



Cavanaugh Macdonald
CONSULTING, LLC

The experience and dedication you deserve

**Sheriffs' Retirement System
of the State of Montana**



**Actuarial Valuation
As of June 30, 2018**





Cavanaugh Macdonald

CONSULTING, LLC

The experience and dedication you deserve

October 1, 2018

Public Employees' Retirement Board
100 North Park, Suite 200
Helena, MT 59620-0139

Members of the Board:

In this report are submitted the results of the annual valuation of the assets and liabilities of the Sheriffs' Retirement System of Montana of the State of Montana (SRS), prepared as of June 30, 2018.

The purpose of this report is to provide a summary of the funded status of the System as of June 30, 2018. While not verifying the data at source, the actuary performed tests for consistency and reasonability. The valuation indicates that the statutory contribution rate is sufficient to amortize the unfunded accrued liability within 21 years. The asset values used to determine unfunded liabilities are not market values but less volatile market related values. A smoothing technique is applied to market values to determine the market related values. The unfunded liability amounts using the market value of assets would be different. The interest rate used for determining liabilities is based on the expected return on assets. Therefore, liability amounts in the report cannot be used to assess a settlement of the obligation.

The promised benefits of the System are included in the actuarially calculated contribution rates, which are developed using the Entry Age Normal Cost Method. Four-year market related value of assets is used for actuarial valuation purposes. Gains and losses are reflected in the unfunded accrued liability that is being amortized by regular annual contributions as a level percentage of payroll, on the assumption that payroll will increase by 3.50% annually. The assumptions recommended by the actuary and adopted by the Board are, in the aggregate, reasonably related to the experience under the Fund and to reasonable expectations of anticipated experience under the Fund.

This is to certify that Edward Macdonald and Todd Green, Principal and Consulting Actuaries for Cavanaugh Macdonald Consulting, are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein. This also certifies that the undersigned have experience in performing valuations for public retirement systems, that the valuation was prepared in accordance with principles of practice prescribed by the Actuarial Standards Board, and that the actuarial calculations were performed by qualified actuaries in accordance with accepted actuarial procedures, based on the current provisions of the retirement system and on actuarial assumptions that are internally consistent and reasonably based on the actual experience of the System.



Future actuarial results may differ significantly from the current results 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. Since the potential impact of such factors is outside the scope of a normal annual actuarial valuation, an analysis of the range of results is not presented herein.

The Table of Contents, which immediately follows, outlines the material contained in the report.

Respectfully submitted,

A handwritten signature in blue ink, appearing to read 'Edward Macdonald', written in a cursive style.

Edward A. Macdonald, ASA, FCA, MAAA
President

A handwritten signature in blue ink, appearing to read 'Todd B. Green', written in a cursive style.

Todd B. Green, ASA, FCA, MAAA
Principal and Consulting Actuary

A handwritten signature in blue ink, appearing to read 'Matthew Yonz', written in a cursive style.

Matthew Yonz, ASA, FCA, MAAA
Actuary



**Sheriffs' Retirement System
State of Montana**

Table of Contents

Section 1: Summary of Results	1
Section 2: Assets	8
Table 1: Statement of Fiduciary Net Assets.....	9
Table 2: Statement of Changes in Fiduciary Net Position	10
Table 3: Determination of Actuarial Value of Net Position	11
Table 4: Historical Investment Returns	12
Table 5: Market Value of Assets vs Actuarial Value of Assets	13
Section 3: Actuarial Present Value of Future Benefits	14
Table 6: Actuarial Present Value of Future Benefits for Actives, Retirees, and Beneficiaries	15
Section 4: Employer Contributions	16
Table 7: Normal Cost Contribution Rates as Percentage of Salary	18
Table 8: Unfunded Actuarial Accrued Liability	19
Section 5: Cash Flows	20
Table 9: Cash Flow History.....	21
Section 6: Actuarial Gains or Losses.....	22
Table 10: Analysis of Actuarial Gains or Losses.....	23
Table 11: Historical Actuarial Gains or Losses	24
Appendix A: Actuarial Procedures and Methods.....	25
Appendix B: Summary of Valuation Assumptions	28
Appendix C: Summary of Benefit Provisions.....	35
Appendix D: Valuation Data	41
Appendix E: Comparative Schedules	52
Appendix F: Financial Statement Information	56
Appendix G: Glossary	59



Section I: Summary of Results

For convenience of reference, the principal results of the valuation and a comparison with the preceding year's results are summarized below:

VALUATION DATE	June 30, 2018	June 30, 2017
Active Members	1,429	1,415
Retirees and Beneficiaries	654	619
Disabled Members*	27	29
Terminated Vested Members	129	108
Terminated Non-Vested Members	539	465
Total**	2,778	2,636
Annual Covered Payroll of Active Members	\$ 77,587,294	\$ 74,581,258
Average Salaries from Covered Payroll	\$ 54,295	\$ 52,708
Annual Allowances for Retired Members and Beneficiaries	\$ 18,520,545	\$ 17,153,339
Assets		
Actuarial value	\$ 353,904,349	\$ 332,169,329
Market value	358,880,360	330,910,169
Actuarial Accrued Liability (AAL)	\$ 436,715,156	\$ 411,386,604
Unfunded Actuarial Accrued Liability (UAAL)	\$ 82,810,807	\$ 79,217,275
Funded Ratio	81.04%	80.74%
Market Value Rate of Return	8.83%	11.95%
Annual Cost		
Statutory Funding Rate	23.610%	23.610%
Total Normal Rate	15.940%	16.280%
Employee Contribution Rate	<u>10.495%</u>	<u>10.495%</u>
Employer Normal Rate	5.445%	5.785%
Employer Contribution Rate		
Normal Rate	5.445%	5.785%
Administrative Expense Load	0.230%	0.210%
UAAL Rate	<u>7.440%</u>	<u>7.120%</u>
Total Rate	13.115%	13.115%
Amortization Period	21 Years	25 Years
Employer Contribution Rate Necessary to Amortize UAAL over 30 Years		
Normal Rate	5.445%	5.785%
Administrative Expense Load	0.230%	0.210%
UAAL Rate (30-Year Rate)	<u>6.023%</u>	<u>6.327%</u>
Total Rate	11.698%	12.322%
Shortfall/(Surplus)	(1.417)%	(0.793)%

- * Based on PERB categorization for the annual report. For actuarial purposes, 45 members in 2017 and 46 members in 2018 were valued as disabled members with offsetting reductions to the number of retired members.
- ** A reconciliation between participant counts used for the annual report and counts for the valuation appears at the beginning of Appendix D.



Section I: Summary of Results

As a result of this actuarial valuation of the benefits in effect under the Sheriffs' Retirement System as of June 30, 2018, the statutory employer contributions are sufficient to amortize the Unfunded Actuarial Accrued Liability (UAAL) of the Retirement System within 21 years. The Funded Ratio is 81.04% on an actuarial value of assets basis.

Calculations based on the Market Value of Assets

MCA 19-2-407 requires this report to show how market performance is affecting the actuarial funding of the Retirement System. The June 30, 2018 market value of assets is \$4,976,011 more than the actuarial value of assets. This is due to the smoothing of investment gains and losses over a four-year period. If the market value of assets was used, the amortization period would be 20 years, and the Funded Ratio would be 82.18%.

Additional Details

MCA 19-7 sets the employer contribution at 13.115% of salary and the employee contribution at 10.495% for actives.

The actuarial costs are calculated using the entry age actuarial cost method. This is the method used by most public plans. It is designed to provide a stable contribution rate as a percent of member pay. This actuarial valuation measures the adequacy of the contribution rates set in Montana State Law.

Investment Experience

The market assets earned 8.83% net of investment and operating expenses. As a result of prior year's unrecognized losses, the actuarial assets earned 6.92%, which is 0.73% less than the expected return of 7.65%. The return on the actuarial assets differs from the return on market assets because the actuarial value of assets spreads gains and losses over four years. The chart below shows the annual returns for the past ten years.

Year	Market Return	Actuarial Return	Assumed Investment Return	Market Return over Assumption	Actuarial Return over Assumption
7/1/2008 to 6/30/2009	(20.53)%	(0.15)%	8.00%	(28.53)%	(8.15)%
7/1/2009 to 6/30/2010	12.65	(0.92)	7.75	4.90	(8.67)
7/1/2010 to 6/30/2011	21.57	0.65	7.75	13.82	(7.10)
7/1/2011 to 6/30/2012	2.32	3.82	7.75	(5.43)	(3.93)
7/1/2012 to 6/30/2013	12.88	11.57	7.75	5.13	3.82
7/1/2013 to 6/30/2014	17.08	12.96	7.75	9.33	5.21
7/1/2014 to 6/30/2015	4.60	9.60	7.75	(3.15)	1.85
7/1/2015 to 6/30/2016	2.06	8.66	7.75	(5.69)	0.91
7/1/2016 to 6/30/2017	11.95	8.23	7.75	4.20	0.48
7/1/2017 to 6/30/2018	8.83	6.92	7.65	1.18	(0.73)

Asset gains or losses result when the return on the actuarial value of assets differs from the assumed actuarial investment return.

Amortization of the UAAL

The statutory contributions are sufficient to amortize the UAAL over a 21 year period as of June 30, 2018.



