable experience was due to the combined impact of an actuarial loss on the actuarial value of assets and a net actuarial gain on liabilities. The most significant source of liability gain was salary increases that were lower than assumed in the prior valuation.



**SECTION 1 – EXECUTIVE SUMMARY**

A summary of the key results from the June 30, 2018 actuarial valuation, compared to the prior valuation, is shown in the following table. Further detail on the changes and actuarial experience affecting the valuation results can be found in the following sections of this Executive Summary.

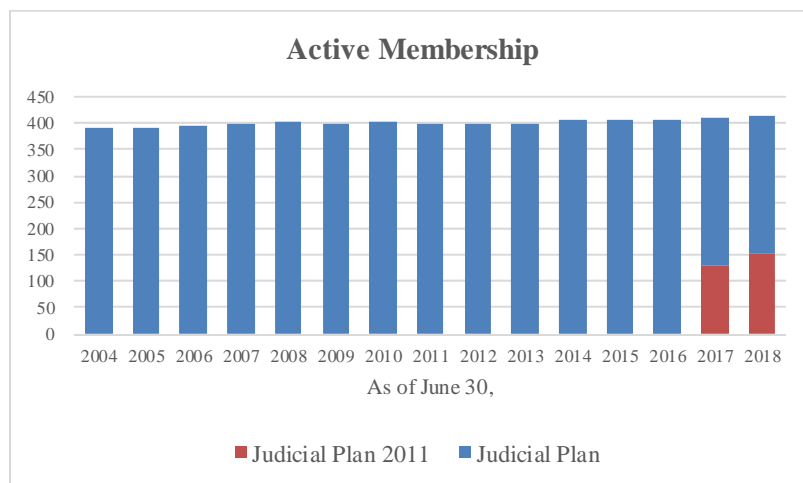
	June 30, 2018	June 30, 2017
Unfunded Actuarial Accrued Liability (\$M)	\$432	\$413
Funded Ratio (Actuarial Assets)	27.3%	26.9%
Normal Cost Rate	22.52%	22.29%
UAAL Amortization Rate	42.76%	42.71%
Total Actuarial Required Contribution	65.28%	65.00%
Member Contribution Rate	(1.48%)	(1.29%)
Employer Contribution Rate	63.80%	63.71%

**Experience for the Last Plan Year**

Numerous factors contributed to the change in the Judges assets, liabilities, and actuarial required contribution rate between June 30, 2017 and June 30, 2018. The components are examined in the following discussion.

**Membership**

There was a 1.5% increase in the number of active members in this valuation (415) compared to the prior valuation (410). As shown in the graph below, the active population has remained steady over the last 15 years, which is typical for a statewide Judges system.



Note: Split between MSEP and MSEP 2011 is not available prior to June 30, 2017.

The percentage of active members covered by the Judicial 2011 Plan has increased over time as actives covered by the Judicial Plan leave the bench and are replaced by new judges. The number of active members covered by the Judicial 2011 Plan increased from 130 in the 2017 valuation (about 46%) to 153 (about 58% of total) in the 2018 valuation. Because the benefit structure is different for the Judicial 2011



## SECTION 1 – EXECUTIVE SUMMARY

members, including an employee contribution rate of 4%, the ongoing cost of the Plan declines as a greater percentage of active members is covered by the Judicial 2011 Plan.

As is expected in a mature retirement system, the number of members receiving benefits increased from 559 last year to 569 in the current valuation. In addition, the average amount of benefits for this group also increased by 3.1%.

### System Assets

As of June 30, 2018, Judges had net assets of \$150.2 million, when measured on a market value basis, an increase of \$12.6 million from the prior year value of \$137.6 million.

The market value of assets is not used directly in the calculation of the unfunded actuarial accrued liability and the employer actuarial contribution rate. An asset valuation method, which smoothes the effect of market fluctuations, is applied to determine the value of assets used in the valuation. The resulting amount is called the actuarial value of assets. As of June 30, 2018, a new method is utilized for calculating the AVA. Under the new asset smoothing method, the difference between the dollar amount of the actual and assumed investment return on the market value of assets is recognized evenly over a closed five-year period. In addition, the total unrecognized investment experience as of June 30, 2017 (\$11.9 million) is recognized evenly over a seven-year period beginning June 30, 2018. As a result of the new asset smoothing method, the actuarial value of assets in the current valuation is \$41,615 lower than the value produced by the prior method. In this year's valuation, the actuarial value of assets for Judges is \$162.1 million, an increase of \$10.3 million from the prior year. The components of change in the asset values are shown in the following table:

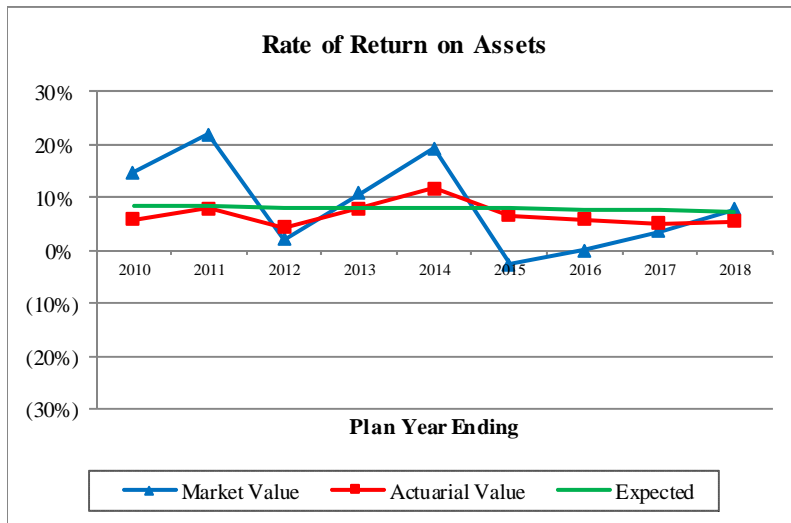
	Market Value (\$M)		Actuarial Value (\$M)	
<b>Net Assets, June 30, 2017</b>	\$	137.63	\$	151.83
- Asset Adjustment for GASB 75	-	0.07	-	0.07
- Employer and Member Contributions	+	37.79	+	37.79
- Benefit Payments	-	35.66	-	35.66
- Net Investment Income	+	10.69	+	8.43
- Administrative Expenses	-	0.18	-	0.18
<b>Net Assets, June 30, 2018</b>	\$	150.20	\$	162.14
Rate of Return, Net of Expenses		7.71%		5.51%

Due to the recognition of some of the deferred investment experience in the asset smoothing method, the estimated rate of return on the actuarial value of assets was 5.51%, which is lower than the investment return assumption of 7.50% for FY 2018. As a result, there was an actuarial loss on the smoothed value of assets of \$3.0 million. The investment return on the market value of assets for FY 2018 of 7.71% produced a small amount of excess earnings, about \$0.3 million. Please see Section 3 of this report for more detailed information on the market and actuarial value of assets.

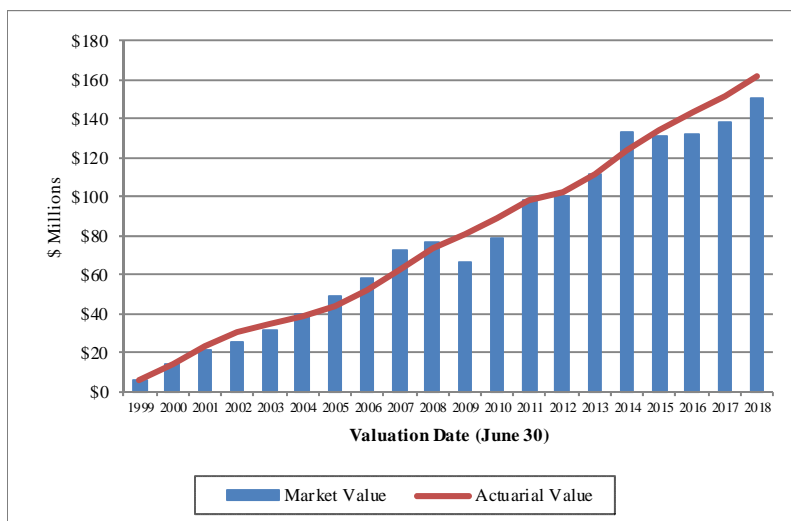




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*The rate of return of the actuarial value of assets has been less volatile than the market value return, illustrating the benefit of using an asset smoothing method. However, during this time period, the rate of return on actuarial assets has been at or below the assumed rate of return for most years.*



*An asset smoothing method is used to mitigate the volatility in the market value of assets. By using a smoothing method, the actuarial (or smoothed) value can be, and actually should be, either above or below the pure market value.*

*Note the asset smoothing method changed with the 2018 valuation.*

### System Liabilities

The actuarial accrued liability is that portion of the present value of future benefits that will not be paid by future normal costs. The difference between this liability and the actuarial value of assets as of the valuation date is called the unfunded actuarial accrued liability. The dollar amount of the UAAL is reduced if the contributions to the System exceed the normal cost for the year plus interest on the prior year's UAAL.

Note that until 1999, the Judges Plan was funded on a pay-as-you-go basis so no advance funding occurred. Since that time the funding of the Plan has steadily increased, but the funded ratio is still very low and the amount of the UAAL is significant for a Plan of this size. As the state continues to fund the Judges Plan, the funded ratio is expected to increase and eventually reach 100%, if all actuarial assumptions are met in future years.



**SECTION 1 – EXECUTIVE SUMMARY**

The UAAL, using both the actuarial and market value of assets, is shown as of June 30, 2018 in the following table:

	<b>Actuarial Value of Assets</b>	<b>Market Value of Assets</b>
Actuarial Accrued Liability	\$593,788,592	\$593,788,592
Value of Assets	<u>162,135,045</u>	<u>150,199,575</u>
Unfunded Actuarial Accrued Liability	\$431,653,547	\$443,589,017
Funded Ratio	27.31%	25.30%

See Section 4 of the report for the detailed development of the UAAL.

The net change in the UAAL from June 30, 2017 to June 30, 2018 was an increase of \$19.1 million. The components of this net change are shown in the following table:

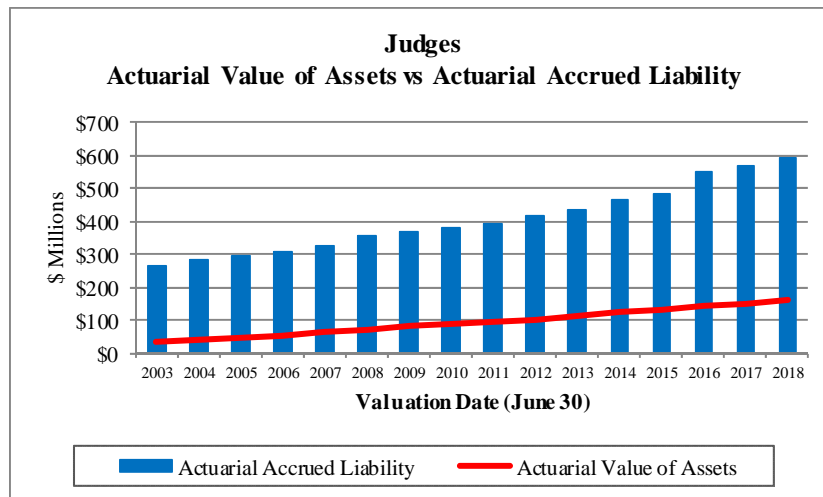
	<b>(\$ Millions)</b>
<b>Unfunded Actuarial Accrued Liability, June 30, 2017</b>	\$412.6
- Expected increase from amortization method	4.5
- Impact of the Policy Minimum Employer Contribution Rate	0.0
- Investment experience	3.0
- Liability experience	(1.3)
- Change from revised assumptions	12.3
- Change from revised asset smoothing method	0.0
- Other experience	<u>0.6</u>
<b>Unfunded Actuarial Accrued Liability, June 30, 2018</b>	\$431.7

As shown above, various components impacted the dollar amount of the UAAL. Actuarial gains (losses), which result from actual experience that is more (less) favorable than anticipated based on the actuarial assumptions in place in the prior valuation, are reflected in the UAAL and are measured as the difference between the expected UAAL and the actual UAAL, taking into account any changes due to actuarial assumptions and methods, or benefit provision changes. Overall, Judges experienced a net actuarial loss of \$1.7 million, the result of an actuarial loss of \$3.0 million on actuarial assets and a \$1.3 million actuarial gain on System liabilities. The liability gain was largely due to the gain from actual salary increases that were lower than expected, based on the assumption in last year’s valuation.

As the following graph of historical actuarial assets and accrued liabilities shows, due to the magnitude of the contributions to the Plan, the assets have been growing at a faster rate than the liabilities. As a result, the Plan’s funded ratio has steadily improved over time.



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An evaluation of the UAAL on a pure dollar basis may not provide a complete analysis since only the difference between the assets and liabilities (which are both very large numbers) is reflected. Another way to evaluate the UAAL and the progress made in its funding is to track the funded ratio, the ratio of the actuarial value of assets to the actuarial accrued liability. The funded status information, using both the actuarial value of assets and the market value of assets, is shown below (in millions).