Section I: Summary of Results

Funding and Benefits Policy

The Montana Public Employees' Retirement Board has adopted a Funding and Benefits Policy to provide general guidelines to help ensure decisions are made based on sound, consistent, and thoroughly examined criteria. The Funding and Benefits Policy includes guidance on the following topics:

1) Funding Requirement

a) The Funding and Benefits Policy states:

1. The Entry Age Normal Cost Method shall be applied to the projected benefits in determining the Normal Cost and Actuarial Accrued Liability.
2. Asset smoothing can be used in the valuation process to spread the recognition of investment gains and losses over a four-year period.
3. The unfunded actuarial accrued liability should be amortized over a reasonable period of time and should not exceed 30 years on a rolling basis. Generally, the funding period should be constant or decreasing.

b) Analysis: The liabilities of the System are determined using the Entry Age Normal Cost Method and are compared to the actuarial value of assets, which are developed using assets smoothing that recognizes gains and losses over a four-year period. The contributions provided for in statute are sufficient to fully amortize the unfunded actuarial accrued liability within 30 years.

2) Funding Objectives

a) The Funding and Benefits Policy states: "The primary objectives are to: 1) ensure that the systems are financially sound and pay all benefits promised using assets accumulated from required employer and member contributions and investment income; and 2) achieve a well-funded status with a range of safety to absorb market volatility without creating a UAL."

b) Analysis: The contributions provided for in the statute are sufficient to fully amortize the unfunded actuarial accrued liability within 30 years. The employer and employee contributions provided for in statute to amortize the unfunded actuarial accrued liability within a 21-year period. This ensures the System is financially sound and will be able to pay all promised benefit and achieve a well-funded status with a range of safety to absorb market volatility without creating a UAL.

3) Benefit Enhancements

a) The Funding and Benefits Policy states: "Proposals must provide funding from sources sufficient to cover future costs. Unfunded liabilities created by the proposal must be amortized over a period of time appropriate to the retirement system, but not more than 30 years."

b) Analysis: Without the supplemental funding, a benefit enhancement would increase the amortization period of the unfunded actuarial accrued liability and further delay the goal of achieving a well-funded status with a range of safety to absorb market volatility without creating a UAL.



Section I: Summary of Results

Sensitivity to Future Experience

The valuation results are projections based on the actuarial assumptions. Actual experience will differ from these assumptions, either increasing or decreasing the ultimate cost. The following illustrations provide simple analyses on how the costs are sensitive to changes in the assumed rate of return.

Investment Return – The investment return generally has the largest impact on the funding of the System.

Impact of Assuming 1.00% Lower Investment Return	
	<u>Funded Ratio</u>
Current Assumption 7.65%	81.04%
Lower Assumption 6.65%	<u>70.97%</u>
Increase / (Decrease)	(10.07)%
	<u>Amortization Period</u>
	<u>Increase / (Decrease)</u>
Current Assumption 7.65%	21 Years
Lower Assumption 6.65%	<u>Does Not Amortize</u>
Increase / (Decrease)	N/A
Impact of Assuming 0.50% Lower Investment Return	
	<u>Funded Ratio</u>
Current Assumption 7.65%	81.04%
Lower Assumption 7.15%	<u>74.92%</u>
Increase / (Decrease)	(6.12)%
	<u>Amortization Period</u>
	<u>Increase / (Decrease)</u>
Current Assumption 7.65%	21 Years
Lower Assumption 7.15%	<u>113 Years</u>
Increase / (Decrease)	92 Years



Section I: Summary of Results

Impact of Assuming 0.50% Higher Investment Return	
	<u>Funded Ratio</u>
Current Assumption 7.65%	81.04%
Higher Assumption 8.15%	<u>85.23%</u>
Increase / (Decrease)	4.19%
	<u>Amortization Period</u>
	<u>Increase / (Decrease)</u>
Current Assumption 7.65%	21 Years
Higher Assumption 8.15%	<u>12 Years</u>
Increase / (Decrease)	(9) Years
Impact of Assuming 1.00% Higher Investment Return	
	<u>Funded Ratio</u>
Current Assumption 7.65%	81.04%
Higher Assumption 8.65%	<u>91.69%</u>
Increase / (Decrease)	10.65%
	<u>Amortization Period</u>
	<u>Increase / (Decrease)</u>
Current Assumption 7.65%	21 Years
Higher Assumption 8.65%	<u>5 Years</u>
Increase / (Decrease)	(16) Years

The future funding status of the System will be determined by the System's experience. The System's actual asset returns and retirement rates, as well as member longevity, salary increases, withdrawal rates, disability rates and future legislation will all impact the funding status of the System. The entry age normal cost method and four year smoothing of asset gains and losses will help to provide a more orderly funding of the System's liabilities, but will not change the actual experience. The amortization period of the UAAL is not likely to decrease by the expected 1.0 year with each passing actuarial valuation. Instead, the amortization period is expected to decrease more or less than 1.0 years each year, reflecting gains and losses due to experience different than the actuarial assumptions.

Assumption Changes

There have been no assumption changes since the previous valuation.

Benefit Changes

There have been no benefit changes since the previous valuation.

Contribution Changes

There have been no contribution changes since the previous valuation.

Method Changes

There have been no method changes since the previous valuation.



Section I: Summary of Results

Impact of Changes

The following table summarizes how experience has changed the UAAL since the June 30, 2017 Actuarial Valuation. Further detail can be found in Table 10 and Table 11.

Changes in the Unfunded Actuarial Accrued Liability (UAAL)

June 30, 2017 Valuation UAAL	\$79,217,275
Normal Cost (Including Expenses)	11,100,435
Contributions	(18,835,423)
Interest	6,188,849
Expected June 30, 2018 UAAL	<u>\$77,671,136</u>
Experience (Gain) / Loss on Actuarial Liabilities	\$2,713,177
Experience (Gain) / Loss on Actuarial Assets	2,426,494
Assumption & Method Changes	0
Plan Changes	0
Total (Gain) / Loss	<u>\$5,139,671</u>
June 30, 2018 Valuation UAAL	<u>\$82,810,807</u>



Section I: Summary of Results

Summary

- * The System's actuarial value investment return of 6.92% for the year ended June 30, 2018 is 0.73% less than the expected return of 7.65%. This represents an asset loss of \$2,426,494 due to investment return less than anticipated. As of June 30, 2018, the market value of assets was \$358,880,360. As of June 30, 2018, the actuarial value of assets was \$353,904,349. The June 30, 2018 market value of assets will be recognized in future actuarial valuations unless it is offset by returns less than the 7.65% assumption.
- * As of June 30, 2018, the amortization period of the UAAL is 21 years. The ultimate goal of the Board's Funding and Benefits Policy is to increase the funded status to a level such that the amortization period is below 30 years. The System is currently being funded within the parameters defined by the Board.
- * The funding of the retirement system will be impacted by future experience which will sometimes be more favorable than the actuarial assumptions and sometimes less favorable. In particular, investment returns larger and smaller than the 7.65% assumption are expected to have significant impacts on the System's funding progress. In the long term, the favorable experience is needed to offset the less favorable experience. This is the reason for using an actuarial value of assets that allows gains and losses to be smoothed over four years.
- * The unfunded actuarial accrued liability is amortized using a level percentage of payroll method over the amortization period. Under the level percentage of payroll method, amortization payments will not be large enough to cover interest on the UAL in the beginning of the amortization schedule, which means that as a dollar amount the UAL is expected to grow. After a period of time, amortization payments will be large enough that the amortization payments will cover both interest and principal, and the UAL as a dollar amount will be projected to decrease in each subsequent year. The payroll growth assumption is used to determine the percentage of payroll required over the remaining amortization period to fully amortize the unfunded liability. The payroll growth assumption is 3.50%.



Section II: Assets

Assets

In many respects, an actuarial valuation can be regarded 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. These assets are compared with the actuarial liabilities. The actuarial process thus leads to a method of determining what contributions by members and their employers are needed to strike a balance.

The asset valuation method being used is a four-year smoothing method. The expected return is determined each year based on the beginning of year market value and actual cash flows during the year. Any difference between the expected market value return and the actual market value return is recognized evenly over a period of four years.

Table 1 lists the assets held and their market value for the past two years. Table 2 summarizes the fund's activity during the past two years. Table 3 summarizes the determination of the actuarial value of assets. Table 4 summarizes historical asset returns for the last 10 years including the amount recognized by the actuarial asset valuation method which was greater or less than the actuarial investment return assumption. Table 5 summarizes the historical asset values on a market value and actuarial value basis, to the extent it was available. Additional data can be included in this table for future reports, if provided by the System.



Section II: Assets

Table 1:
Statement of Fiduciary Net Position
Fiscal Year Ended June 30

Table with 3 columns: Description, 2018, and 2017. Rows include ASSETS (Cash and Short Term Investments, Securities Lending Collateral, Receivables, Investments, Capital Assets) and LIABILITIES (Securities Lending Liability, Accounts Payable, etc.). Totals for ASSETS and LIABILITIES are provided, along with NET POSITION - RESTRICTED FOR PENSION BENEFITS.



Section II: Assets

Table 2:
Statement of Changes in Fiduciary Net Position
Fiscal Year Ended June 30

Table with 3 columns: Description, 2018, and 2017. Rows include ADDITIONS (Contributions, Misc. Income, Investment Income), DEDUCTIONS (Benefit Payments, Refunds, etc.), and NET INCREASE (DECREASE) IN PLAN NET ASSETS. Final row shows END OF YEAR values for 2018 (\$358,880,360) and 2017 (\$330,910,169).



Section II: Assets

**Table 3:
Determination of Actuarial Value of Assets**

Valuation Date June 30:	2017	2018	2019	2020	2021
A. Actuarial Value Beginning of Year	\$ 310,510,355	\$ 332,169,329			
B. Market Value End of Year	330,910,169	358,880,360			
C. Market Value of Beginning of Year	299,152,006	330,910,169			
D. Cash Flow					
D1. Contributions	14,750,962	18,835,423			
D2. Benefit Payments	(18,116,118)	(19,606,742)			
D3. Administrative Expenses	(387,378)	(432,091)			
D4. Investment Expenses	(1,698,315)	(2,186,159)			
D5. Net	\$ (5,450,849)	\$ (3,389,569)			
E. Investment Income					
E1. Market Total: B. - C. - D5.	\$ 37,209,012	\$ 31,359,760			
E2. Assumed Rate	7.75%	7.65%			
E3. Amount for Immediate Recognition C.*E2. + ((D1.+D2.+D3.)*E2.*0.5) - D4.	24,737,185	27,454,756			
E4. Amount for Phased-in Recognition E1. - E3.	12,471,827	3,905,004			
F. Phased-In Recognition of Investment Income					
F1. Current Year: 0.25 * E4.	\$ 3,117,957	\$ 976,251	\$ -	\$ -	\$ -
F2. First Prior Year	(4,188,656)	3,117,957	976,251	-	-
F3. Second Prior Year	(2,235,719)	(4,188,656)	3,117,957	976,251	-
F4. Third Prior Year	5,679,056	(2,235,719)	(4,188,656)	3,117,957	976,251
F5. Total Recognized Investment Gain	\$ 2,372,638	\$ (2,330,167)	\$ (94,448)	\$ 4,094,208	\$ 976,251
G. Actuarial Value End of Year A. + D5. + E3. + F5.	\$ 332,169,329	\$ 353,904,349			



Section II: Assets

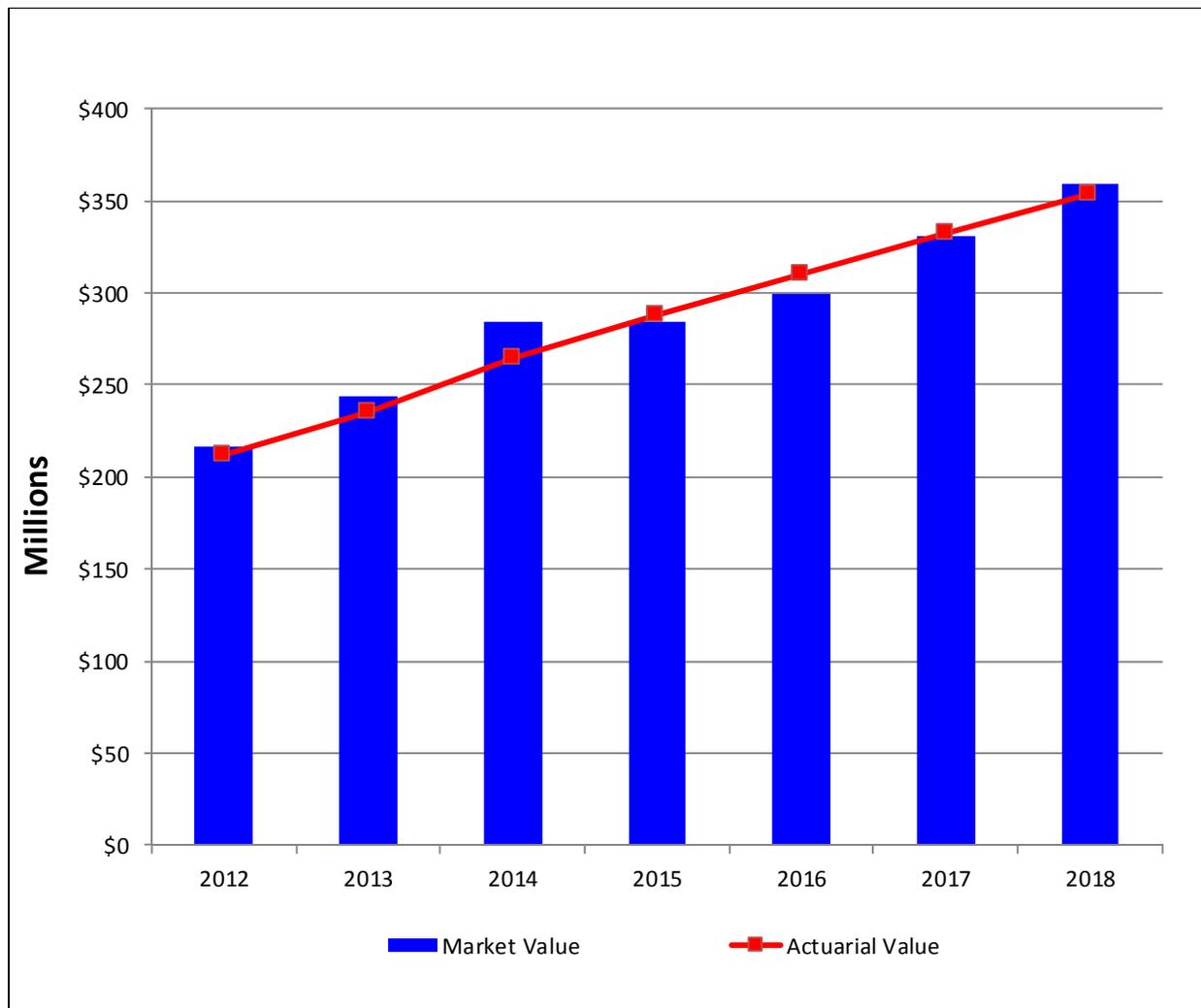
**Table 4:
Historical Investment Returns***

Fiscal Year Ending	Market Returns	Actuarial Returns	Assumed Return	Actuarial Return Over Assumption
June 30, 2009	(20.53)%	(0.15)%	8.00%	(8.15)%
June 30, 2010	12.65%	(0.92)%	7.75%	(8.67)%
June 30, 2011	21.57%	0.65%	7.75%	(7.10)%
June 30, 2012	2.32%	3.82%	7.75%	(3.93)%
June 30, 2013	12.88%	11.57%	7.75%	3.82%
June 30, 2014	17.08%	12.96%	7.75%	5.21%
June 30, 2015	4.60%	9.60%	7.75%	1.85%
June 30, 2016	2.06%	8.66%	7.75%	0.91%
June 30, 2017	11.95%	8.23%	7.75%	0.48%
June 30, 2018	8.83%	6.92%	7.65%	(0.73)%
10 Year Average	6.71%	6.03%		(1.75)%

* Returns reflect all investment returns, including investment income and realized and unrealized investment gains and losses, and are net of investment expenses and administrative expenses paid by the System.



**Table 5:
Market Value of Assets vs. Actuarial Value of Assets**





Section III: Actuarial Present Value of Future Benefits

Actuarial Present Value of Future Benefits

In the previous section, an actuarial valuation was related to an inventory process, and an analysis was given of the inventory of assets of the System as of the valuation date. In this section, the discussion will focus on the commitments of the System, which will be referred to as its actuarial liabilities.

Table 6 contains an analysis of the actuarial present value of all future benefits for active members, for retirees, and for beneficiaries. The analysis is given by type of benefit.

The actuarial liabilities summarized in Table 6 include the actuarial present value of all future benefits expected to be paid with respect to each member covered as of the valuation date. For an active member, this value includes a measure of both benefits already earned and future benefits to be earned. Thus, 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 beneficiaries.

The actuarial valuation does not recognize liabilities for employees who become members and participate in the System after the valuation date.



Section III: Actuarial Present Value of Future Benefits

**Table 6:
Actuarial Present Value of Future Benefits for Actives,
Retirees, and Beneficiaries**

	<u>June 30, 2018</u> Total	<u>June 30, 2017</u> Total
A. Active Members Liability Due to Probability of		
Retirement	\$ 215,190,774	\$ 203,282,704
Disability	\$ 6,842,815	\$ 6,624,495
In-Service Death	\$ 10,859,341	\$ 10,417,960
Termination	\$ 26,629,369	\$ 25,429,057
Total	\$ 259,522,299	\$ 245,754,216
B. Inactive Members and Annuitants		
Service Retirement	\$ 213,972,659	\$ 201,439,609
Disability Retirement	\$ 25,271,527	\$ 24,935,917
Beneficiaries*	\$ 15,720,596	\$ 13,272,163
Vested Terminated Members	\$ 7,484,726	\$ 5,605,021
Refund of Member Contributions	\$ 3,858,074	\$ 3,549,479
Total	\$ 266,307,582	\$ 248,802,189
C. Grand Total	\$ 525,829,881	\$ 494,556,405

* Includes survivors of active and retired members



Section IV: Employer Contributions

Employer Contributions

In the previous two sections, attention has been focused on the assets and the present value of all future benefits of the System. A comparison of Tables 3 and 6 indicates that there is a shortfall in current actuarial assets to meet the present value of all future benefits for current members and beneficiaries.

In an active system, there will always be a difference between the assets and the present value of all future benefits. An actuarial valuation sets a schedule of future contributions that will deal with this funding in an orderly fashion.

The method used to determine the incidence of the contributions in various years is called the actuarial cost method. For this valuation, the entry age actuarial cost method has been used. A description of the entry age actuarial cost method is provided in Appendix A. Under this method, or essentially any actuarial cost method, the contributions required to meet the difference between current assets and the present value of all future benefits are allocated each year between three elements:

- A normal cost amount, which ideally is relatively stable as a percentage of salary over the years;
- A load for administrative expenses; and
- An amount which is used to amortize the UAAL.

The two items described above, normal cost and UAAL, are the keys to understanding the actuarial cost method. Let us first discuss the normal cost.

The normal cost is the theoretical contribution rate, which will meet the ongoing costs of a group of average new employees. Suppose that a group of new employees were covered under a separate fund from which all benefits and to which all contributions and associated investment return were to be paid. Under the entry age actuarial cost method, the normal cost contribution rate is that level percentage of pay which would be exactly right to maintain this fund on a stable basis. If experience were to follow the actuarial assumptions exactly, the fund would be completely liquidated with the last payment to the last survivor of the group.

The assumed investment rate of return is 7.65%, net of investment expenses only. As a result, the actuarially determined contribution must include an amount for administrative expenses expected to occur during the year.