	6/30/2013	6/30/2014	6/30/2015	6/30/2016	6/30/2017	6/30/2018
Using Actuarial Value of Assets:						
- Funded Ratio	25.5%	28.0%	27.8%	26.2%	26.9%	27.3%
- UAAL (\$M)	\$324	\$338	\$349	\$404	\$413	\$432
Using Market Value of Assets:						
- Funded Ratio	25.5%	28.7%	27.1%	24.1%	24.4%	25.3%
- UAAL (\$M)	\$324	\$330	\$352	\$416	\$427	\$444

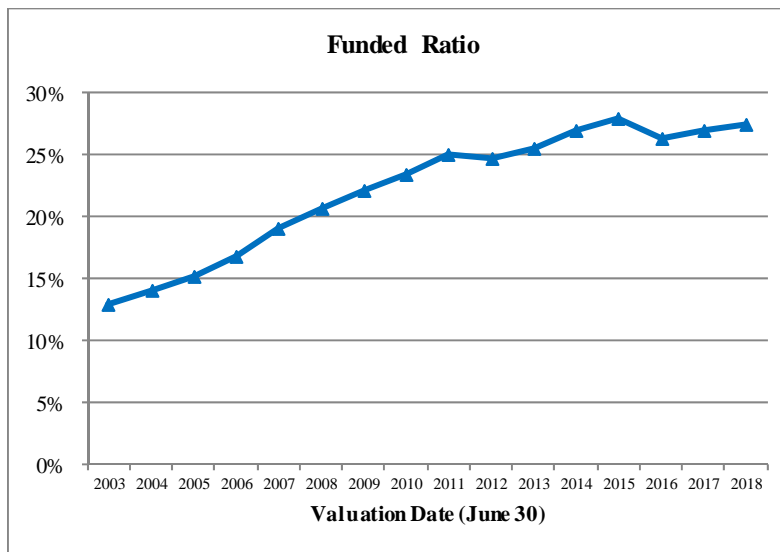
Note that the funded ratio does not indicate whether or not the System assets are sufficient to settle benefits earned to date. The funded ratio, by itself, also may not be indicative of future funding requirements. As shown in the table above, the funded ratios differ using the market value of assets.



## SECTION 1 – EXECUTIVE SUMMARY

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The funded ratio over a longer period is shown in the following graph:



Typically plans that have been in existence as long as Judges (over 40 years) have a funded ratio well above the current 27.3% level. However, until 1999, Judges was funded on a pay-as-you-go basis. As a result, each year's contribution was equal to the benefits and administrative expenses for that year only. In other words, the funded ratio was 0%. As a result of a change in funding policy that required contributions to equal the normal cost plus an UAAL amortization payment, the funded ratio has steadily increased over time. Assuming future experience follows the current actuarial assumptions, continued funding at the current policy will allow the funding ratio to increase, until the UAAL is fully amortized in 2048, and the funded ratio reaches 100%.

### Actuarial Required Contribution Rate

The Plan is funded by contributions from employers (actuarially determined) and employees hired after December 31, 2010 (4.00% of pay). Under the Entry Age Normal cost method, the actuarial contribution rate consists of two components:

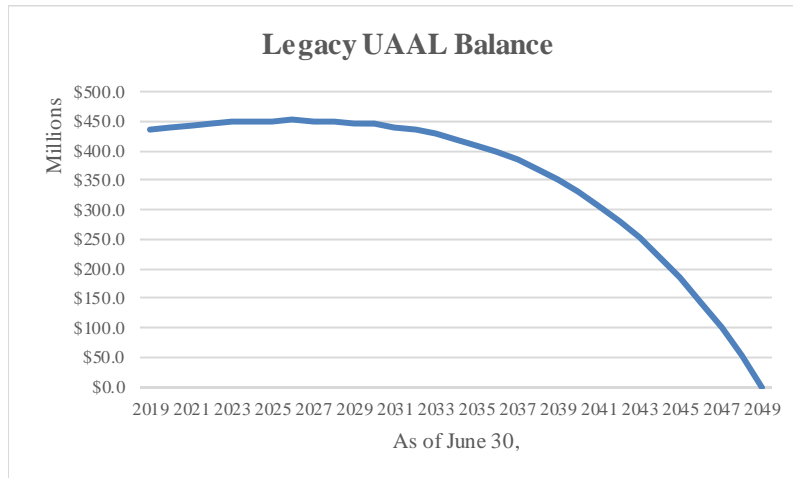
- A "normal cost" for the portion of projected liabilities allocated by the actuarial cost method to service of members during the year following the valuation date.
- An "unfunded actuarial accrued liability contribution" for the excess of the portion of projected liabilities allocated to service to date over the actuarial value of assets.

Effective with the June 30, 2018 valuation, the UAAL contribution rate is determined by amortizing the UAAL using the layered amortization method. To implement this method, the projected UAAL developed in the June 30, 2018 valuation is amortized as a level-percent of payroll over a closed, 30-year period. In subsequent years, changes to the projected UAAL that are generated by actuarial experience that is different than expected or changes in assumptions and methods will be amortized as a level-percent of payroll over separate closed, 30-year periods beginning on that date. Any change in the UAAL due to changes in the benefit provisions will be amortized over a closed 20-year period, as required by statute. Note that the use of closed amortization periods for each layer will eventually result in the System being fully funded, if all actuarial assumptions are met.



**SECTION 1 – EXECUTIVE SUMMARY**

The level percent of payroll methodology for UAAL payments results in dollar amounts of payments that are lower than the level-dollar payment method in the initial years of the amortization period, but increase each year in the future with the assumed payroll growth assumption of 2.50%. Because the UAAL contribution rate is determined as a level-percent of payroll, the dollar amount of the UAAL contribution is scheduled to increase 2.50% each year in the future even if all actuarial assumptions are met. If covered payroll increases, as expected based on the assumption, the contribution rate will remain stable. In addition, note that with this payment methodology the dollar amount of the UAAL is expected to hold steady for about ten years before starting to decline as illustrated in the following graph:



See Section 5 of the report for the detailed development of the employer contribution rate, which is summarized in the following table:

Contribution Rates	June 30 Valuation*	
	2018	2017
1. Normal Cost Rate	22.52%	22.29%
2. UAAL Contribution Rate	42.76%	42.71%
3. Total Actuarial Required Contribution Rate	65.28%	65.00%
4. Member Contribution Rate	(1.48%)	(1.29%)
5. Employer Contribution Rate	63.80%	63.71%

\*Note different assumptions were used in the two valuation reports so results are not directly comparable.

The total actuarial required contribution rate in the June 30, 2018 valuation is 65.28%. The member contribution rate (as a percentage of total payroll) is anticipated to be 1.48%, resulting in an employer contribution for the fiscal year ending June 30, 2020 of 63.80%. This amount exceeds the minimum employer contribution of 58.45%.



**SECTION 1 – EXECUTIVE SUMMARY**

The following table shows the reconciliation of the Computed Employer Contribution Rate from June 30, 2017 to June 30, 2018:

	<b>% of Payroll</b>
<b>6/30/2017 Computed Employer Contribution Rate</b>	<b>63.71%</b>
Asset (Gain)/Loss	0.33%
Liability (Gain)/Loss	(0.14%)
Economic Assumption Changes	3.26%
Change to Asset Smoothing Method	0.00%
Change to UAAL Amortization Method	(3.16%)
Projected Payroll Lower than Expected	0.26%
Impact of the Policy Minimum Employer Contribution Rate	0.00%
Change in Normal Cost Rate	(0.32%)
Change in Effective Employee Contribution Rate	(0.19%)
Other Experience	0.05%
<b>6/30/2018 Computed Employer Contribution Rate</b>	<b>63.80%</b>

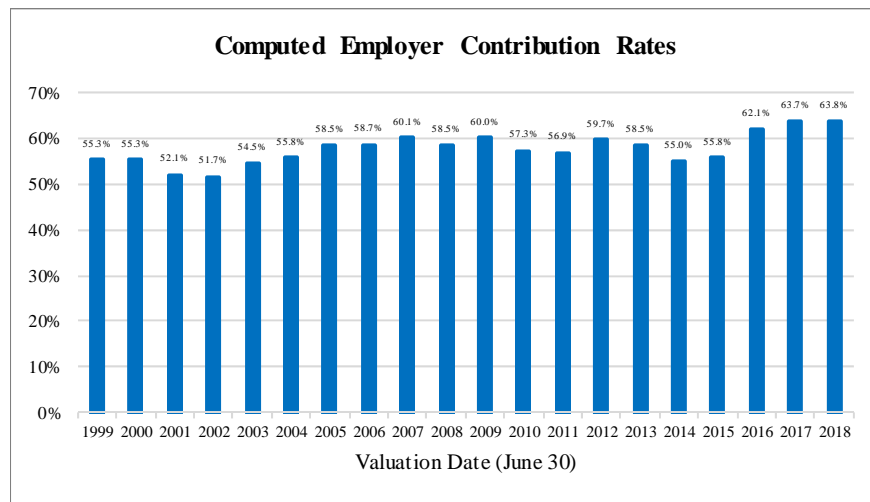
The state of Missouri has historically contributed the full actuarial contribution as shown in the table below which compares the computed employer contribution rates and actual contribution amounts:

<b>Fiscal Year Ending</b>	<b>Actuarially Determined Employer Contribution</b>	<b>Actual Dollar Amount</b>	<b>Percent Contributed</b>
June 30, 2005	\$21.9	\$21.9	100.0%
June 30, 2006	22.4	22.4	100.0%
June 30, 2007	23.7	23.7	100.0%
June 30, 2008	26.2	26.2	100.0%
June 30, 2009	27.7	27.7	100.0%
June 30, 2010	27.0	27.0	100.0%
June 30, 2011	27.8	27.8	100.0%
June 30, 2012	26.3	26.3	100.0%
June 30, 2013	28.3	28.3	100.0%
June 30, 2014	29.3	29.3	100.0%
June 30, 2015	32.7	32.7	100.0%
June 30, 2016	31.6	33.6	106.3%
June 30, 2017	32.7	34.2	104.6%
June 30, 2018	36.9	36.9	100.0%

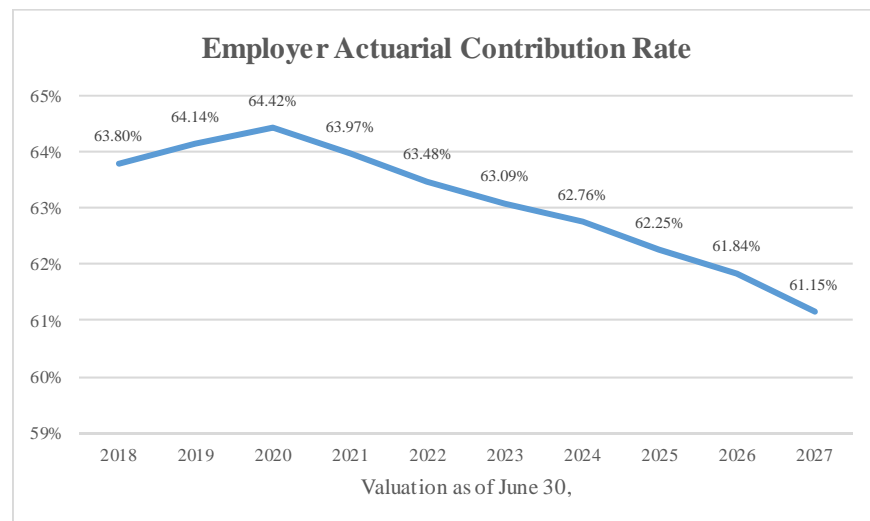


## SECTION 1 – EXECUTIVE SUMMARY

The historical computed employer contribution rates are shown graphically below:



The computed employer contribution rate, which is determined based on the snapshot of the System taken on each valuation date, is anticipated to increase over the short-term as the deferred investment experience is recognized through the asset smoothing method and the investment return assumption declines to 6.95% in the 2020 valuation. Anticipated increases in employee contributions, as a percentage of total payroll, will provide a small offset to the increase in the employer contribution rate. Future experience (both investment and demographic) will also have an impact on the ultimate level of Judges contributions. The following graph of the projected employer contribution rate over the next ten years reflects the combined impact of the recognition of the deferred investment experience (\$11.9 million) and the step down in the investment return assumption to 6.95% over the next two valuations:



The deferred investment losses (actuarial value of assets great than market value) is \$11.9 million as of June 30, 2018. Absent favorable investment experience in future years, the deferred investment losses will eventually be reflected in the actuarial value of assets in future years. While the use of an asset smoothing method is a common procedure for public retirement systems, it is important to identify the potential impact



## SECTION 1 – EXECUTIVE SUMMARY

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of the deferred investment experience. This is accomplished by comparing the key valuation results from the June 30, 2018 actuarial valuation using both the actuarial and market value of assets (see table below):

	Using Actuarial Value of Assets	Using Market Value of Assets
Actuarial Accrued Liability	\$593,788,592	\$593,788,592
Asset Value	<u>(162,135,045)</u>	<u>(150,199,575)</u>
Unfunded Actuarial Accrued Liability	\$431,653,547	\$443,589,017
Funded Ratio	27.3%	25.3%
Normal Cost Rate	22.52%	22.52%
UAAL Contribution Rate	<u>42.76%</u>	<u>44.02%</u>
Total Contribution Rate	65.28%	66.54%
Member Contribution Rate	<u>(1.48%)</u>	<u>(1.48%)</u>
Employer Contribution Rate	63.80%	65.06%

The next page contains a comprehensive summary of valuation results for the current and prior year. Detailed exhibits deriving the results are in the following sections.