We have determined the normal cost rates separately by type of benefit under the System. These are summarized in Table 7. In Table 7 we also provide a summary of the member and employer statutory contributions.

The term "fully funded" is often applied to a system where contributions for everyone at the normal cost rate will fully pay for the benefits of existing as well as new employees. Often, systems are not fully funded, either because of benefit improvements in the past that have not been completely paid for or actuarial deficiencies that have occurred because experience has not been as anticipated. Under these circumstances, a UAAL exists.



Section IV: Employer Contributions

Table 8 shows how the UAAL was derived for the System. Lines A and B show, respectively, the total present value of future benefits and the portion of the future liability that is expected to be paid from future normal cost contributions, both employer and employee. The future normal cost contributions are the portion of the present value of future benefits that are attributed to future years of service that have not been earned yet by the active membership. Line C shows the actuarial accrued liability. Line D shows the amount of assets available for benefits. Line E shows the UAAL.

The UAAL at any date after establishment of a system is affected by any actuarial gains or losses arising when the actual experience of the system varies from the experience anticipated by the actuarial assumptions used in the valuations. To the extent actual experience as it develops differs from the assumptions used, so also will the actual emerging costs differ from the estimated costs. The impact of these differences in actual experience from the assumptions is included in Section 1, the Summary of Results.



Section IV: Employer Contributions

**Table 7:
Normal Cost Contribution Rates
As Percentages of Salary**

	<u>June 30, 2018 Total</u>	<u>June 30, 2017 Total</u>
Service retirement	9.800%	9.940%
Disability retirement	1.360%	1.410%
In Service Death	0.460%	0.480%
Termination	<u>4.320%</u>	<u>4.450%</u>
Total Normal Rate	<u>15.940%</u>	<u>16.280%</u>
Employee Normal Rate	10.495%	10.495%
Employer Normal Rate	5.445%	5.785%
Administrative Expense Load	0.230%	0.210%
Rate Available to Amortize Unfunded Actuarial Accrued Liability	<u>7.440%</u>	<u>7.120%</u>
Statutory Funding Rate	23.610%	23.610%

Note: The normal cost rate for members hired on or after July 1, 2011 is 15.17%.



Section IV: Employer Contributions

**Table 8:
Unfunded Actuarial Accrued Liability**

	<u>June 30, 2018</u>	<u>June 30, 2017</u>
A. Actuarial present value of all future benefits for active members, retirees and beneficiaries (Table 6)	\$ 525,829,881	\$ 494,556,405
B. Less actuarial present value of total future normal costs for present members	<u>\$ 89,114,725</u>	<u>\$ 83,169,801</u>
C. Actuarial accrued liability	\$ 436,715,156	\$ 411,386,604
D. Less assets available for benefits	<u>\$ 353,904,349</u>	<u>\$ 332,169,329</u>
E. Unfunded actuarial accrued liability	\$ 82,810,807	\$ 79,217,275



Cash Flows

The fundamental equation for funding a retirement system is that benefits and administrative expenses must be provided for by contributions (past and future) and investment income. When a retirement system matures, benefits and administrative expenses often exceed contributions. In this case we say the system has a “negative cash flow.” Mature systems are characterized by negative cash flows and large pools of assets. This is natural. Actuarial funding is designed to accumulate large pools of assets which will in turn provide investment income and finance negative cash flows when systems mature. If the fund is looked at as a whole, investment income is usually larger than the difference between contributions and benefit payments. The retirement system’s investment strategy should maximize potential returns at a prudent level of risk while providing for needed cash flows.

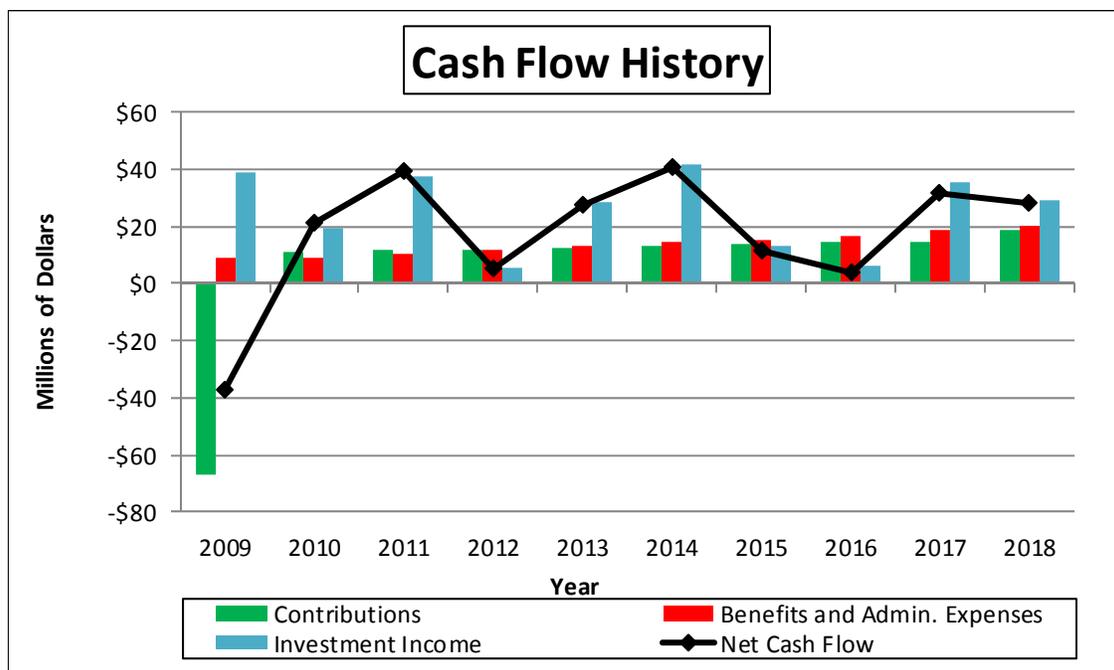
Table 9 shows the System had a positive cash flow for the year ended June 30, 2018. The System’s total cash flow including benefits payments, administrative expenses and investment earnings was \$28.0 million. Of the \$28.0 million, \$29.2 million was due to investment returns.

As long as the System had a positive cash flow, there was no need to plan where the funds would come from to pay benefits since benefits could be paid by incoming contributions. A negative cash flow, as defined above, requires planning what funds will be used to pay the difference between benefits and contributions.



Section V: Cash Flows

**Table 9:
Cash Flow History
(Dollar amounts in millions)**



Year Ended June 30	Historical Cash Flows			Net Cash Flow
	Contributions	Benefits & Administrative Expenses	Investment Income	
2009	\$ (67.2)	\$ 9.0	\$ 38.8	\$ (37.4)
2010	11.0	9.3	19.5	21.2
2011	11.8	10.3	37.5	39.1
2012	11.7	11.9	5.1	5.0
2013	12.1	13.1	28.2	27.2
2014	13.1	14.1	41.8	40.8
2015	13.5	15.5	13.0	11.0
2016	14.3	16.9	6.1	3.5
2017	14.8	18.5	35.5	31.8
2018	18.8	20.0	29.2	28.0



Section VI: Actuarial Gains of Losses

Actuarial Gains or Losses

An analysis of actuarial gains or losses is performed in conjunction with all regularly scheduled valuations.

The developments of the gains or losses related to the actuarial liability and the assets are shown in Table 10. The results of our analysis of the financial experience of the System in the three most recent regular actuarial valuations are presented in Table 11. Each gain or loss shown represents our estimate of how much the given type of experience caused the Unfunded Actuarial Accrued Liability or Funding Reserve to change in the period since the previous actuarial valuation.

Gains and losses shown due to demographic sources are approximate. Demographic experience is analyzed in greater detail in our periodic experience studies.

Non-recurring gains and losses result from changes in the actuarial assumptions and benefit improvements.



Section VI: Actuarial Gains of Losses

**Table 10:
Analysis of Actuarial (Gains) or Losses***

A. ACTUARIAL ACCRUED ACTUARIAL LIABILITY (GAIN) / LOSS ANALYSIS	
1. Actual Actuarial Actuarial Liability as of June 30, 2017:	\$ 411,386,604
2. Normal Cost for this Plan Year (Including Expenses):	11,100,435
3. Interest on items 1 and 2 [(1+2) x 7.65%]:	32,320,258
4. Benefit Payments for this Plan Year (Including Expenses):	(20,038,833)
5. Interest on item [4 x 7.65% x .5]:	(766,485)
6. Expected Actuarial Accrued Liability as of June 30, 2018:	<u>\$ 434,001,979</u>
7. Changes due to:	
a. Assumption Changes:	-
b. Plan Amendments:	-
c. Funding Method:	-
d. Actuarial (Gain) / Loss:	\$ 2,713,177
8. Actual Actuarial Accrued Liability as of June 30, 2018:	<u>\$ 436,715,156</u>
9. Items Affecting Calculation of Unfunded Accrued Actuarial Liability:	
a. Benefit provisions reflected in the unfunded accrued liability (see Appendix C)	
b. Actuarial assumptions and methods used to determine actuarial accrued liability (see Appendix B)	
B. ASSET (GAIN) / LOSS ANALYSIS	
1. Actuarial Value of Assets as of June 30, 2017:	\$ 332,169,329
2. Interest on item [1 x 7.65%]:	25,410,954
3. Contributions for this Plan Year:	18,835,423
4. Interest on item [3. x 7.65% x .5]:	720,455
5. Benefit Payments for this Plan Year (Including Expenses):	(20,038,833)
6. Interest on item [5. x 7.65% x .5]:	(766,485)
7. Expected Actuarial Value of Assets as of June 30, 2018:	<u>\$ 356,330,843</u>
8. Actuarial Value of Assets as of June 30, 2018:	353,904,349
9. (Gain) / Loss	<u>\$ 2,426,494</u>
C. UNFUNDED ACCRUED LIABILITY (GAIN) / LOSS ANALYSIS	
1. Actual Unfunded Actuarial Accrued Liability as of June 30, 2017:	\$ 79,217,275
2. Normal Cost for this Plan Year (Including Expenses):	11,100,435
3. Contributions for this Plan Year:	(18,835,423)
4. Interest	6,188,849
5. Expected Unfunded Actuarial Accrued Liability as of June 30, 2018:	<u>\$ 77,671,136</u>
6. Changes due to:	
a. Assumption Changes:	-
b. Plan Amendments:	-
c. Funding Method:	-
d. Actuarial (Gain) / Loss:	\$ 5,139,671
7. Actual Actuarial Accrued Liability as of June 30, 2018:	<u>\$ 82,810,807</u>

* Effects related to gains are shown in parentheses. Numerical results are expressed as a (decrease) increase in the Actuarial Accrued Liability (AAL). Gains decrease the AAL and losses increase the AAL.



Section VI: Actuarial Gains of Losses

**Table 11:
Historical Actuarial (Gains) or Losses*
(Dollar amounts in thousands)**

	UAAL (Gain)/Loss		
	June 30, 2018	June 30, 2017	June 30, 2016
Investment Income			
Investment income was (greater) less than expected based on actuarial value of assets.	\$ 2,426.5	\$ (1,492.4)	\$ (2,603.4)
Pay Increases			
Pay increases were (less) greater than expected.	\$ (165.6)	\$ (2,042.7)	\$ (2,505.3)
Age & Service Retirements			
Members retired at (older) younger ages or with (less) greater final average pay than expected	\$ (1,693.8)	\$ 2,365.5	\$ 1,917.9
Disability Retirements			
Disability claims were (less) greater than expected	\$ (31.8)	\$ 88.2	\$ 1,200.5
Death-in-Service Benefits			
Survivor claims were (less) greater than expected	\$ (89.4)	\$ (81.9)	\$ 213.1
Withdrawal From Employment			
(More) less reserves were released by withdrawals than expected	\$ (180.4)	\$ (388.5)	\$ 1,423.4
Death After Retirement			
Retirees (died younger) lived longer than expected	\$ 419.6	\$ (35.0)	\$ (385.6)
Data Adjustments and Benefit Payment Timing			
Service purchases, data corrections, etc.	\$ 4,495.7	\$ 3,978.2	\$ 1,066.0
Other			
Miscellaneous (gains) and losses	\$ (41.1)	\$ (1,395.8)	\$ (1,038.5)
Total (Gain) or Loss During Period From Financial Experience	\$ 5,139.7	\$ 995.6	\$ (711.9)
Non-Recurring Items.			
Changes in actuarial assumptions and methods	\$ -	\$ 14,306.0	\$ -
Changes in benefits caused a (gain) loss	\$ -	\$ (1,332.9)	\$ -
Composite (Gain) Loss During Period	\$ 5,139.7	\$ 13,968.7	\$ (711.9)

* Effects related to gains are shown in parentheses. Numerical results are expressed as a (decrease) increase in the Unfunded Actuarial Accrued Liability (UAAL). Gains decrease the UAAL and losses increase the UAAL.



Appendix A: Actuarial Procedures and Methods

The assumptions and methods utilized in the valuation were developed in the six-year experience study for the period ending June 30, 2016.

Tables B-1 through B-7 give rates of decrement for service retirement, disablement, mortality, and other terminations of employment.

Actuarial Cost Method

The actuarial valuation was prepared using the entry age actuarial cost method. Under this method, the actuarial present value of the projected benefits of each individual included in the valuation is allocated as a level percentage of the individual's projected compensation between entry age and assumed exit. The portion of this actuarial present value allocated to a valuation year is called the normal cost. The normal cost was first calculated for each individual member. The normal cost rate is defined to equal the total of the individual normal costs, divided by the total pay rate.

The portion of this actuarial present value not provided for at a valuation date by the sum of (a) the actuarial value of the assets and (b) the actuarial present value of future normal costs is called the UAAL. The UAAL is amortized as a level percentage of the projected salaries of present and future members of the System.

Records and Data

The data used in the valuation consist of financial information; records of age, sex, service, salary, contribution rates, and account balances of contributing members; and records of age, sex, and amount of benefit for retired members and beneficiaries. All of the data was supplied by the System and has been accepted for valuation purposes without audit.

Replacement of Terminated Members

The ages at entry and distribution by sex of future members are assumed to average the same as those of the present members they replace. If the number of active members should increase, it is further assumed that the average entry age of the larger group will be the same, from an actuarial standpoint, as that of the present group. Under these assumptions, the normal cost rates for active members will not vary with the termination of present members.

Administrative and Investment Expenses

The investment expenses of the System are assumed to be funded by investment earnings in excess of 7.65% per year.

Administrative expenses are assumed to equal 0.23% of payroll.



Appendix A: Actuarial Procedures and Methods

Valuation of Assets

The actuarial asset valuation method spreads asset gains and losses over four years. The expected return is determined each year based on the beginning of year market value and actual cash flows during the year. Any difference between the expected market value return and the actual market value return is recognized evenly over a period of four years.

Investment Earnings

The annual rate of investment earnings of the assets of the System is assumed to be 7.65% per year net of investment expenses, compounded annually.

Interest on Member Contributions

Interest on member contributions is assumed to accrue at a rate of 2.75% per annum, compounded annually.

Future Salaries

The rates of annual salary increase assumed for the purpose of the valuation are illustrated in Table B-2. In addition to increases in salary due to merit and longevity, this scale includes an assumed 3.50% annual rate of increase in the general wage level of the membership.

Service Retirement

Table B-3 shows the annual assumed rates of retirement for actives members meeting the service retirement eligibilities.

Disablement

The rates of disablement used in this valuation are illustrated in Table B-4.

Mortality

The mortality rates used in this valuation are illustrated in Table B-5. A written description of each table used is included in Table B-1.

Other Terminations of Employment

The rates of assumed future withdrawal from active service for reasons other than death, disability or retirement are shown for representative ages in Table B-6.



Appendix A: Actuarial Procedures and Methods

Benefits for Terminating Members

Members terminating with less than five years of service are assumed to request an immediate withdrawal of their contributions with interest. Table B-7 shows the assumed probability of retaining membership in the System among members terminating with five or more years of service.

We estimated the present value of future benefits for terminated vested members based on the greater of the present value of their deferred benefit at age 60 or their available contribution account.

Probability of Marriage & Dependent Children

If death occurs in active status, all members are assumed to have an eligible surviving spouse with no dependent children. Female spouses are assumed to be three years younger than males.

Records with no Birth Date

New records with no birth date are assumed to be 37 years old. Records that are not new and have no birth date used the same birth date as the prior year's valuation.

Active Records with a Salary Less than \$1,000

These members are included in the active headcounts, however the pay of these members is not included in the Valuation Projected Salaries summarized in Appendix D. The liability for these members is their accumulated member contributions payable on the valuation date.



Appendix B: Summary of Valuation Assumptions

Table B-1

Summary of Valuation Assumptions

I. Economic assumptions	
A. General wage increases	3.50%
B. Investment return	7.65%
C. Price inflation assumption	2.75%
D. Growth in membership	0.00%
E. Interest on member accounts	2.75%
F. Administrative Expenses as a percentage of payroll	0.23%
II. Demographic assumptions	
A. Individual salary increase due to promotion and longevity	Table B-2
B. Retirement	Table B-3
C. Disablement	Table B-4
D. Mortality among contributing members, service retired members, and beneficiaries. The tables include margins for mortality improvement which is expected to occur in the future. For Males and Females: RP 2000 Combined Employee and Annuitant Mortality Table projected to 2020 using Scale BB, set back one year for males.	Table B-5
E. Mortality among disabled members For Males and Females: RP 2000 Combined Mortality Table.	Table B-5
F. Other terminations of employment	Table B-6
G. Probability of retaining membership in the System upon vested termination	Table B-7



Appendix B: Summary of Valuation Assumptions

Table B-2
Future Salaries

Years of Service	(a) Individual Merit & Longevity	(b) General Wage Increase	(1+(a))*(1+(b)) Total Salary Increase
1	6.30%	3.50%	10.02%
2	4.70	3.50	8.36
3	3.50	3.50	7.12
4	2.70	3.50	6.29
5	2.00	3.50	5.57
6	1.40	3.50	4.95
7	0.90	3.50	4.43
8	0.50	3.50	4.02
9	0.20	3.50	3.71
10 & Up	0.00	3.50	3.50



Appendix B: Summary of Valuation Assumptions

Table B-3

**Retirement
Annual Rates**

<u>Age</u>	<u>20 or More Years of Service</u>
Less than 50	10.0%
50	10.0%
51	10.0
52	10.0
53	10.0
54	10.0
55	15.0
56	15.0
57	15.0
58	15.0
59	15.0
60	20.0
61	20.0
62	20.0
63	20.0
64	20.0
65 & Over	100.0

Vested terminations are assumed to retire at their earliest unreduced eligibility.



Appendix B: Summary of Valuation Assumptions

Table B-4
Disablement
Annual Rates

<u>Age</u>	<u>All Members</u>
22	.00%
27	.10
32	.10
37	.10
42	.40
47	.40
52	.40
57	.40
62	.00

75% of disabilities are assumed to be duty-related. All disabilities are assumed to be permanent and without recovery.