**SECTION 1 – EXECUTIVE SUMMARY****SUMMARY OF PRINCIPAL RESULTS**  
(\$ in millions)

<b>Valuation Date</b>	<b>June 30, 2018</b>	<b>June 30, 2017</b>	
<b>Contribution for Fiscal Year Ending</b>	<b>June 30, 2020</b>	<b>June 30, 2019</b>	<b>% Change</b>
<b>Computed Employer Contribution</b>			
Annual Amount (Estimated)	\$40.1	\$39.4	1.8%
Percentage of Covered Payroll	63.80%	63.71%	0.1%
<b>Benefit Payments</b>	\$35.7	\$34.0	5.0%
<b>Membership</b>			
Number of			
- Active Members	415	410	1.2%
- Retirees and Beneficiaries	569	559	1.8%
- Terminated Vested Members	26	25	4.0%
- Leave-of-Absence Members	0	1	(100.0%)
- Long Term Disability Members	0	0	0.0%
- Total	1,010	995	1.5%
- Reported Payroll	\$59.6	\$58.2	2.4%
<b>Assets</b>			
Market Value (MVA)	\$150.2	\$137.6	9.2%
Actuarial Value (AVA)	\$162.1	\$151.8	6.8%
Ratio - Actuarial Value to Market Value	108%	110%	
Return on Market Value	7.71%	3.53%	
Return on Actuarial Value	5.51%	5.18%	
<b>Actuarial Information</b>			
Actuarial Accrued Liability (AAL)	\$593.8	\$564.4	5.2%
Unfunded Actuarial Accrued Liability (UAAL)	\$431.7	\$412.6	4.6%
Funded Ratio	27.3%	26.9%	1.5%
Amortization Period	30 Years	27 years	
Ratio of AVA to Payroll	2.7	2.6	
Ratio of AAL to Payroll	10.0	9.7	
Normal Cost Rate	22.52%	22.29%	1.0%
UAAL Contribution Rate	42.76%	42.71%	0.1%
Total Contribution Rate	65.28%	65.00%	
Member Contribution Rate	(1.48%)	(1.29%)	14.7%
Employer Contribution Rate	63.80%	63.71%	0.1%



## **SECTION 2 – SCOPE OF THE REPORT**

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This report presents the actuarial valuation results of the Missouri State Employees' Retirement System – Judges as of June 30, 2018. This valuation was prepared at the request of the MOSERS Board.

Please pay particular attention to our actuarial certification letter, where the guidelines employed in the preparation of this report are outlined. We also comment on the sources and reliability of both the data and the actuarial assumptions upon which our findings are based. Those comments are the basis for our certification that this report is complete and accurate to the best of our knowledge and belief.

A summary of the findings which result from this valuation is presented in the previous section. Section 3 describes the assets and investment experience of the System. Sections 4 and 5 describe how the obligations of the System are to be met under the System's funding policy. Section 6 contains projections of future valuation results, assuming all actuarial assumptions are met. Section 7 includes some historical funding information that was required by the Governmental Accounting Standards Board (GASB) in the past.



## **SECTION 3 – SYSTEM ASSETS**

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In many respects, an actuarial valuation can be thought of as an inventory process. The inventory is taken as of the actuarial valuation date, which for this valuation is June 30, 2018. On that date, the assets available for the payment of benefits are appraised. The assets are compared with the liabilities of the System, which are generally in excess of assets. The actuarial process then leads to a method of determining the contributions needed by members and the employer in the future to balance the System assets and liabilities.

### **Market Value of Assets**

The current market value represents the "snapshot" or "cash-out" value of System assets as of the valuation date. In addition, the market value of assets provides a basis for measuring investment performance from time to time. Table 1 shows a summary of changes to both the market and the actuarial value assets for the year beginning June 30, 2017 and ending June 30, 2018.

### **Actuarial Value of Assets**

Neither the market value of assets, representing a "cash-out" value of System assets, nor the book values of assets, representing the cost of investments, may be the best measure of the System's ongoing ability to meet its obligations.

To arrive at a suitable value of assets for the actuarial valuation, a technique for determining the actuarial value of assets is used which dampens swings in the market value while still indirectly recognizing market values.

Table 2 shows the development of the actuarial value of assets (AVA) as of the valuation date.



SECTION 3 – SYSTEM ASSETS

TABLE 1  
ASSET SUMMARY

	Judges	
	Market Value	Actuarial Value
1. Assets at June 30, 2017	137,634,941	151,828,631
2. Asset Adjustment for GASB 75	(68,711)	(68,711)
3. Adjusted Assets at June 30, 2017	137,566,230	151,759,920
4. Contributions		
State Contributions	36,892,203	36,892,203
Employee Contributions	902,319	902,319
Member Purchases of Service Credit	0	0
Total	37,794,522	37,794,522
5. Investment Income, Net of Investment Expenses	10,677,666	8,419,446
6. Benefit Payments		
Monthly Benefit Payments	35,651,489	35,651,489
Contribution Refunds	5,759	5,759
Total	35,657,248	35,657,248
7. Administrative and Misc. Expenses	181,595	181,595
8. Assets at June 30, 2018 (3) + (4) + (5) - (6) - (7)	150,199,575	162,135,045
9. Rate of Return, Net of Investment Expenses*	7.71%	5.51%

\* Based on the approximation formula:  $I / [.5 \times (A+B-I)]$ , where

I = Investment Increment

A = Beginning of year asset value

B = End of year asset value



**SECTION 3 – SYSTEM ASSETS**

**TABLE 2  
DEVELOPMENT OF ACTUARIAL VALUE OF ASSETS**

Under the current asset smoothing method, the difference between the actual and assumed investment return on the market value of assets will be recognized evenly over a closed five-year period. The method was first implemented with the June 30, 2018 valuation. Deferred asset experience as of June 30, 2017 will be recognized evenly over a closed seven-year period, beginning June 30, 2018.

<b>Fiscal Year End June 30,</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>
A. Market Value of Assets, Beginning of Year	\$ 137,566,230	\$ NA	\$ NA	\$ NA
B. Contributions During Year	37,794,522	NA	NA	NA
C. Benefit Payments and Expenses During Year	35,838,843	NA	NA	NA
D. Expected Rate of Return	7.50%	7.25%	7.10%	6.95%
E. Expected Net Investment Income	10,389,479			
F. Expected Market Value of Assets, End of Year	149,911,388	NA	NA	NA
G. Market Value of Assets, End of Year	150,199,575			
H. Excess/(Shortfall) of Net Investment Income	\$ 288,187	\$ NA	\$ NA	\$ NA

The table below shows the development of gain/(loss) to be recognized in the current year:

<b>Plan Year Ended</b>	<b>Asset Gain/(Loss)</b>	<b>Gain/(Loss) Recognized in Prior Years</b>	<b>Gain/(Loss) Recognized This Year</b>	<b>Gain/(Loss) Deferred to Future Years</b>
6/30/2017	(14,193,690)	0	(2,027,670) *	(12,166,020)
6/30/2018	288,187	0	57,637	230,550
<b>Total</b>	<b>(13,905,503)</b>	<b>0</b>	<b>(1,970,033)</b>	<b>(11,935,470)</b>

A. Market Value of Assets as of June 30, 2018	\$ 150,199,575
B. Total Deferred Investment Experience	\$ (11,935,470)
C. Actuarial Value of Assets as of June 30, 2018 (A. - B.)	\$ 162,135,045
D. Ratio of Actuarial Value to Market Value	107.9%

\* The unrecognized investment experience as of June 30, 2017 will be recognized over a closed seven-year period.



## SECTION 4 – SYSTEM LIABILITIES

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In the previous section, an analysis of System's current assets was given as of June 30, 2018. In this section, the discussion will focus on the commitments (future benefit payments) of the System, which are referred to as its liabilities.

Table 3 contains an analysis of the actuarial present value of all future benefits (PVFB) for contributing members, inactive members, retirees and their beneficiaries. The liabilities summarized in Table 3 include the actuarial present value of all future benefits expected to be paid with respect to each member. For an active member, this value includes measures of both benefits already earned and future benefits expected to be earned. For all members, active and retired, the value extends over benefits earnable and payable for the rest of their lives and, if an optional benefit is chosen, for the lives of their surviving spouses.

The actuarial assumptions used to determine liabilities are based on the results of the latest experience study. These assumptions are outlined in Appendix C.

Table 4 illustrates the amortization schedule of the projected UAAL calculated in Table 4, given the Board's funding policy that amortizes the UAAL using a "layered" bases method. Under this method, the "Legacy UAAL", as determined in the June 30, 2018 valuation, is amortized over a closed 30-year period. Subsequent changes in the UAAL due to actuarial gains/losses or assumption changes are separately financed by establishing amortization bases and payments, as a level percentage of payroll, over closed 30-year periods. Any change in the System's benefit structure shall be amortized over a closed period of 20 years, as set out in state statutes. The total UAAL amortization payment is the sum of the payments for each of the amortization bases. Note that the use of closed amortization periods will result in the System being fully funded at the end of the amortization period, if all actuarial assumptions are met.

All liabilities reflect the benefit provisions in place as of June 30, 2018, as amended by any legislation in the 2018 Legislative Session.

### **Actuarial Accrued Liability**

A fundamental principle in financing the liabilities of a retirement program is that the cost of its benefits should be related to the period in which benefits are earned, rather than to the period of benefit distribution. An actuarial cost method is a mathematical technique that allocates the present value of future benefits into annual costs. In order to do this allocation, it is necessary for the funding method to "breakdown" the present value of future benefits into two components:

- (1) that which is attributable to the past and
- (2) that which is attributable to the future.

Actuarial terminology calls the part attributable to the past the "past service liability" or the "actuarial accrued liability." The portion allocated to the future is known as the present value of future normal costs, with the specific piece of it allocated to the current year being called the "normal cost." Table 5 contains the actuarial balance sheet for the System. The Entry Age Normal actuarial cost method is used to develop the actuarial accrued liability. Table 6 shows the gain/(loss) analysis in total for the System.



**TABLE 3**  
**UNFUNDED ACTUARIAL ACCRUED LIABILITY**

	(1)	(2)	(3) = (1) - (2)
	Actuarial Present Value	Present Value of Future Normal Cost Contributions	Actuarial Accrued Liabilities
<b>Active Members</b>			
Service retirement benefits based on service rendered before and likely to be rendered after valuation date	\$253,121,720	\$75,009,370	\$178,112,350
Disability benefits likely to be paid to present active members who become totally and permanently disabled	1,436,998	1,300,956	136,042
Survivor benefits likely to be paid to widows and children of present active members who die before retiring	5,389,300	3,350,950	2,038,350
Separation benefits likely to be paid to present active members	8,848,882	9,298,238	(449,356)
Active Member Totals	\$268,796,900	\$88,959,514	\$179,837,386
<b>Members on Leave of Absence &amp; LTD</b>			
Service retirement benefits based on service rendered before the valuation date			0
<b>Terminated Vested Members</b>			
Service retirement benefits based on service rendered before the valuation date			12,225,596
<b>Retired Lives</b>			401,725,610
<b>Total Actuarial Accrued Liability</b>			\$593,788,592
<b>Actuarial Value of Assets</b>			162,135,045
<b>Unfunded Actuarial Accrued Liability</b>			\$431,653,547
<b>Funded Ratio</b>			27.3%



**TABLE 4**  
**AMORTIZATION SCHEDULE FOR UAAL**

As of June 30	Unfunded Actuarial Accrued Liability (BOY)	Amortization Years Remaining	Contributions
			(\$M)
2019	436	30	27
2020	440	29	28
2021	443	28	28
2022	446	27	29
2023	448	26	30
2024	450	25	30
2025	451	24	31
2026	451	23	32
2027	451	22	33
2028	450	21	34
2029	448	20	34
2030	444	19	35
2031	440	18	36
2032	434	17	37
2033	427	16	38
2034	419	15	39
2035	409	14	40
2036	397	13	41
2037	384	12	42
2038	368	11	43
2039	350	10	44
2040	330	9	45
2041	307	8	46
2042	281	7	47
2043	253	6	49
2044	221	5	50
2045	185	4	51
2046	145	3	52
2047	102	2	54
2048	53	1	55
2049	0	0	0





**SECTION 4 – SYSTEM LIABILITIES**

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**TABLE 5  
ACTUARIAL BALANCE SHEET**

ASSETS

Actuarial Value of Assets	\$	162,135,045
Unfunded Actuarial Accrued Liability		431,653,547
Present Value of Future Normal Costs		<u>88,959,514</u>
Total Assets	\$	682,748,106

LIABILITIES

Present Value of Future Benefits

Active members

Retirement	\$	253,121,720	
Withdrawal		8,848,882	
Death		5,389,300	
Disability		<u>1,436,998</u>	
Total	\$		268,796,900

Inactive members

Currently receiving benefits		401,725,610	
Not currently receiving benefits		<u>12,225,596</u>	
Total	\$		413,951,206

Total Liabilities	\$		682,748,106
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**SECTION 4 – SYSTEM LIABILITIES****TABLE 6  
ANALYSIS OF GAIN/(LOSS)**

	(1) Actuarial Accrued Liabilities	(2) Valuation Assets	(3) = (1) - (2) UAAL
(1) Value at start of year	\$ 564,417,925	\$ 151,828,631	\$ 412,589,294
(2) Asset adjustment for GASB 75	<u>0</u>	<u>(68,711)</u>	<u>68,711</u>
(3) Adjusted value at start of year	564,417,925	151,759,920	412,658,005
(4) Total normal cost from last valuation	12,090,417	0	12,090,417
(5) Actual contributions (Employer and Member)	0	37,794,522	(37,794,522)
(6) Benefit payments	(35,657,248)	(35,657,248)	0
(7) Administrative expenses	0	(181,595)	181,595
(8) Interest on (3), (4), (5), (6) and (7) at 7.50%	<u>41,925,152</u>	<u>11,454,006</u>	<u>30,471,146</u>
(9) Expected value before changes	\$ 582,776,246	\$ 165,169,605	\$ 417,606,641
(10) Change in actuarial assumptions and methods	<u>12,332,042</u>	<u>(41,615)</u>	<u>12,373,657</u>
(11) Expected value after changes: (9) + (10)	\$ 595,108,288	\$ 165,127,990	\$ 429,980,298
(12) Actual value at end of year	593,788,592	162,135,045	431,653,547
(13) Gain / (Loss)	\$ 1,319,696	\$ (2,992,945)	\$ (1,673,249)
(14) Gain / (Loss) as percent of expected actuarial accrued liabilities: \$582,776,246	0.2%	(0.5%)	(0.3%)



## **SECTION 5 – EMPLOYER CONTRIBUTIONS**

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The previous two sections were devoted to a discussion of the System's assets and liabilities. Table 5 indicates that current assets fall short of meeting the present value of future benefits (total liability). This is expected in all but a completely closed fund, where no further contributions are anticipated. In an active system, there will almost always be a difference between the actuarial value of assets and total liabilities. This deficiency has to be made up by future contributions and investment returns. An actuarial valuation sets out a schedule of future contributions that will deal with this deficiency in an orderly fashion.

The method used to determine the incidence of the contributions in various years is called the actuarial cost method. Under an actuarial cost method, the contributions required to meet the difference between current assets and current liabilities are allocated each year between two elements: (1) the normal cost rate and (2) the unfunded actuarial accrued liability contribution rate.

The term "fully funded" is often applied to a system in which contributions at the normal cost rate are sufficient to pay for the benefits of existing employees as well as for those of new employees. More often than not, systems are not fully funded, either because of past benefit improvements that have not been completely funded or because of actuarial deficiencies that have occurred because experience has not been as favorable as anticipated by the actuarial assumptions. Under these circumstances, an unfunded actuarial accrued liability (UAAL) exists. Likewise, when the actuarial value of assets is greater than the actuarial accrued liability, a surplus exists.

### **Description of Contribution Rate Components**

The Entry Age Normal (EAN) actuarial cost method is used for the valuation. Under that method, the normal cost for each year from entry age to assumed exit age is a constant percentage of the member's year by year projected compensation. The portion of the present value of future benefits not provided by the present value of future normal costs is the actuarial accrued liability. The unfunded actuarial accrued liability/ (surplus) represents the difference between the actuarial accrued liability and the actuarial value of assets as of the valuation date. The unfunded actuarial accrued liability is calculated each year and reflects experience gains and losses.

In general, contributions are computed in accordance with a level percent-of-payroll funding objective. The contribution rate based on the June 30, 2018 actuarial valuation will be used to determine the actuarial required employer contribution rate for the plan year ending June 30, 2020. In this context, the term "contribution rate" means the percentage, which is applied to a particular active member payroll to determine the actual employer contribution amount (i.e., in dollars) for the group.

### **Contribution Rate Summary**

Table 7 shows the development of the June 30, 2019 projected UAAL. In Table 8, the amortization payment related to the UAAL is developed. Table 9 develops the computed employer contribution rate for the Plan and the estimated amount of required State contributions. Table 10 shows a summary what the actuarial results would be under different investment return assumptions.

The contribution rates shown in this report are based on the actuarial assumptions and cost methods described in Appendix C.



**SECTION 5 – EMPLOYER CONTRIBUTIONS**

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**TABLE 7  
PROJECTED UAAL AS OF JUNE 30, 2019**

(1) Unfunded Actuarial Accrued Liability at June 30, 2018	431,653,547
(2) Expected Contribution Rate for Year Ending June 30, 2019*	65.00%
(3) Normal Cost Rate for Year Ending June 30, 2019	22.52%
(4) Contribution Rate Applied to UAAL [(2) - (3)]	42.48%
(5) Projected Payroll for the Year After the Valuation Date	61,388,628
(6) Expected UAAL Contribution [(4) * (5)]	26,077,889
(7) Interest on (1) and (6) to June 30, 2019 at 7.25%	30,366,098
(8) Projected UAAL at June 30, 2019 [(1) - (6) + (7)]	435,941,756

\*The Total Contribution Rate was the employer rate of 63.71% plus the weighted average member rate of 1.29% of payroll.



SECTION 5 – EMPLOYER CONTRIBUTIONS

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**TABLE 8**  
**UAAL CONTRIBUTION RATE**

<b>Amortization Base</b>	<b>Original Amount</b>	<b>Remaining Payments</b>	<b>Projected June 30, 2019 Balance</b>	<b>Annual Payment*</b>
2018 Legacy UAAL	435,941,756	30	435,941,756	26,908,378
<b>Total</b>			<b>\$ 435,941,756</b>	<b>\$ 26,908,378</b>

\* Payment amount reflects mid-year timing.

1. Total UAAL Amortization Payments	\$	26,908,378
2. Expected Payroll for FYE 2020	\$	62,923,344
3. UAAL Amortization Payment Rate (1) / (2)		42.76%



**SECTION 5 – EMPLOYER CONTRIBUTIONS**

**TABLE 9  
COMPUTED EMPLOYER CONTRIBUTION RATE  
FOR THE FISCAL YEAR ENDING JUNE 30, 2020**

**ACTUARIAL VALUATION RESULTS AS OF JUNE 30, 2018**

	Percents of Payroll		Weighted Average
	Pre 1/1/2011 Hires	Post 1/1/2011 Hires	
A. Normal Cost			
(1) Service retirement benefits	19.85 %	17.40 %	18.93 %
(2) Termination benefits	2.52	1.51	2.15
(3) Survivor benefits	0.78	0.90	0.83
(4) Disability benefits	0.31	0.31	0.31
(5) Administrative expenses	0.30	0.30	0.30
(6) Total	<u>23.76</u>	<u>20.42</u>	<u>22.52</u>
B. Less Member Contributions	0.00	4.00	1.48
C. Employer Normal Cost [A(6) - B]	23.76	16.42	21.04
D. Unfunded Actuarial Accrued Liabilities (UAAL) (level percent-of-payroll amortization with layered bases)			<u>42.76</u>
<b>E. TOTAL COMPUTED EMPLOYER CONTRIBUTION RATE [C. + D.]</b>			<b>63.80 %</b>
<b>F. POLICY MINIMUM EMPLOYER CONTRIBUTION RATE</b>			<b>58.45 %</b>
<b>G. ESTIMATED EMPLOYER CONTRIBUTION (\$Millions)#</b>			<b>\$40.1</b>

At the September 18, 2014 meeting, the Board adopted a policy minimum contribution rate so that the employer shall not fall below the fiscal 2015 rate (58.45% of payroll) until the plan is 80% funded.

# Illustrative only. Estimated employer contribution amounts (shown in millions) are based on the greater of the Total Computed Employer Contribution Rate and the Policy Minimum Contribution Rate shown and the valuation payroll projected two years into the applicable fiscal year using the valuation assumption of 2.50% per year.



SECTION 5 – EMPLOYER CONTRIBUTIONS

TABLE 10  
COMPARISON OF VALUATION RESULTS UNDER ALTERNATE  
INVESTMENT RETURN ASSUMPTIONS

Investment Return Assumption	6.25%	6.75%	7.25%	7.75%	8.25%
<b>Contributions</b>					
Total Normal Cost	27.28%	24.77%	22.52%	20.51%	18.71%
Member Contributions	1.48%	1.48%	1.48%	1.48%	1.48%
Employer Normal Cost	25.80%	23.29%	21.04%	19.03%	17.23%
Unfunded Actuarial Accrued Liability	43.52%	43.17%	42.76%	42.32%	41.83%
<b>Total Employer Contribution</b>	69.32%	66.46%	63.80%	61.35%	59.06%
<b>Total Employer Contribution (\$ in millions)</b>	\$43.6	\$41.8	\$40.1	\$38.6	\$37.2
<b>Actuarial Value of Assets</b>	\$162.1	\$162.1	\$162.1	\$162.1	\$162.1
<b>Actuarial Accrued Liability</b>	\$654.8	\$623.1	\$593.8	\$566.7	\$541.6
<b>Funded Ratio</b>	24.8%	26.0%	27.3%	28.6%	29.9%

Note: All other assumptions are unchanged for purposes of this sensitivity analysis.



## SECTION 6 – PROJECTIONS

The June 30, 2018 valuation results present the System’s financial status at a single point in time and contribution requirements for a single fiscal year. Historical valuation results allow analysis of past trends, but no insight into future trends. A projection model provides insight into the longer term trend of (1) the projected Employer contributions; (2) the projected System funded status (ratio of actuarial assets over liabilities); (3) net cash flow patterns; and (4) the unfunded actuarial accrued liability (actuarial accrued liability minus actuarial assets). Projections can also be used to demonstrate how sensitive the valuation results are to the key variables being modeled, but such sensitivities are not included in this report.

For Judges, projections are particularly important and insightful due to the multiple-tiered benefit structure. The current valuation produces a normal cost and accrued liability based on the composition of active members on the valuation date, June 30, 2018. Without a tiered structure, systems can assume that the normal cost, as a percentage of payroll, will remain relatively level. However, since all new employees are covered under a less costly benefit structure, until all new employees are covered under the post-2010 benefit structure, the normal cost percentage will continue to decrease. In addition, members hired after 2010 are the only group making employee contributions so projections allow for the projected payroll to be segregated by tier so that total future contributions reflect an estimate of the amounts to be contributed by employees.

The member data (active and in-pay status) is projected for each year in the future using current assumptions. After the first year, a new-member profile is used to estimate the demographics of new employees replacing members who are projected to terminate, retire, die or become disabled in future years. For this modeling, the number of active members is assumed to remain level over the projection period.

These projections assume that all actuarial assumptions are met in all future years, including the investment return assumption, and that the Employer makes contributions equal to the full amount of the actuarially determined contribution, as calculated by the valuation, based on the Board’s Funding Policy. In addition, the projections assume the Board will not take action to change the current phase-in of assumptions. Therefore, the economic assumptions used in the projections are shown in the table below. The projections are based on the current plan provisions and assume that all new members joining after June 30, 2018 will make employee contributions and be in the post-2010 benefit structure.

<b>Economic Assumption</b>	<b>Effective June 30, 2018</b>	<b>Effective June 30, 2019</b>	<b>Effective June 30, 2020</b>
6. Investment Return	7.25%	7.10%	6.95%
7. Inflation	2.50%	2.35%	2.25%
8. Cost-of-Living Adjustment (COLA)	2.00%	1.88%	1.80%
9. General Wage Growth	2.75%	2.60%	2.50%
10. Payroll Growth	2.50%	2.35%	2.25%

The projections do not predict the System’s financial condition or its ability to pay benefits in the future and do not provide any guarantee of future financial soundness of the System nor do they, on their own, indicate future funding requirements. Over time, a defined benefit plan’s total cost will depend on a number of factors, including the amount of benefits paid, the number of people paid benefits, plan expenses and the amount of earnings on assets invested to pay benefits. These amounts, and other variables, are uncertain and unknowable at the time the projections were prepared. Because not all of the assumptions will unfold exactly as expected, actual results will differ from the projections shown.





SECTION 6 – PROJECTIONS

**TABLE 11  
30-YEAR PROJECTION OF ACTUARIAL VALUATION RESULTS  
AS OF JUNE 30, 2018**

Projection Based on Assumptions Outlined in Appendix D Amounts in thousands											
Valuation as of June 30, (1)	Covered Payroll at Valuation (2)	Actuarial Accrued Liability (AAL) (3)	Actuarial Value of Assets (AVA) (4)	Unfunded AAL (5)	Funded Ratio Using AVA (6)	Normal Cost Rate (7)	UAAL Amortization Payment Rate (8)	Actuarial Contribution Rate (9)	Member Contribution Rate (10)	Employer Actuarial Contribution Rate (11)	Estimated Dollar Amount of Employer Contribution* (12)
2018	\$61,389	\$593,789	\$162,135	\$431,654	27.3%	22.52%	42.76%	65.28%	1.48%	63.80%	\$39,899
2019	62,538	616,053	173,123	442,929	28.1%	22.12%	43.74%	65.86%	1.72%	64.14%	40,798
2020	63,607	637,809	183,446	454,363	28.8%	21.81%	44.57%	66.38%	1.96%	64.42%	41,769
2021	64,839	652,115	193,057	459,058	29.6%	21.28%	44.89%	66.17%	2.20%	63.97%	42,301
2022	66,127	665,084	202,408	462,676	30.4%	20.73%	45.17%	65.90%	2.42%	63.48%	42,841
2023	67,488	676,889	211,263	465,627	31.2%	20.30%	45.41%	65.71%	2.62%	63.09%	43,413
2024	68,811	687,345	219,545	467,800	31.9%	19.89%	45.67%	65.56%	2.80%	62.76%	44,126
2025	70,309	697,024	229,727	467,296	33.0%	19.55%	45.65%	65.20%	2.95%	62.25%	44,707
2026	71,818	705,548	239,704	465,845	34.0%	19.28%	45.64%	64.92%	3.08%	61.84%	45,423
2027	73,453	713,468	249,708	463,759	35.0%	18.78%	45.56%	64.34%	3.19%	61.15%	45,859
2028	74,995	719,683	259,362	460,321	36.0%	18.49%	45.56%	64.05%	3.32%	60.73%	46,564
2029	76,674	725,306	268,954	456,352	37.1%	18.06%	45.51%	63.57%	3.41%	60.16%	47,121
2030	78,326	729,592	278,550	451,043	38.2%	17.73%	45.49%	63.22%	3.51%	59.71%	47,806
2031	80,063	732,828	288,141	444,687	39.3%	17.56%	45.45%	63.01%	3.59%	59.42%	48,632
2032	81,844	735,561	298,242	437,319	40.5%	17.44%	45.42%	62.86%	3.65%	59.21%	49,592
2033	83,756	738,110	309,385	428,725	41.9%	17.35%	45.34%	62.69%	3.72%	58.97%	50,486
2034	85,613	740,317	321,726	418,591	43.5%	17.27%	45.31%	62.58%	3.77%	58.81%	51,499
2035	87,568	742,536	335,564	406,972	45.2%	17.25%	45.26%	62.51%	3.81%	58.70%	52,596
2036	89,601	745,191	351,438	393,753	47.2%	17.24%	45.19%	62.43%	3.85%	58.58%	53,679
2037	91,633	748,353	369,635	378,717	49.4%	17.25%	45.15%	62.40%	3.88%	58.52%	54,884
2038	93,787	752,266	390,492	361,774	51.9%	17.27%	45.07%	62.34%	3.91%	58.43%	56,062
2039	95,946	756,884	414,217	342,667	54.7%	17.28%	45.02%	62.30%	3.93%	58.37%	57,241
2040	98,066	761,652	440,497	321,156	57.8%	17.30%	45.00%	62.30%	3.95%	58.35%	58,588
2041	100,408	766,653	469,435	297,218	61.2%	17.33%	44.89%	62.22%	3.96%	58.26%	59,828
2042	102,691	771,390	500,984	270,406	64.9%	17.36%	44.84%	62.20%	3.97%	58.23%	61,168
2043	105,046	775,824	535,080	240,744	69.0%	17.41%	44.77%	62.18%	3.98%	58.20%	62,530
2044	107,440	779,871	571,932	207,939	73.3%	17.45%	44.71%	62.16%	3.98%	58.18%	63,958
2045	109,931	783,854	612,029	171,826	78.1%	17.48%	44.62%	62.10%	3.99%	58.11%	65,399
2046	112,544	788,067	655,919	132,148	83.2%	17.52%	44.52%	62.04%	3.99%	58.05%	66,888
2047	115,224	792,521	703,928	88,592	88.8%	17.54%	44.41%	61.95%	3.99%	57.96%	68,416