Appendix B: Summary of Valuation Assumptions

Table B-5
Mortality
Annual Rates

Age	Contributing Members, Service Retired Members and Beneficiaries		Disabled Members	
	Men	Women	Men	Women
25	0.0354%	0.0195%	0.0376%	0.0207%
30	0.0388	0.0249	0.0444	0.0264
35	0.0661	0.0447	0.0773	0.0475
40	0.0961	0.0665	0.1079	0.0706
45	0.1316	0.1058	0.1508	0.1124
50	0.1879	0.1578	0.2138	0.1676
55	0.3010	0.2458	0.3624	0.2717
60	0.5271	0.4135	0.6747	0.5055
65	0.9041	0.7624	1.2737	0.9706
70	1.4636	1.3151	2.2206	1.6742
75	2.5057	2.2077	3.7834	2.8106
80	4.2816	3.6037	6.4368	4.5879
85	7.3750	6.0833	11.0757	7.7446
90	13.0721	10.5549	18.3408	13.1682
95	21.7835	17.2452	26.7491	19.4509

10% of all member deaths are assumed to be duty-related.



Table B-6

**Other Terminations of Employment
Among Members Not Eligible to Retire
Annual Rates**

<u>Years of Service</u>	<u>All Members</u>
0	25.0%
1	17.0
2	15.0
3	13.0
4	11.0
5	9.0
6	9.0
7	9.0
8	5.0
9	5.0
10	5.0
11	4.0
12	4.0
13	4.0
14	4.0
15 & Over	3.0



Table B-7
Probability of Retaining Membership in the System
Upon Vested Termination

<u>Age</u>	<u>Probability of Retaining Membership</u>
Under 35	30%
35	40
36	40
37	40
38	40
39	40
40	50
41	50
42	50
43	50
44	50
45	60
46	60
47	60
48	60
49	60
50 & Over	100

Family Composition

Female spouses are assumed to be three years younger than males. 100% of non-retired employees are assumed married for both male and female employees. Actual marital characteristics are used for pensioners.

Vested Benefits for Termination Members

Vested benefits for members who terminated during years ending June 30, 2009 and later were estimated based upon compensation and service information in the census data. For members who terminated prior to June 30, 2008, vested benefits valued were the same as had been calculated by the prior actuary for the June 30, 2008 actuarial valuation.



Appendix C: Summary of Benefit Provisions

- | | |
|--|---|
| Service credit | <ul style="list-style-type: none">• Service credit is used to determine the amount of a member's retirement benefit.• One month of service credit is earned for each month where the member is paid for 160 hours. This includes certain transferred and purchased service. |
| Membership service | <ul style="list-style-type: none">• Membership service is used to determine eligibility for vesting, retirement or other benefits.• One month of membership service is earned for any month member contributions are made, regardless of the number of hours worked.• Eligible members in all systems may purchase service that counts toward membership service.• Additionally, eligible active and inactive Sheriffs' Retirement System (SRS) members may purchase 1 for 5 (additional) service that will count as membership service. |
| Contributions | <ul style="list-style-type: none">• Member contributions are made through an "employer pick-up" arrangement which results in deferral of taxes on the contributions. |
| Compensation | <ul style="list-style-type: none">• Compensation generally means all remuneration paid, excluding certain allowances, benefits, and lump sum payments. Compensation is specifically defined in law and differs amongst the systems.• Bonuses paid on or after July 1, 2013 to any member will not be treated as compensation for retirement purposes. No member or employer contributions will be paid on bonuses. |
| Withdrawal of employee contributions | <ul style="list-style-type: none">• A member is eligible for a withdrawal of their contributions when they terminate service and are either not eligible for or have not taken a retirement benefit.• The member receives the accumulated member contributions, which consists of member contributions and regular interest.• Upon receipt of a refund of accumulated contributions a member's vested right to a monthly benefit is forfeited. |
| Member contributions interest credited (regular interest) | <ul style="list-style-type: none">• Interest is credited to member accounts at the rates determined by the Board.• The current interest rate credited to member accounts is 0.77%. |



Appendix C: Summary of Benefit Provisions

Working Retiree Limitations

Applies to retirement system members who return **on or after** July 1, 2017 to covered employment in the system from which they retired. These limits already applied to SRS members before July 1, 2017.

- Members who return for **less than 480 hours** in a **calendar year**:
 - may not become an active member in the system; and
 - are subject to a \$1 reduction in their retirement benefit for each \$3 earned in excess of \$5,000 in the calendar year.
- Members who return for **480 or more hours** in a **calendar year**;
 - must become an active member of the system;
 - will stop receiving a retirement benefit from the system; **and**
 - will be eligible for a second retirement benefit if they earn 5 or more years of service credit through their second employment.
- Employee, employer and state contributions apply as follows:
 - Employer contributions and state contributions (if any) must be paid on all working retirees;
 - Employee contributions must be paid on working retirees who return to covered employment for 480 or more hours in a calendar year.

NOTE: PERS has its own limits.

Second Retirement Benefit

Applies to retirement system members who return on or after July 1, 2017 to active service covered by the system from which they retired.

- If the member works more than 480 hours in a calendar year and accumulates less than 5 years of service credit before terminating again, the member:
 - is not awarded service credit for the period of reemployment;
 - is refunded the accumulated contributions associated with the period of reemployment;
 - starting the first month following termination of service, receives the same retirement benefit previously paid to the member; and
 - does not accrue post-retirement benefit adjustments during the term of reemployment but receives a GABA in January immediately following second retirement.



Appendix C: Summary of Benefit Provisions

- | | |
|----------------------------------|---|
| Second Retirement Benefit | <ul style="list-style-type: none">• If the member works more than 480 hours in a calendar year and accumulates at least 5 years of service credit before terminating again, the member:<ul style="list-style-type: none">○ is awarded service credit for the period of reemployment;○ starting the first month following termination of service, receives:<ul style="list-style-type: none">* the same retirement benefit previously paid to the member; and* a second retirement benefit for the period of reemployment calculated based on the laws in effect as of the member's rehire date; and○ does not accrue post-retirement benefit adjustments during the term of reemployment but receives a GABA:<ul style="list-style-type: none">* on the initial retirement benefit in January immediately following second retirement; and* on the second retirement benefit starting in January after receiving that benefit for at least 12 months.• A member who returns to covered service is not eligible for a disability benefit. |
| Refunds | <ul style="list-style-type: none">• Terminating members eligible to retire may, in lieu of receiving a monthly retirement benefit, refund their accumulated contributions in a lump sum.• Terminating members with accumulated contributions between \$200 and \$1,000 who wish to rollover their refund must do so within 90 days of termination of service.• Trusts, estates, and charitable organizations listed as beneficiaries are entitled to receive only a lump sum payment. |
| Lump-sum payouts | <ul style="list-style-type: none">• Effective July 1, 2017, lump sum payouts in all systems are limited to the member's accumulated contributions rather than the present value of the member's benefit. |
| Type of plan | <ul style="list-style-type: none">• Multiple-employer cost sharing |
| Membership eligibility | <ul style="list-style-type: none">• Sheriffs• Investigators (effective July 1, 1993)• Detention officers (effective July 1, 2005) |
| Member contributions | <ul style="list-style-type: none">• 10.195% of member's compensation (effective July 1, 2017) |



Appendix C: Summary of Benefit Provisions

Employer contributions	<ul style="list-style-type: none">• 13.115% of each member's compensation (effective July 1, 2017)• Rate increased 0.29% from 9.535% to 9.825% on July 1, 2007, then to 10.115% on July 1, 2009, and then to present rate 13.115% on July 1, 2017.• SRS employee contributions will return to 9.245% and SRS employer contributions will return to 9.535% when reducing the employee contribution and terminating the additional employer contributions will not cause the amortization period to exceed 25 years.• Beginning July 1, 2013, employers of retirees who return to work in a position working less than 480 hours contribute 10.115% of the working retiree's compensation.
Compensation period used in benefit calculation	<ul style="list-style-type: none">• HAC = Highest Average Compensation• Hired prior to July 1, 2011: HAC is average of the highest 36 consecutive months (or shorter period of total service) of compensation paid to member.• Hired on or after July 1, 2011: HAC is average of the highest 60 consecutive months (or shorter period of total service) of compensation paid to member.• Hired on or after July 1, 2013: 110% annual cap on compensation considered as part of a member's HAC.
Service retirement eligibility and benefit formula	<ul style="list-style-type: none">• 20 years of membership service• 2.5% of HAC x years of service credit
Early retirement eligibility and benefit	<ul style="list-style-type: none">• Age 50 with 5 years of membership service• Normal retirement benefit calculated using HAC and service credit at early retirement, and reduced to the actuarial equivalent commencing at the earliest of age 60 or the attainment of 20 years of service credit.
Disability retirement eligibility and benefit formula	<p>Non-duty-related disability:</p> <ul style="list-style-type: none">• Active or inactive vested member• 5 years membership service• The actuarial equivalent of the accrued normal retirement benefit available at time of disability. <p>Duty-related disability:</p> <ul style="list-style-type: none">• Vested or non-vested active member• Any membership service• Less than 20 years of membership service: 50% of HAC, or• 20 years or more of membership service: 2.5% of HAC x years of service credit



Appendix C: Summary of Benefit Provisions

Survivor's eligibility and benefit formula

Duty-related death:

- Vested or non-vested active member
- Lump-sum payment of the member's accumulated contributions; **or**
- A monthly survivor benefit to the designated beneficiary **equal to the greater of:**
 - 50% of HAC; **or**
 - 2.5% of HAC for each year of service credit if over 20 years.

Non-duty-related death:

- Active or Inactive member
- Lump-sum payment of the member's accumulated contributions; **or**
- A monthly survivor benefit equal to 2.5% of HAC for each year of service credit actuarially reduced from age 60 **or** from the date when 20 years of membership service would have been completed, whichever provides the greater benefit.
- A beneficiary may elect to receive the present value of the benefit as a single lump sum.
- For retired members without a contingent annuitant, a payment will be made to the designated beneficiary equal to the accumulated contributions reduced by any retirement benefits already paid.