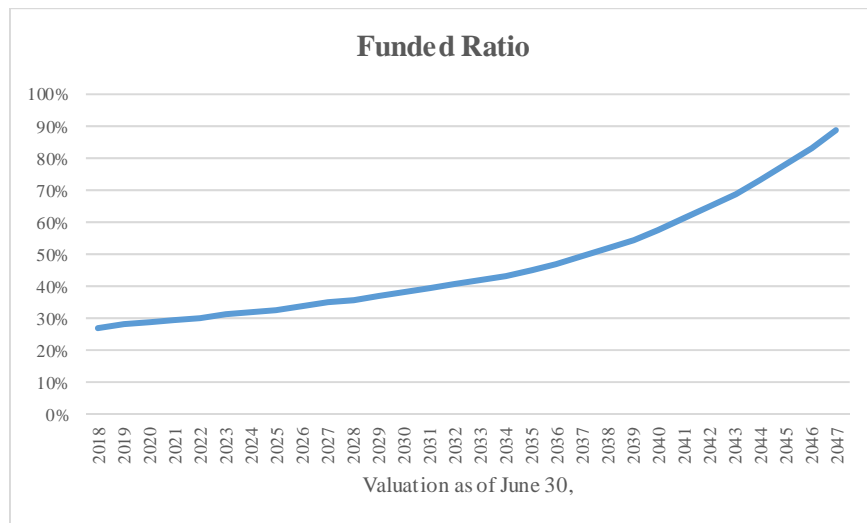
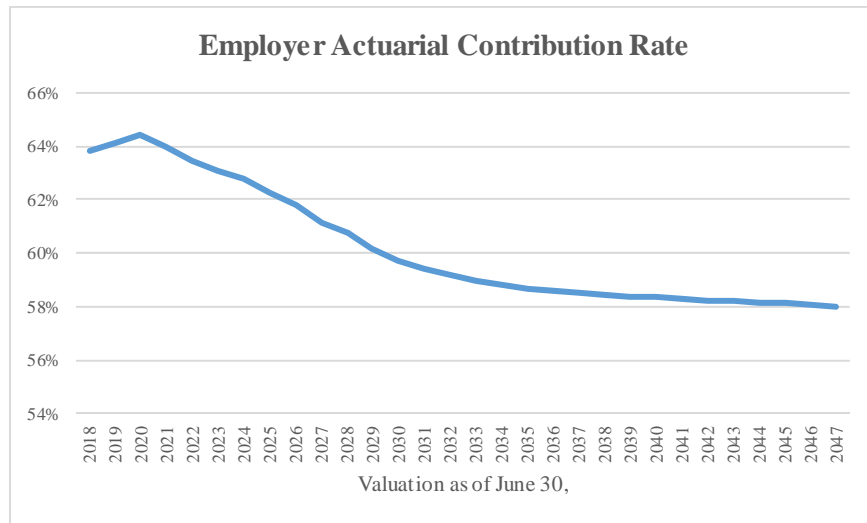
\* Amounts shown are contributions in the fiscal year ending two years after the valuation date.

Note: Projections assume phase-in of assumptions until an investment return assumption of 6.95% is reached with the June 30, 2020 valuation. Projections also assume the active population remains constant over the projection period.



**TABLE 11**  
**30-YEAR PROJECTION OF ACTUARIAL VALUATION RESULTS**  
**AS OF JUNE 30, 2018**

(continued)

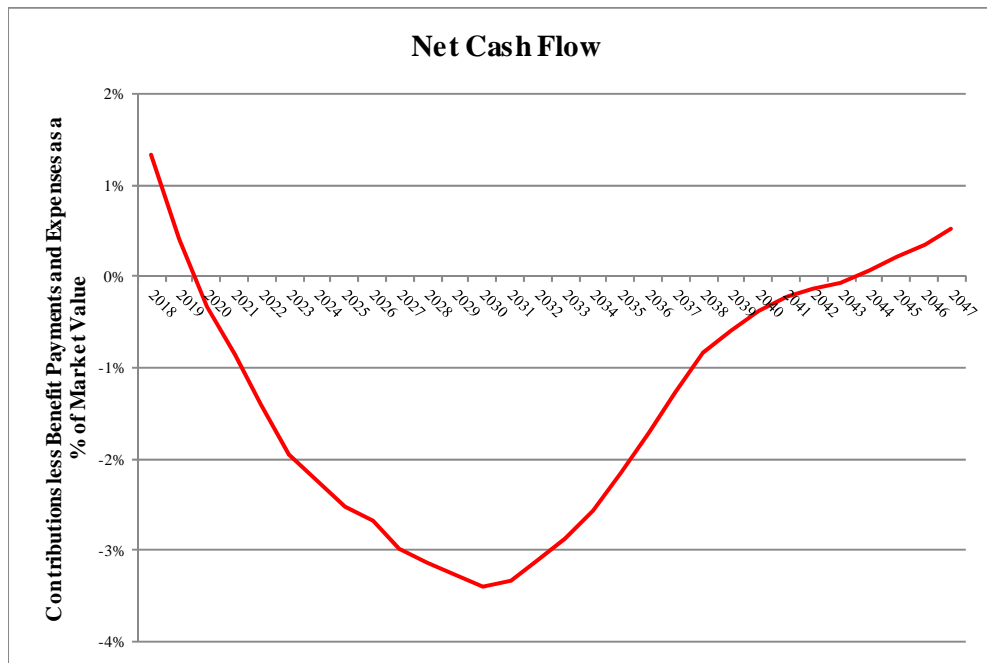




SECTION 6 – PROJECTIONS

**TABLE 12**  
**30-YEAR PROJECTION OF NET CASH FLOWS**  
**AS OF JUNE 30, 2018**

Projection Based on Assumptions Outlined in Appendix D						
Amounts in thousands						
Valuation as of June 30, (1)	Total Contributions (2)	Benefit Payments (3)	Administrative Expenses (4)	Net Cash Flows (5)	Market Value of Assets (MVA) (6)	Net Cash Flow as a % of MVA (7)
2018	\$39,903	\$37,719	\$186	\$1,998	\$150,200	1.33%
2019	40,825	39,950	191	685	163,158	0.42%
2020	41,892	42,290	195	(593)	175,451	(0.34%)
2021	43,040	44,463	199	(1,621)	187,031	(0.87%)
2022	43,756	46,360	204	(2,808)	198,353	(1.42%)
2023	44,475	48,358	208	(4,091)	209,235	(1.96%)
2024	45,216	49,912	213	(4,909)	219,545	(2.24%)
2025	46,095	51,669	218	(5,792)	229,727	(2.52%)
2026	46,825	53,037	223	(6,435)	239,704	(2.68%)
2027	47,686	54,905	228	(7,447)	249,708	(2.98%)
2028	48,252	56,174	233	(8,155)	259,362	(3.14%)
2029	49,109	57,667	238	(8,796)	268,954	(3.27%)
2030	49,792	58,995	243	(9,446)	278,550	(3.39%)
2031	50,616	59,963	249	(9,596)	288,141	(3.33%)
2032	51,570	60,584	254	(9,268)	298,242	(3.11%)
2033	52,649	61,247	260	(8,858)	309,385	(2.86%)
2034	53,671	61,646	266	(8,241)	321,726	(2.56%)
2035	54,800	61,730	272	(7,202)	335,564	(2.15%)
2036	56,009	61,753	278	(6,022)	351,438	(1.71%)
2037	57,207	61,596	284	(4,673)	369,635	(1.26%)
2038	58,523	61,534	291	(3,301)	390,492	(0.85%)
2039	59,813	61,941	297	(2,425)	414,217	(0.59%)
2040	61,095	62,411	304	(1,620)	440,497	(0.37%)
2041	62,554	63,285	311	(1,042)	469,435	(0.22%)
2042	63,894	64,275	318	(698)	500,984	(0.14%)
2043	65,339	65,339	325	(325)	535,080	(0.06%)
2044	66,806	66,138	332	336	571,932	0.06%
2045	68,333	66,684	340	1,310	612,029	0.21%
2046	69,890	67,200	347	2,343	655,919	0.36%
2047	71,485	67,504	355	3,626	703,928	0.52%





## **HISTORICAL FUNDING AND OTHER INFORMATION**

This section of the report provides a historical perspective on the System’s funding and contribution practices, along with other information that may be of interest.

The information required for financial reporting by the System and participating employers is established by the Governmental Accounting Standards Board (GASB). GASB 67 separates accounting and financial reporting from funding requirements by creating disclosure and reporting requirements that are independent of the basis used for funding the System. A separate report that contains all of the information and exhibits of an actuarial nature that are necessary for the System’s financial reporting under GASB 67 will be issued in the future.

GASB Statement No. 68 establishes standards for the measurement, recognition, and display of pension expense and related liabilities. Annual pension cost is measured and disclosed on the accrual basis of accounting. A separate report containing all of the pertinent information under GASB 68 reporting will also be prepared in the future.



SECTION 7 – OTHER INFORMATION

TABLE 13  
SCHEDULE OF FUNDING PROGRESS

Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL) (b)	Unfunded Actuarial Accrued Liability (UAAL) (b - a)	Funded Ratio (a / b)	Covered Payroll (c)	UAAL as a % of Covered Payroll [(b - a) / c]
June 30, 2004	\$39	\$280	\$241	14.0%	\$39.9	604.0%
June 30, 2005	44	292	248	15.1%	40.0	620.0%
June 30, 2006	52	309	257	16.7%	40.3	637.7%
June 30, 2007	62	327	265	18.9%	40.8	649.5%
June 30, 2008	73	355	282	20.6%	44.5	633.7%
June 30, 2009	81	369	288	22.0%	45.5	633.0%
June 30, 2010	89	382	293	23.3%	46.1	635.6%
June 30, 2011	98	393	295	25.0%	45.9	642.7%
June 30, 2012	102	413	311	24.8%	45.8	679.0%
June 30, 2013	111	435	324	25.5%	48.7	665.3%
June 30, 2014	124	462	338	28.0%	49.6	681.5%
June 30, 2015	134	483	349	27.8%	55.7	626.6%
June 30, 2016	143	548	404	26.2%	57.4	703.8%
June 30, 2017	152	564	413	26.9%	58.2	708.9%
June 30, 2018	162	594	432	27.3%	59.6	724.8%

Note: Information before 2017 was produced by the prior actuary. Numbers may not add due to rounding.



**TABLE 14**  
**HISTORICAL EMPLOYER CONTRIBUTIONS**

<b>Fiscal Year Ending</b>	<b>Actuarially Determined Employer Contribution</b>	<b>Actual Dollar Amount</b>	<b>Percent Contributed</b>
June 30, 2005	\$21.9	\$21.9	100.0%
June 30, 2006	22.4	22.4	100.0%
June 30, 2007	23.7	23.7	100.0%
June 30, 2008	26.2	26.2	100.0%
June 30, 2009	27.7	27.7	100.0%
June 30, 2010	27.0	27.0	100.0%
June 30, 2011	27.8	27.8	100.0%
June 30, 2012	26.3	26.3	100.0%
June 30, 2013	28.3	28.3	100.0%
June 30, 2014	29.3	29.3	100.0%
June 30, 2015	32.7	32.7	100.0%
June 30, 2016	31.6	33.6	106.3%
June 30, 2017	32.7	34.2	104.6%
June 30, 2018	36.9	36.9	100.0%



SECTION 7 – OTHER INFORMATION

TABLE 15  
HISTORICAL MEMBER STATISTICS

Valuation Date June 30	Active Members				Retired Members			
	Number	Payroll \$ Millions	Average Salary \$	% Incr.	Number	Active/ Retired	Annual Benefits \$ Millions	% Incr.
2004	391	\$40	\$101,911		397	1.0	\$18.0	
2005	392	40	102,082	0.2	397	1.0	18.8	4.4
2006	394	40	102,209	0.1	398	1.0	19.4	3.2
2007	400	41	102,116	(0.1)	437	0.9	21.7	11.9
2008	401	45	111,079	8.8	440	0.9	22.5	3.7
2009	397	46	114,623	3.2	463	0.9	24.0	6.7
2010	402	46	114,708	0.1	465	0.9	24.5	2.1
2011	399	46	115,008	0.3	486	0.8	26.5	8.2
2012	398	46	115,165	0.1	488	0.8	27.0	1.9
2013	400	49	121,744	5.7	497	0.8	28.4	5.2
2014	405	50	122,439	0.6	511	0.8	29.8	4.9
2015	405	56	137,423	12.2	539	0.8	32.4	8.7
2016	408	57	140,738	2.4	540	0.8	33.2	2.5
2017	410	58	141,832	0.8	559	0.7	34.6	4.2
2018	415	60	143,498	1.2	569	0.7	36.3	4.9



**APPENDIX A – MEMBERSHIP DATA**

**MEMBER DATA RECONCILIATION**

	<b>Active Members</b>	<b>Inactive Vested</b>	<b>Leave of Absence</b>	<b>Long-term Disability</b>	<b>Retirees and Beneficiaries</b>	<b>Total</b>
As of June 30, 2017	410	25	1	0	559	995
Changes in status:						
a) Retirement	(19)	(2)	0	0	21	0
b) Death	0	0	0	0	(19)	(19)
c) Leave of absence	0	0	0	0	0	0
d) Vested termination	(3)	3	0	0	0	0
e) Contribution refund	0	0	0	0	0	0
f) Beneficiary in receipt	0	0	0	0	9	9
g) Disability retirement	0	0	0	0	0	0
h) Return to active service	2	0	(1)	0	(1)	0
i) Expired benefit	0	0	0	0	0	0
j) Data adjustment	<u>(2)</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>(2)</u>
Total changes in status	(22)	1	(1)	0	10	(12)
New entrants	27	0	0	0	0	27
Net Change	5	1	(1)	0	10	15
As of June 30, 2018	415	26	0	0	569	1,010





**APPENDIX A – MEMBERSHIP DATA**

**SUMMARY OF MEMBERSHIP DATA**

<b>A. ACTIVE MEMBERS</b>	<b>June 30, 2018</b>	<b>June 30, 2017</b>	<b>% Change</b>
1. Number of Active Members			
(a) Judicial Plan	262	280	(6.4)
(b) Judicial Plan 2011	153	130	17.7
(c) Total	415	410	1.2
2. Annualized Reported Salary			
(a) Judicial Plan	\$ 38,111,403	\$ 40,208,938	(5.2)
(b) Judicial Plan 2011	21,440,471	17,941,997	19.5
(c) Total	\$ 59,551,874	\$ 58,150,935	2.4
3. Accumulated Member Contributions	\$ 3,124,482	\$ 2,232,404	40.0
4. Active Member Averages			
(a) Age	56.4	56.6	(0.4)
(b) Service	11.5	11.8	(2.5)
(c) Compensation	\$ 143,498	\$ 141,832	1.2
<b>B. INACTIVE MEMBERS</b>			
1. Number of Inactive Vested Members	26	26	0.0
2. Inactive Vested Member Averages			
(a) Age	55.0	53.8	2.2
(b) Monthly benefit	\$ 2,947	2,830	4.1
<b>C. RETIREES, DISABLEDS, AND BENEFICIARIES</b>			
1. Number of Members			
(a) Retirees	405	398	1.8
(b) Beneficiaries	164	161	1.9
(c) Total	569	559	1.8
2. Total Monthly Benefits			
(a) Retired	\$ 2,518,041	\$ 2,394,264	5.2
(b) Beneficiaries	510,062	491,355	3.8
(c) Total	\$ 3,028,103	\$ 2,885,619	4.9

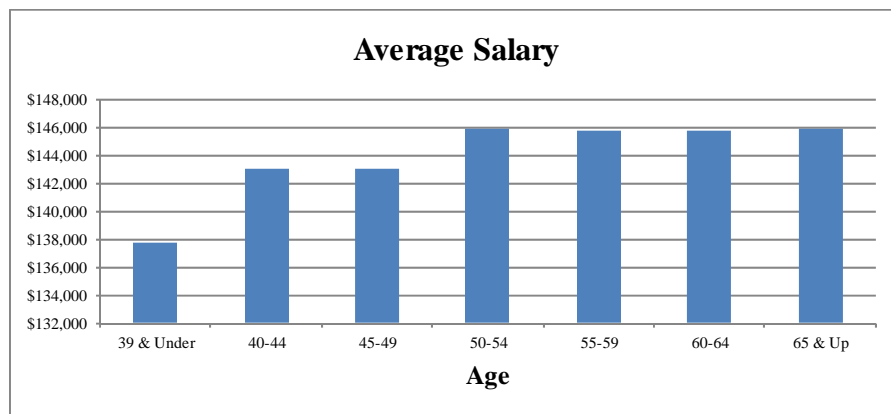
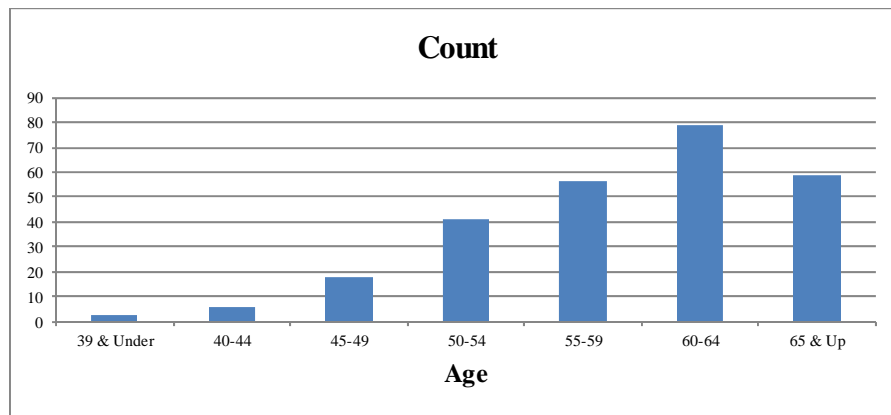


**APPENDIX A – MEMBERSHIP DATA**

**ACTIVE MEMBERS  
AS OF JUNE 30, 2018**

**HIRED BEFORE JANUARY 1, 2011**

<u>Age</u>	<u>Count of Members</u>			<u>Reported Annualized Earnings for Current Members</u>		
	<u>Male</u>	<u>Female</u>	<u>Total</u>	<u>Male</u>	<u>Female</u>	<u>Total</u>
39 & Under	3	0	3	\$ 413,105	\$ 0	\$ 413,105
40-44	5	1	6	720,485	137,633	858,118
45-49	11	7	18	1,561,896	1,011,414	2,573,310
50-54	30	11	41	4,389,979	1,592,797	5,982,776
55-59	38	18	56	5,514,365	2,648,250	8,162,615
60-64	59	20	79	8,530,826	2,984,232	11,515,058
65 & Up	<u>45</u>	<u>14</u>	<u>59</u>	<u>6,556,476</u>	<u>2,049,945</u>	<u>8,606,421</u>
Total	191	71	262	\$ 27,687,132	\$ 10,424,271	\$ 38,111,403



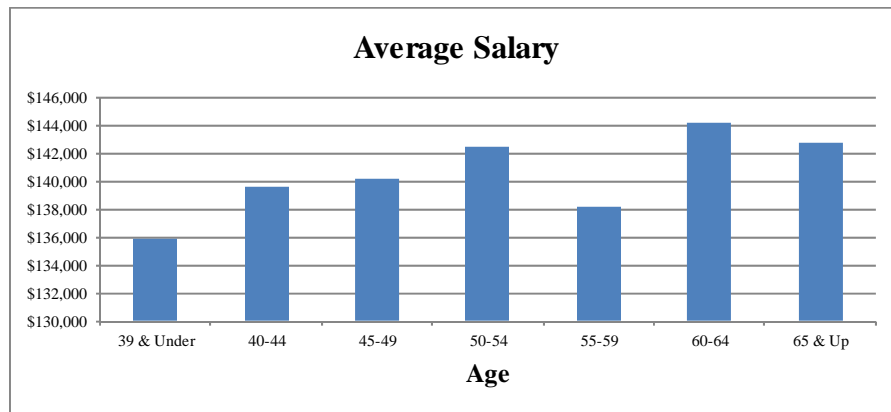
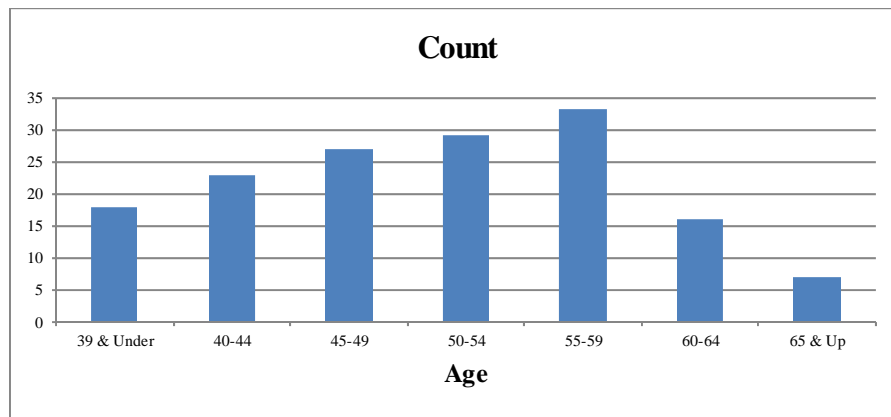


**APPENDIX A – MEMBERSHIP DATA**

**ACTIVE MEMBERS  
AS OF JUNE 30, 2018**

**HIRED ON OR AFTER JANUARY 1, 2011**

Age	Count of Members			Reported Annualized Earnings for Current Members		
	Male	Female	Total	Male	Female	Total
39 & Under	9	9	18	\$ 1,286,886	\$ 1,159,654	\$ 2,446,540
40-44	11	12	23	1,527,316	1,682,982	3,210,298
45-49	20	7	27	2,810,065	975,510	3,785,575
50-54	22	7	29	3,121,037	1,011,303	4,132,340
55-59	23	10	33	3,182,846	1,376,330	4,559,176
60-64	14	2	16	2,019,973	287,234	2,307,207
65 & Up	<u>6</u>	<u>1</u>	<u>7</u>	<u>861,702</u>	<u>137,633</u>	<u>999,335</u>
Total	105	48	153	\$ 14,809,825	\$ 6,630,646	\$ 21,440,471



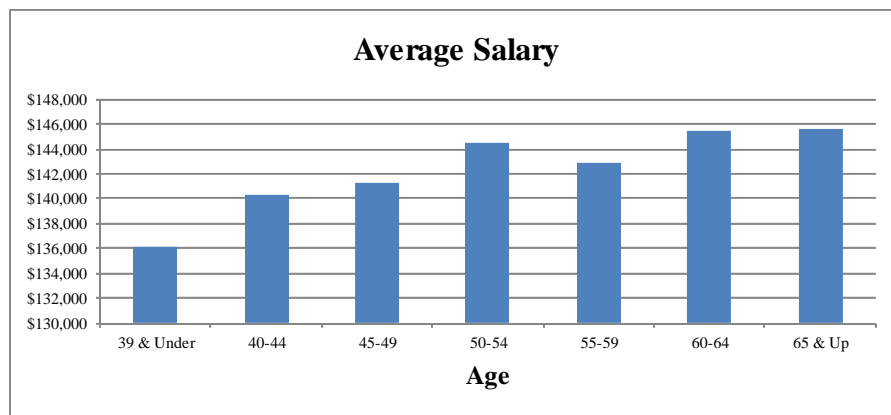
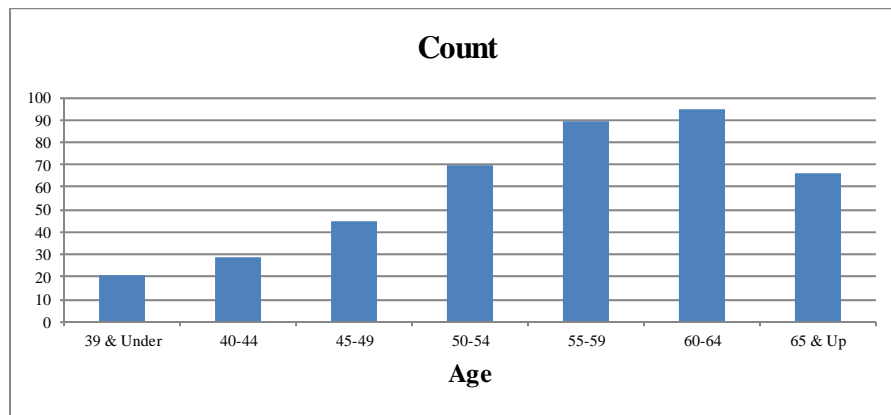


**APPENDIX A – MEMBERSHIP DATA**

**ACTIVE MEMBERS  
AS OF JUNE 30, 2018**

**TOTAL**

<u>Age</u>	<u>Count of Members</u>			<u>Reported Annualized Earnings for Current Members</u>		
	<u>Male</u>	<u>Female</u>	<u>Total</u>	<u>Male</u>	<u>Female</u>	<u>Total</u>
39 & Under	12	9	21	\$ 1,699,991	\$ 1,159,654	\$ 2,859,645
40-44	16	13	29	2,247,801	1,820,615	4,068,416
45-49	31	14	45	4,371,961	1,986,924	6,358,885
50-54	52	18	70	7,511,016	2,604,100	10,115,116
55-59	61	28	89	8,697,211	4,024,580	12,721,791
60-64	73	22	95	10,550,799	3,271,466	13,822,265
65 & Up	<u>51</u>	<u>15</u>	<u>66</u>	<u>7,418,178</u>	<u>2,187,578</u>	<u>9,605,756</u>
Total	296	119	415	\$ 42,496,957	\$ 17,054,917	\$ 59,551,874