Vesting eligibility and benefit

- 5 years of membership service
- Accrued normal retirement benefit, payable when eligible for retirement.
- In lieu of a pension, a member may receive a refund of accumulated contributions.
- Upon receipt of a refund of accumulated contributions, a member's vested right to a monthly benefit is forfeited.

Retirement benefits - Form of payment

Option 1, the normal form of payment is a single life annuity with a refund of any remaining accumulated contributions (account balance) to a designated beneficiary.

Optional Benefits:

- Option 2, a life annuity and joint 100% survivor benefit,
- Option 3, a life annuity and joint 50% survivor benefit, and
- Option 4, a life annuity with a period certain.

If a retiring member selects Option 2 or 3 and the contingent annuitant predeceases or is divorced from the member, the retiree may, with 18 months of the death or divorce, choose to revert to the higher Option 1 benefit available at retirement or the retiree may select a different contingent annuitant and/or a different option.



Appendix C: Summary of Benefit Provisions

Post retirement benefit increases

For retired members who have been retired at least 12 months, a Guaranteed Annual Benefit Adjustment (GABA) will be made each year equal to:

- 3% for members hired **before** July 1, 2007, and
- 1.5% for members hired **on or after** July 1, 2007

Changes since last valuation

- None



Appendix D: Valuation Data

Valuation Data

This chart is presented for informational purposes only. The counts shown in the valuation line were used for preparation of the liabilities disclosed within this report. The counts disclosed for the Annual Financial Report and the Summary of Results (page 1) match the CAFR at the request of the Board. The differences between counts, if any, have no material effect upon the liability calculation.

	<u>Active</u>	<u>Disabled</u>	<u>Retirees and Beneficiaries</u>	<u>Terminated Vested Members</u>	<u>Terminated Non-Vested Members</u>	<u>Total</u>
Participant Counts Used for Valuation	1,429	73	608	129	539	2,778
Disabled Members having attained normal retirement age		(46)	46			
Beneficiaries of Disabled Members						
Beneficiaries with less than one year of certain payments remaining						
Other Adjustments						
Participant Counts shown in the Annual Financial Report	1,429	27	654	129	539	2,778



Appendix D: Valuation Data

Valuation Data

This valuation is based upon the membership of the System as of June 30, 2018. Membership data was supplied by the System and has been accepted for valuation purposes without audit. However, tests were performed to ensure that the data is sufficiently accurate for valuation purposes.

The salaries used in the tables and charts which follow are different than the salaries used for the Board Summary on page 1. The valuation projected salaries to be paid for the following fiscal year, whereas the Board Summary, salaries are applicable in the year ending on the valuation date.

<u>Active Members</u>	<u>Number</u>	<u>Valuation Projected Salaries</u>
Full-Time Members	1,333	\$ 77,404,139
Part-Time Members	<u>96</u>	<u>\$ 2,002,224</u>
Total Active Members	1,429	\$ 79,406,363

Table D-1 contains summaries of the data for contributing members. For full-time members, values shown in the tables are the numbers of members and their total and average annual salaries. For part-time members, only the numbers of members are shown.

Table D-2 presents distributions of the following:

- Members receiving service retirement benefits.
- Members receiving disability retirement benefits.
- Survivors of deceased retired members receiving benefits.
- Survivors of deceased active members.
- Terminated vested members.

Table D-3 is a reconciliation of membership data from June 30, 2017 to June 30, 2018.



Appendix D: Valuation Data

The following is a summary of retired members and beneficiaries currently receiving benefits. The chart reflects the counts and benefits used for valuation purposes as a result of data processing. Please refer to the chart on page 41 for an explanation of the number of annuitants used for valuation purposes.

<u>Type of Annuitant</u>	<u>Number</u>	<u>Annual Benefits</u>	<u>Average Annual Benefits</u>
Service Retirement	545	\$ 15,444,553	\$ 28,339
Survivors of Deceased Retired Members	38	687,200	18,084
Survivors of Deceased Active Members	<u>25</u>	<u>602,615</u>	<u>24,105</u>
Total Service Retirement (including survivors)	608	\$ 16,734,368	\$ 27,524
Disability Retirement	<u>73</u>	<u>1,786,177</u>	<u>24,468</u>
Total Annuitants	681	\$ 18,520,545	\$ 27,196

<u>Terminated Members with Contributions Not Withdrawn</u>	<u>Number</u>
Vested Terminated Members	129
Non-Vested Terminated Members	<u>539</u>
Total Terminated Members	668



**Table D-1:
Active Members Distribution of
Full-Time Employees and Salaries
as of June 30, 2018**

Number of Employees

Age	Completed Years of Service												Totals	
	0	1	2	3 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40+		
<25	53	41	16	15	1									126
25 to 29	47	44	36	41	30									198
30 to 34	28	37	18	47	67	14								211
35 to 39	16	15	17	32	44	53	8	1						186
40 to 44	6	4	11	10	40	52	35	3						161
45 to 49	14	8	9	17	25	32	38	17	2					162
50 to 54	6	6	9	11	24	29	29	9	8	1				132
55 to 59	3	3	6	11	13	21	15	9	5	4				90
60 to 64		2	2	2	14	11	9	2	2	1	2	2		49
65 to 69				2	2	5	3	2	1	1				16
70 and up							2							2
Totals	173	160	124	188	260	217	139	43	18	7	2	2		1,333



**Table D-1:
Active Members Distribution of
Full-Time Employees and Salaries
as of June 30, 2018**

Annual Salaries in Thousands

Age	Completed Years of Service												Totals	
	0	1	2	3 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40+		
<25	2,190	1,790	753	767	42									5,542
25 to 29	2,035	2,141	1,888	2,183	1,706									9,952
30 to 34	1,253	1,749	1,015	2,656	4,145	890								11,709
35 to 39	732	780	916	1,839	2,679	3,527	636	80						11,189
40 to 44	237	197	635	545	2,597	3,419	2,622	214						10,466
45 to 49	633	448	482	949	1,476	2,097	2,913	1,429	175					10,603
50 to 54	234	254	475	523	1,583	1,836	2,017	719	605	96				8,342
55 to 59	107	235	259	579	737	1,229	931	659	414	326				5,476
60 to 64		102	78	123	784	613	587	113	135	60	160	151		2,906
65 to 69				119	130	304	201	142	72	146				1,114
70 and up							105							105
Totals	7,421	7,695	6,500	10,282	15,879	13,916	10,013	3,357	1,401	628	160	151		77,404



**Table D-1:
Active Members Distribution of
Full-Time Employees and Salaries
as of June 30, 2018**

Average Annual Salary

Age	Completed Years of Service												Totals	
	0	1	2	3 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40+		
<25	41,322	43,661	47,070	51,115	42,472									43,988
25 to 29	43,293	48,661	52,445	53,236	56,862									50,265
30 to 34	44,764	47,268	56,381	56,519	61,862	63,607								55,492
35 to 39	45,769	52,003	53,871	57,467	60,880	66,538	79,550	80,112						60,155
40 to 44	39,453	49,265	57,704	54,454	64,923	65,751	74,925	71,435						65,005
45 to 49	45,186	55,994	53,554	55,839	59,046	65,539	76,666	84,067	87,669					65,450
50 to 54	39,005	42,267	52,758	47,569	65,960	63,315	69,542	79,897	75,630	96,366				63,198
55 to 59	35,572	78,203	43,221	52,631	56,711	58,500	62,073	73,222	82,848	81,509				60,841
60 to 64		51,044	38,881	61,526	55,992	55,767	65,256	56,626	67,323	59,806	79,845	75,686		59,312
65 to 69				59,256	65,148	60,861	66,936	71,204	72,015	145,763				69,632
70 and up							52,361							52,361
Totals	42,894	48,097	52,423	54,693	61,074	64,128	72,034	78,076	77,849	89,710	79,845	75,686		58,068



**Table D-1:
Active Members Distribution of
Part-Time Employees
as of June 30, 2018**

Number of Employees

Age	Completed Years of Service											Totals		
	0	1	2	3 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39		40+	
<25	7	1	1											9
25 to 29	9	4	1	4	2									20
30 to 34	7	2		1	2									12
35 to 39	3		1		2									6
40 to 44	3	1	1		2		1							8
45 to 49	2	5		2	1	3	1	1						15
50 to 54	2		2	1	1	3	2	1						12
55 to 59	1	1	2		2	1								7
60 to 64			2	1	1									4
65 to 69		1	1											2
70 and up					1									1
Totals	34	15	11	9	14	7	4	2						96



Appendix D: Valuation Data

**Table D-2:
Distribution of Inactive Lives**

The charts reflects the counts and benefits used for valuation purposes as a result of data processing. Please refer to the chart on page 41 for an explanation of the number of annuitants used for valuation purposes.

Members Receiving Service Retirement Benefits as of June 30, 2018

<u>Age</u>	<u>Number of Persons</u>	<u>Annual Benefits</u>	<u>Average Annual Benefits</u>
<50	28	\$ 982,811	\$ 35,100
50 to 54	37	941,540	25,447
55 to 59	79	2,233,132	28,267
60 to 64	122	3,401,263	27,879
65 to 69	128	3,841,443	30,011
70 to 74	85	2,332,577	27,442
75 to 79	43	1,281,832	29,810
80 to 84	15	273,510	18,234
85 to 89	5	112,290	22,458
90 and up	3	44,155	14,718
Totals	545	\$ 15,444,553	\$ 28,339

Members Receiving Disability Retirement Benefits as of June 30, 2018

<u>Age</u>	<u>Number of Persons</u>	<u>Annual Benefits</u>	<u>Average Annual Benefits</u>
<50	13	\$ 377,455	\$ 29,035
50 to 54	8	216,490	27,061
55 to 59	10	250,536	25,054
60 to 64	18	433,825	24,101
65 to 69	11	239,716	21,792
70 to 74	10	218,102	21,810
75 to 79	-	-	-
80 to 84	2	35,587	17,793
85 to 89	1	14,467	14,467
90 and up	-	-	-
Totals	73	\$ 1,786,177	\$ 24,468



Table D-2: Distribution of Inactive Lives

The charts reflects the counts and benefits used for valuation purposes as a result of data processing. Please refer to the chart on page 41 for an explanation of the number of annuitants used for valuation purposes.