APPENDIX A – MEMBERSHIP DATA

**AGE AND SERVICE DISTRIBUTION  
AS OF JUNE 30, 2018**

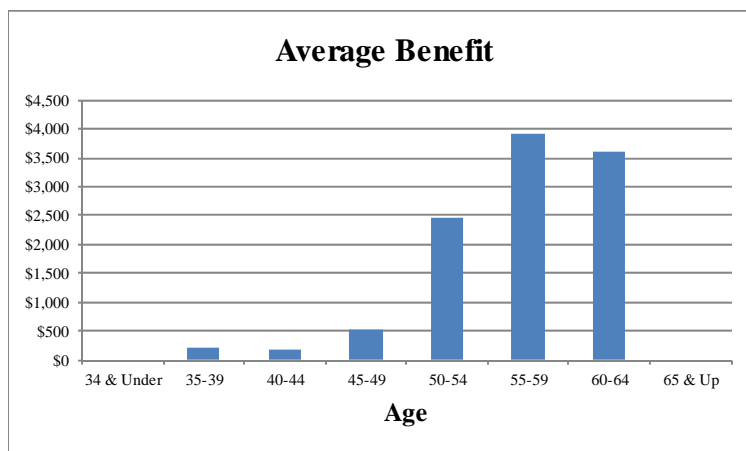
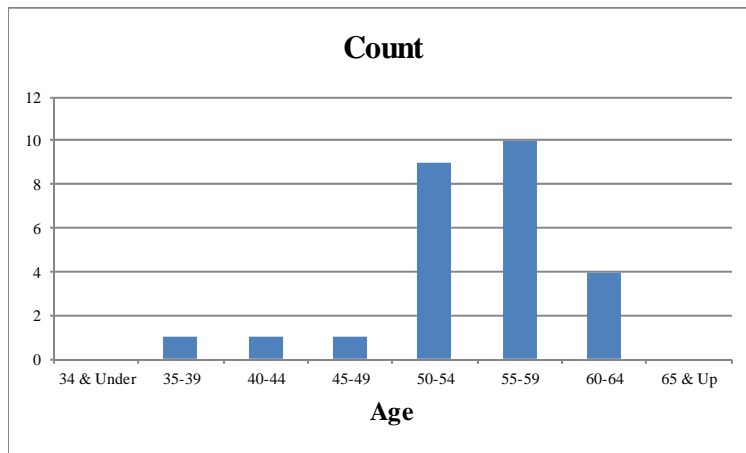
Age		0-4	5-9	10-14	15-19	20-24	25-29	Over 29	Total
<b>39 &amp; Under</b>	Number	19	2	0	0	0	0	0	21
	Total Salary	\$ 2,584,379	\$ 275,266	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 2,859,645
	Average Sal.	\$ 136,020	\$ 137,633	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 136,174
<b>40-44</b>	Number	19	7	3	0	0	0	0	29
	Total Salary	\$ 2,668,150	\$ 987,367	\$ 412,899	\$ 0	\$ 0	\$ 0	\$ 0	\$ 4,068,416
	Average Sal.	\$ 140,429	\$ 141,052	\$ 137,633	\$ 0	\$ 0	\$ 0	\$ 0	\$ 140,290
<b>45-49</b>	Number	21	13	8	3	0	0	0	45
	Total Salary	\$ 2,926,728	\$ 1,870,261	\$ 1,148,997	\$ 412,899	\$ 0	\$ 0	\$ 0	\$ 6,358,885
	Average Sal.	\$ 139,368	\$ 143,866	\$ 143,625	\$ 137,633	\$ 0	\$ 0	\$ 0	\$ 141,309
<b>50-54</b>	Number	23	20	10	16	1	0	0	70
	Total Salary	\$ 3,303,687	\$ 2,867,398	\$ 1,478,332	\$ 2,328,066	\$ 137,633	\$ 0	\$ 0	\$ 10,115,116
	Average Sal.	\$ 143,639	\$ 143,370	\$ 147,833	\$ 145,504	\$ 137,633	\$ 0	\$ 0	\$ 144,502
<b>55-59</b>	Number	28	18	14	16	11	2	0	89
	Total Salary	\$ 3,823,139	\$ 2,627,329	\$ 2,089,621	\$ 2,304,130	\$ 1,602,306	\$ 275,266	\$ 0	\$ 12,721,791
	Average Sal.	\$ 136,541	\$ 145,963	\$ 149,259	\$ 144,008	\$ 145,664	\$ 137,633	\$ 0	\$ 142,941
<b>60-64</b>	Number	12	14	18	14	20	9	8	95
	Total Salary	\$ 1,720,771	\$ 2,034,574	\$ 2,567,428	\$ 1,986,805	\$ 2,998,400	\$ 1,307,650	\$ 1,206,637	\$ 13,822,265
	Average Sal.	\$ 143,398	\$ 145,327	\$ 142,635	\$ 141,915	\$ 149,920	\$ 145,294	\$ 150,830	\$ 145,498
<b>65 &amp; Up</b>	Number	1	7	15	21	11	5	6	66
	Total Salary	\$ 137,633	\$ 1,032,384	\$ 2,136,303	\$ 3,070,361	\$ 1,594,884	\$ 733,182	\$ 901,009	\$ 9,605,756
	Average Sal.	\$ 137,633	\$ 147,483	\$ 142,420	\$ 146,208	\$ 144,989	\$ 146,636	\$ 150,168	\$ 145,542
<b>Total</b>	Number	123	81	68	70	43	16	14	415
	Total Salary	\$ 17,164,487	\$ 11,694,579	\$ 9,833,580	\$ 10,102,261	\$ 6,333,223	\$ 2,316,098	\$ 2,107,646	\$ 59,551,874
	Average Sal.	\$ 139,549	\$ 144,378	\$ 144,611	\$ 144,318	\$ 147,284	\$ 144,756	\$ 150,546	\$ 143,498



**APPENDIX A – MEMBERSHIP DATA**

**INACTIVE VESTED MEMBERS  
AS OF JUNE 30, 2018**

<u>Age</u>	<u>Count of Members*</u>			<u>Monthly Deferred Benefits</u>		
	<u>Male</u>	<u>Female</u>	<u>Total</u>	<u>Male</u>	<u>Female</u>	<u>Total</u>
34 & Under	0	0	0	0	0	0
35-39	1	0	1	213	0	213
40-44	0	1	1	0	203	203
45-49	1	0	1	534	0	534
50-54	5	4	9	15,627	6,589	22,216
55-59	8	2	10	31,346	7,723	39,069
60-64	2	2	4	6,414	7,977	14,391
65 & Up	0	0	0	0	0	0
<b>Total</b>	<b>17</b>	<b>9</b>	<b>26</b>	<b>\$ 54,134</b>	<b>\$ 22,492</b>	<b>\$ 76,626</b>

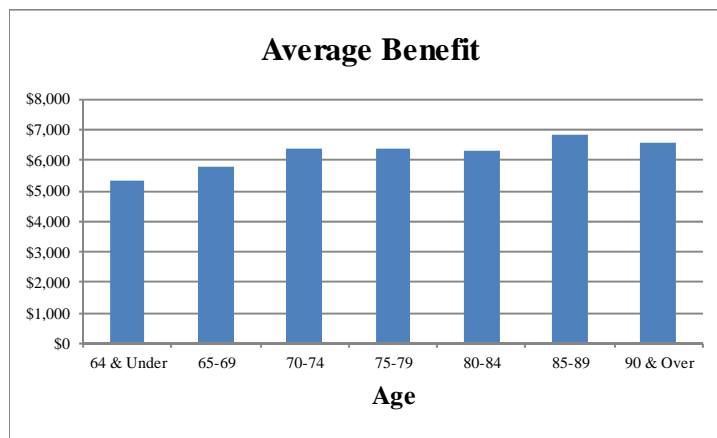
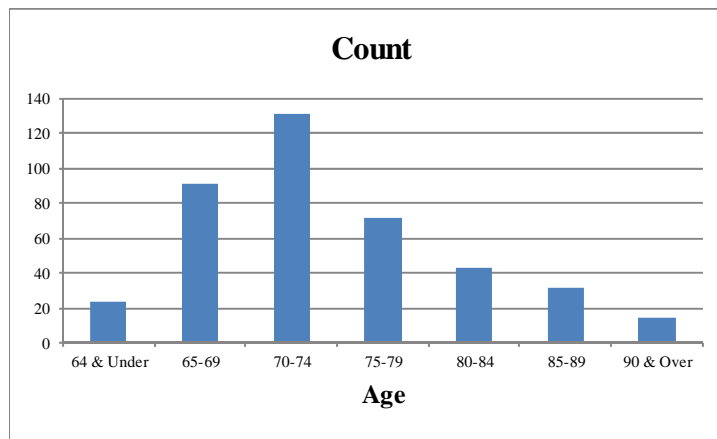




**APPENDIX A – MEMBERSHIP DATA**

**RETIRED MEMBERS  
AS OF JUNE 30, 2018**

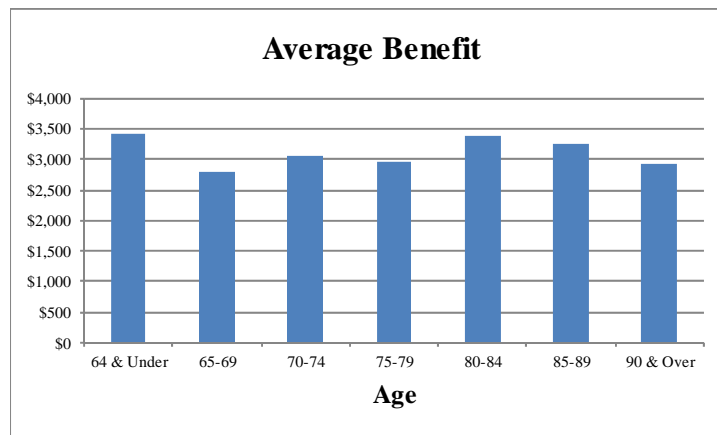
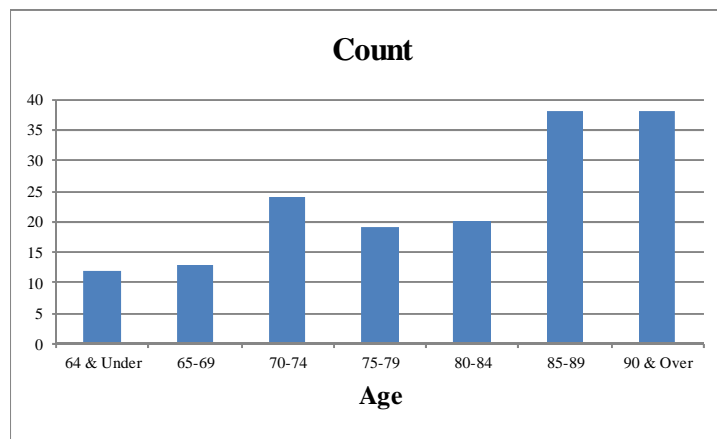
<u>Age</u>	<u>Count of Members</u>			<u>Monthly Benefits</u>		
	<u>Male</u>	<u>Female</u>	<u>Total</u>	<u>Male</u>	<u>Female</u>	<u>Total</u>
64 & Under	17	6	23	\$ 94,880	\$ 27,752	\$ 122,632
65-69	78	13	91	461,067	62,944	524,011
70-74	112	19	131	709,015	127,193	836,208
75-79	64	7	71	407,149	47,148	454,297
80-84	40	3	43	254,795	16,416	271,211
85-89	32	0	32	217,489	0	217,489
90 & Over	<u>13</u>	<u>1</u>	<u>14</u>	<u>85,570</u>	<u>6,623</u>	<u>92,193</u>
Total	356	49	405	\$ 2,229,965	\$ 288,076	\$ 2,518,041





**BENEFICIARIES RECEIVING BENEFITS  
AS OF JUNE 30, 2018**

<u>Age</u>	<u>Count of Members</u>			<u>Monthly Benefits</u>		
	<u>Male</u>	<u>Female</u>	<u>Total</u>	<u>Male</u>	<u>Female</u>	<u>Total</u>
64 & Under	2	10	12	\$ 8,059	\$ 32,884	\$ 40,943
65-69	1	12	13	2,753	33,741	36,494
70-74	2	22	24	6,065	67,348	73,413
75-79	0	19	19	0	56,059	56,059
80-84	0	20	20	0	67,741	67,741
85-89	0	38	38	0	123,700	123,700
90 & Over	<u>1</u>	<u>37</u>	<u>38</u>	<u>2,218</u>	<u>109,494</u>	<u>111,712</u>
Total	6	158	164	\$ 19,095	\$ 490,967	\$ 510,062







**RETIRED LIVES BENEFITS PAYABLE  
TABULATED BY OPTION AND TYPE OF BENEFIT  
AS OF JUNE 30, 2018**

**Judges Hired Before January 1, 2011**

<b>Type of Benefit</b>	<b>No.</b>	<b>Total Monthly Benefits</b>
Service Retirement		
Life Annuity	4	\$ 26,729
50% Joint and Survivor	399	2,489,353
Survivor Beneficiary	130	413,435
Total	<u>533</u>	<u>2,929,517</u>
Death-in-Service	34	96,627
<b>Total</b>	<b>567</b>	<b>\$ 3,026,144</b>

**Judges Hired On or After January 1, 2011**

<b>Type of Benefit</b>	<b>No.</b>	<b>Total Monthly Benefits</b>
Service Retirement		
Life Annuity	1	\$ 1,055
100% Joint and Survivor	1	904
Survivor Beneficiary	0	0
Total	<u>2</u>	<u>1,959</u>
Death-in-Service	0	0
<b>Total</b>	<b>2</b>	<b>\$ 1,959</b>



## APPENDIX B – SUMMARY OF PLAN PROVISIONS

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### Age and Service Retirement

#### *Eligibility for Unreduced Benefit (for Members Hired Before 1/1/2011)*

The earliest of attaining:

- (1) At least 62 with 12 years of creditable service.
- (2) At least 60 with 15 years of creditable service.
- (3) At least 55 with 20 years of creditable service.

#### *Eligibility for Unreduced Benefit (for Members Hired On or After 1/1/2011)*

The earliest of attaining:

- (1) At least 67 with 12 years of creditable service.
- (2) At least 62 with 20 years of creditable service.

#### *Benefit Amount*

50% of compensation

### Early Retirement

#### *Eligibility for Reduced Benefit (for Members Hired Before 1/1/2011)*

Age 60

#### *Benefit Amount*

- (1) If between 60 and 62, years of service divided by 15 multiplied by 50% of compensation.
- (2) If at least 62, years of service divided by 12 and multiplied by 50% of compensation.

#### *Eligibility for Reduced Benefit (for Members Hired On or After 1/1/2011)*

Age 62

#### *Benefit Amount*

- (1) If between 60 and 67, years of service divided by 20 multiplied by 50% of compensation.
- (2) If at least 67, years of service divided by 12 and multiplied by 50% of compensation.

### Compensation used for Benefit Determination

The annual salary at date of termination of the highest position held.



**APPENDIX B – SUMMARY OF PLAN PROVISIONS**

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**Vested Deferred Benefits**

Benefits for employees who terminate prior to eligibility for an immediate benefit are considered to be vested. Benefits commence once the individual qualifies for normal or early retirement based on age and service.

**Death Benefits**

*Death Prior to Retirement*

50% of the benefit the member would have been eligible to receive based on service to age 70 is payable to an eligible spouse or minor children.

*Death After Retirement*

50% of the benefit the retired member was receiving at the date of death to an eligible surviving spouse for members hired before January 1, 2011.

**Disability Benefits**

Disability benefits become payable at the time the member is eligible for normal retirement (50% of salary for remainder of term) and are computed based on the service that would have accrued if active employment had continued until normal retirement age, and member’s compensation while an active employee.

**Post-Retirement Benefit Adjustments**

Benefits are increased to benefit recipients (including survivors) annually in accordance with the following formulas:

Increase in CPI	Formula 1 Benefit Increase	Formula 2 Benefit Increase
5.00% or less	4.00%	80% of CPI increase
5.01% - 6.24%	80% of CPI increase	80% of CPI increase
6.25% or more	5.00%	5.00%

Members first hired prior to August 28, 1997 receive COLAs based on Formula 1 until an aggregate increase of 65% is reached. At that point, subsequent COLAs based on Formula 2 are granted.

Members first hired on or after August 28, 1997 receive COLAs based solely on Formula 2.

Members hired prior to January 1, 2011 who work beyond the later of age 60 or the date when first eligible for age and service retirement will have their monthly benefit increased upon retirement. The percentage increase is equal to all COLAs for the years between (i) the later of age 60 or the date when first eligible for age and service retirement and (ii) date of actual retirement, not to exceed 65%.



**APPENDIX B – SUMMARY OF PLAN PROVISIONS**

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**Member Contributions**

For members hired prior to 1/1/2011:	None
For members hired on or after 1/1/2011:	4.00% of salary, with interest credited at the 52-week Treasury bill rate.



## ACTUARIAL METHODS

1. **Calculation of Normal Cost and Actuarial Accrued Liability:** The funding method used to determine the normal cost and actuarial accrued liability was the Entry Age Actuarial Cost Method described below.

### Entry Age Actuarial Cost Method

Under the entry age normal cost method, the actuarial present value of each member's projected benefit is allocated on a level basis over the member's compensation between the entry age of the member and their assumed exit age. The portion of the actuarial present value allocated to the valuation year is called the normal cost. The actuarial present value of benefits allocated to prior years of service is called the actuarial accrued liability. The unfunded actuarial accrued liability represents the difference between the actuarial accrued liability and the actuarial value of assets as of the valuation date. The unfunded actuarial accrued liability is calculated each year and reflects experience gains/losses.

2. **Calculation of the Actuarial Value of Assets:** Calculation of the Actuarial Value of Assets (AVA): The Board adopted a new asset smoothing method effective with the June 30, 2018 valuation. Under the new method, the difference between the actual and assumed investment return on the market value of assets is recognized evenly over a five-year period. No corridor is used with the new method. In addition, the total unrecognized investment experience as of June 30, 2017 will be recognized evenly over a seven-year period beginning June 30, 2018.
3. **Amortization of the Unfunded Actuarial Accrued Liability (UAAL):** Beginning with the June 30, 2018 valuation, the UAAL is amortized using a "layered" approach. Under this method, the "Legacy UAAL", as determined in the June 30, 2018 valuation, is amortized over a closed 30-year period. Subsequent changes in the UAAL due to actuarial gains/losses or assumption changes are separately financed by establishing amortization bases and payments, as a level percentage of payroll, over closed 30-year periods. Any change in the System's benefit structure shall be amortized over a closed period of 20 years, as set out in state statutes. The total UAAL amortization payment is the sum of the payments for each of the amortization bases.

### Changes in Methods and Assumptions since the Prior Year

An experience study which analyzed the System's economic assumptions was performed in 2018 and the results were presented to the Board. Below is a summary of the changes to methods and assumptions since the prior year:

- The investment return assumption was lowered from 7.50% to 7.25%.
- The general wage growth assumption was lowered from 3.00% to 2.75%.
- The payroll growth assumption was lowered from 3.00% to 2.50%.
- The unfunded actuarial accrued liability amortization method was changed from amortizing the entire unfunded actuarial accrued liability as a single base to using a "layered" bases approach.
- The actuarial value of assets is now calculated by recognizing the difference between the actual and expected return on the market value of assets each year over a closed five-year period. In addition, the total unrecognized investment experience as of June 30, 2017 will be recognized evenly over a seven-year period beginning June 30, 2018.



**APPENDIX C – SUMMARY OF ACTUARIAL ASSUMPTIONS**

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**ACTUARIAL ASSUMPTIONS**

**Economic Assumptions**

1. Investment Return 7.25%, compounded annually, net of investment expenses.

Note: This assumption will change to 7.10% for the June 30, 2019 valuation and 6.95% for the June 30, 2020 valuation and thereafter, absent Board action.

2. Inflation 2.50% per year

Note: This assumption will change to 2.35% for the June 30, 2019 valuation and 2.25% for the June 30, 2020 valuation and thereafter, absent Board action.

3. Salary Increases

Sample Ages	Merit & Seniority	Base (Economy)	Increase Next Year
25	2.20 %	2.75 %	4.95 %
30	2.20	2.75	4.95
35	1.48	2.75	4.23
40	0.76	2.75	3.51
45	0.60	2.75	3.35
50	0.54	2.75	3.29
55	0.44	2.75	3.19
60	0.00	2.75	2.75
65	0.00	2.75	2.75
70	0.00	2.75	2.75

4. Payroll Growth 2.50% per year

Note: This assumption will change to 2.35% for the June 30, 2019 valuation and 2.25% for the June 30, 2020 valuation and thereafter, absent Board action.

5. Cost-of-Living Adjustment (COLA) 4.00% on a compounded basis when a minimum COLA of 4.00% is in effect.

2.00% on a compounded basis when no minimum COLA is in effect.

Note: This assumption will change to 1.88% for the June 30, 2019 valuation and 1.80% for the June 30, 2020 valuation and thereafter, absent Board action.

6. Interest on Member Contributions 1.50% per year

7. Administrative Expenses Actual prior year expenses, included in normal cost rate.



**APPENDIX C – SUMMARY OF ACTUARIAL ASSUMPTIONS**

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**Demographic Assumptions**

- 1. Mortality
  - The mortality assumption includes an appropriate level of conservatism that reflects expected future mortality improvement.
  - a. Post-retirement
    - RP-2014 Healthy Annuitant mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 98%
  - b. Pre-retirement
    - RP-2014 Employee mortality table, projected from 2006 to 2026 with Scale MP-2015
  - c. Long-term disability
    - RP-2014 Disabled mortality table, projected from 2006 to 2026 with Scale MP-2015

Sample Ages	Pre-Retirement Mortality Rates*	
	Males	Females
25	0.03%	0.01%
30	0.03	0.02
35	0.04	0.03
40	0.05	0.04
45	0.07	0.05
50	0.13	0.09
55	0.24	0.16
60	0.42	0.23
65	0.74	0.33
70	1.23	0.55

*\* The pre-retirement mortality table used was the RP-2014 Employee mortality table, projected from 2006 to 2026 with Scale MP-2015.*



**APPENDIX C – SUMMARY OF ACTUARIAL ASSUMPTIONS**

2. Retirement Assumption

Retirement Age	<u>Hired Before 1/1/2011</u>				<u>Hired On or After 1/1/2011</u>		
	Normal Retirement		Early Retirement		Retirement Age	Normal Retirement	
	Male	Female	Male	Female		Male	Female
55	20%	3%					
56	16%	3%					
57	13%	3%					
58	9%	3%					
59	5%	3%					
60	8%	8%					
61	5%	8%					
62	8%	8%	6%	3%	62	30%	35%
63	10%	8%	6%	3%	63	20%	20%
64	12%	8%	6%	3%	64	15%	20%
65	12%	15%	6%	3%	65	30%	50%
66	20%	15%	6%	3%	66	25%	25%
67	20%	15%	6%	3%	67	20%	25%
68	30%	15%	6%	3%	68	20%	25%
69	30%	15%	6%	3%	69	30%	50%
70	100%	100%	100%	100%	70	100%	100%

3. Disability Assumption

Sample Ages	Sample	
	Males	Females
25	0.01 %	0.01 %
30	0.02	0.01
35	0.03	0.02
40	0.04	0.03
45	0.05	0.04
50	0.08	0.07
55	0.13	0.12
60	0.20	0.19
65	0.20	0.19
70	0.20	0.19





## APPENDIX C – SUMMARY OF ACTUARIAL ASSUMPTIONS

### 4. Termination Assumption

Service Index	Percent of Active Members Separating within the Next Year	
	Withdrawal	
	Males	Females
1	0.040 %	0.040 %
2	0.010	0.023
3	0.013	0.023
4	0.013	0.023
5	0.013	0.023
6-10	0.013	0.023
11-15	0.017	0.023
16+	0.010	0.010

### Other Assumptions

- |                                |  |
|--------------------------------|--|
| 1. Form of Payment             | Hired before 1/1/2011 – 50% joint and survivor<br>Hired on or after 1/1/2011 – Straight life annuity   |
| 2. Marital Status              |  |
| a. Percent married             | 100% married   |
| b. Spouse's age                | Females assumed to be four years younger than males.   |
| 3. Pay Increase Timing         | Beginning of the fiscal year.  |
| 4. Decrement Timing            | Decrements of all types are assumed to occur mid-year.   |
| 5. Eligibility Testing         | Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur. |
| 6. Benefit Service             | Exact fractional service is used to determine the amount of the benefit payable.   |
| 7. Decrement Relativity        | Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.                                    |
| 8. Decrement Operation         | Disability and withdrawal do not operate during normal retirement eligibility.   |
| 9. Other Liability Adjustments | None   |



## APPENDIX C – SUMMARY OF ACTUARIAL ASSUMPTIONS

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10. Incidence of Contributions	Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in this report, and the actual payroll payable at the time contributions are made. New entrant normal cost contributions are applied to the funding of new entrant benefits.
11. Forfeitures	No vested member are assumed to take a refund of employee contributions.
12. Salary and Benefit Limits	For purposes of the valuation, no limits were applied to member compensation or benefits.
13. Commencement age for deferred vested benefit	Normal retirement age

### Data Adjustments

Active and retired member data was reported as of May 31, 2018. It was brought forward to June 30, 2018 by adding one month of service for all active members, one month of contributions and interest for Judicial Plan 2011 members, and the June COLA for certain retired members. Financial information continues to be reported as of June 30. This procedure was instituted to provide sufficient time for the Board of Trustees to certify the appropriate contribution rate prior to the October 1 statutory deadline.

Active members reported with no annualized salary were assumed to receive the average active member pay.

### TECHNICAL VALUATION PROCEDURES

#### Other Valuation Procedures

Salary increases are assumed to apply to annual amounts.

Decrement are assumed to occur mid-year, except that immediate retirement is assumed for those who are at or above the age at which retirement rates are 100%. Standard adjustments are made for multiple decrements.

No actuarial liability is included for participants who terminated without being vested prior to the valuation date, except those due a refund of contributions.



## APPENDIX D – GLOSSARY OF TERMS

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<b>Actuarial Accrued Liability</b>	The difference between the actuarial present value of system benefits and the actuarial value of future normal costs. Also referred to as “accrued liability” or “actuarial liability”.
<b>Actuarial Assumptions</b>	Estimates of future experience with respect to rates of mortality, disability, turnover, retirement, rate or rates of investment income and salary increases. Decrement assumptions (rates of mortality, disability, turnover and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (salary increases and investment income) consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation.
<b>Accrued Service</b>	Service credited under the system which was rendered before the date of the actuarial valuation.
<b>Actuarial Equivalent</b>	A single amount or series of amounts of equal actuarial value to another single amount or series of amounts, computed on the basis of appropriate assumptions.
<b>Actuarial Cost Method</b>	A mathematical budgeting procedure for allocating the dollar amount of the actuarial present value of retirement system benefit between future normal cost and actuarial accrued liability. Sometimes referred to as the “actuarial funding method”.
<b>Experience Gain (Loss)</b>	The difference between actual experience and actuarial assumptions anticipated experience during the period between two actuarial valuation dates.
<b>Actuarial Present Value</b>	The amount of funds currently required to provide a payment or series of payments in the future. It is determined by discounting future payments at predetermined rates of interest and by probabilities of payment.
<b>Amortization</b>	Paying off an interest-discounted amount with periodic payments of interest and principal, as opposed to paying off with lump sum payment.
<b>Normal Cost</b>	The actuarial present value of retirement system benefits allocated to the current year by the actuarial cost method.
<b>Unfunded Actuarial Accrued Liability</b>	<p>The difference between actuarial accrued liability and the valuation assets. Sometimes referred to as “unfunded actuarial liability” or “unfunded accrued liability”.</p> <p>Most retirement systems have unfunded actuarial accrued liability. They arise each time new benefits are added and each time an actuarial loss is realized.</p>