Survivors of Deceased Retired Members as of June 30, 2018

Age	Number of Persons	Annual Benefits	Average Annual Benefits
<50	1	\$ 6,042	\$ 6,042
50 to 54	1	13,465	13,465
55 to 59	3	102,026	34,009
60 to 64	1	21,429	21,429
65 to 69	9	155,061	17,229
70 to 74	4	98,117	24,529
75 to 79	7	99,009	14,144
80 to 84	6	116,328	19,388
85 to 89	6	75,723	12,621
90 and up	-	-	-
Totals	38	\$ 687,200	\$ 18,084

Survivors of Deceased Active Members as of June 30, 2018

Age	Number of Persons	Annual Benefits	Average Annual Benefits
<50	9	\$ 161,434	\$ 17,937
50 to 54	1	45,200	45,200
55 to 59	2	95,613	47,806
60 to 64	3	91,352	30,451
65 to 69	2	23,297	11,648
70 to 74	3	99,620	33,207
75 to 79	-	-	-
80 to 84	1	47,108	47,108
85 to 89	3	25,989	8,663
90 and up	1	13,002	13,002
Totals	25	\$ 602,615	\$ 24,105



**Table D-2:
Distribution of Inactive Lives**

The chart reflects the counts and benefits used for valuation purposes as a result of data processing. Please refer to the chart on page 41 for an explanation of the number of annuitants used for valuation purposes.

**Terminated Vested Members as of June 30, 2018
Number of Persons**

<u>Age</u>	<u>Number</u>
<25	1
25 to 29	4
30 to 34	16
35 to 39	28
40 to 44	23
45 to 49	30
50 to 54	15
55 to 59	7
60 to 64	5
65 to 69	
70 and above	
Total	129



**Table D-3:
Data Reconciliation**

The following table shows a reconciliation of the participants used in the previous valuation to this valuation. This chart reflects the counts used for valuation purposes as a result of data processing.

	<u>Active Contributing Members</u>	<u>Terminated Vested Members</u>	<u>Service Retired Members</u>	<u>Disabled Members</u>	<u>Survivors and Beneficiaries</u>
June 30, 2017 Valuation	1,415	108	516	74	58
Refunds and Non-Vested Terminations	(146)	(7)			
Vested Terminations	(39)	39			
Service Retirements	(24)	(8)	32		
Disability Retirements	(1)			1	
Deaths			(7)		(1)
New Entrants	214				5
Rehires	18	(3)			
Other	(8)		4	(2)	1
June 30, 2018 Valuation	1,429	129	545	73	63



Appendix E: Comparative Schedules

Comparative Schedules

This section contains tables that summarize the experience of the System shown in present and past valuation reports.

Table E-1 shows a summary of the active members covered as of the various valuation dates.

Table E-2 shows a summary of the retired and inactive members as of the various valuation dates.

Table E-3 summarizes the contribution rates determined by each annual actuarial valuation.



**Table E-1:
Active Membership Data**

<u>Valuation Date (June 30)</u>	<u>Actives</u>	<u>Annual Salaries in Thousands</u>	<u>Average Annual Salary</u>	<u>Average Age</u>	<u>Average Years of Service</u>	<u>Average Hire Age</u>
2018	1,429	77,587	54,295	39.8	7.4	32.4
2017	1,415	74,581	52,708	40.0	7.2	33.8
2016	1,364	70,593	51,755	40.1	7.2	32.9
2015	1,336	67,881	50,809	40.3	7.2	33.1
2014	1,307	64,424	49,291			
2013	1,276	60,948	47,765			
2012	1,241	58,281	46,963			



Appendix E: Comparative Schedules

**Table E-2:
Members in Receipt of Annuities and Inactive Membership Data**

Valuation Date (June 30)	Number	All Annuitants					Terminated Members	
		Annual Benefits in Thousands	Average Annual Benefit	Average Current Age	Average Age at Retirement	Average Service at Retirement	Number Vested Terminated	Number Non-Vested Terminated
2018	681	18,521	27,196	64.9	53.0	18.3	129	539
2017	648	17,153	26,471	64.4	52.8	18.5	108	465
2016	620	16,021	25,840	64.9	54.5	18.3	95	394
2015	577	14,432	25,012	64.2	52.6	18.3	81	342
2014	533	13,044	24,473				73	288
2013	503	12,013	23,883				67	235
2012	469	10,850	23,134				60	212



Appendix E: Comparative Schedules

**Table E-3:
Contribution Rates**

Valuation Date (June 30)	Contribution Rates			Normal	UAAL
	Employee	Employer	Total	Cost Rate*	Rate**
2018	10.495%	13.115%	23.61%	16.17%	7.44%
2017	10.495	13.115	23.61	16.49	7.12
2016	9.245	10.115	19.36	18.08	1.28
2015	9.245	10.115	19.36	18.22	1.14
2014	9.245	10.115	19.36	18.46	0.90
2013	9.245	10.115	19.36	18.52	0.84
2012	9.245	10.115	19.36	18.73	0.63

* Includes administrative expenses starting with the 2014 Valuation Date

** The UAAL rate is the amount available to amortize the UAAL. It is equal to the total contribution rate, minus the normal cost rate.



Appendix F: Financial Statement Information

The information presented in the required supplementary schedules was determined as part of the actuarial valuation as of June 30, 2018. Additional information as of the latest actuarial valuation follows.

Valuation date	June 30, 2018
Actuarial cost method	Entry Age Normal
Amortization method	Open
Remaining amortization period	21 Years
Asset valuation method	Four-year smoothed market
Actuarial assumptions:	
Investment rate of return*	7.65%
General wage growth*	3.50%
Merit salary increases	0.0% - 6.3%
*Includes inflation	2.75%



Appendix F: Financial Statement Information

Gain and Loss in Accrued Liability During Years Ended June 30 Resulting from Differences Between Assumed Experience and Actual Experience						
Type of Activity	Gain or (Loss) for Year Ending June 30, (expressed in thousands)					
	2013	2014	2015	2016	2017	2018
Investment Income on Actuarial Value of Assets	\$ 8,062	\$ 12,235	\$ 4,869	\$ 2,603	\$ 1,492	\$ (2,426)
Combined Liability Experience	642	195	123	(1,892)	(2,488)	(2,713)
(Loss)/Gain During Year from Financial Experience	\$ 8,704	\$ 12,430	\$ 4,992	\$ 712	\$ (996)	\$ (5,140)
Non-Recurring Items	0	0	0	0	(12,973)	0
Composite Gain or (Loss) During Year	\$ 8,704	\$ 12,430	\$ 4,992	\$ 712	\$ (13,969)	\$ (5,140)

Schedule of Funding Progress (expressed in thousands)						
Valuation Date	Actuarial Value of Assets	Actuarial Liability (AAL)	Funded Ratio	Unfunded AAL (UAAL)	Covered Payroll	UAAL as a Percentage of Covered Payroll
2018	\$ 353,904	\$ 436,715	81%	\$ 82,811	\$ 77,587	107%
2017	332,169	411,387	81%	79,217	74,581	106%
2016	310,510	373,146	83%	62,636	70,593	89%
2015	288,269	348,912	83%	60,643	68,046	89%
2014	264,945	326,077	81%	61,132	64,673	95%
2013	235,310	304,185	77%	68,875	61,467	112%



Appendix F: Financial Statement Information

Solvency Test Aggregate Accrued Liabilities for (expressed in thousands)								
Valuation Date June 30,	Active Member Contributions	Retirees & Beneficiaries	Active Member Employer Financed Contributions	Actuarial Value of Reported Assets	Portion of Accrued Liability Covered by Reported Assets			
	(1)	(2)	(3)		(1)	(2)	(3)	
2018	\$ 55,236	\$ 254,965	\$ 126,515	\$ 353,904	100%	100%	35%	
2017	51,998	239,648	119,741	332,169	100%	100%	34%	
2016	47,826	213,000	112,321	310,510	100%	100%	44%	
2015	46,500	193,359	109,053	288,269	100%	100%	44%	
2014	45,595	176,538	103,944	264,945	100%	100%	41%	
2013	43,007	164,339	96,839	235,310	100%	100%	29%	



Appendix G: Glossary

The following definitions are largely excerpts from a list adopted in 1981 by the major actuarial organizations in the United States. In some cases the definitions have been modified for specific applicability to the Sheriffs' Retirement System. Defined terms are capitalized throughout this Appendix.

Accrued Benefit

The amount of an individual's benefit (whether or not vested) as of a specific date, determined in accordance with the terms of a pension plan and based on compensation and service to that date.

Actuarial Accrued Liability

That portion, as determined by a particular Actuarial Cost Method, of the Actuarial Present Value of pension plan benefits and expenses which is not provided for by future Normal Costs.

Actuarial Assumptions

Assumptions as to the occurrence of future events affecting pension costs, such as: mortality, withdrawal, disablement, and retirement; changes in compensation, rates of investment earnings, and asset appreciation or depreciation; procedures used to determine the Actuarial Value of Assets; and other relevant items.

Actuarial Cost Method

A procedure for determining the Actuarial Present Value of pension plan benefits and expenses and for developing an actuarially equivalent allocation of such value to time periods, usually in the form of a Normal Cost and an Actuarial Accrued Liability.

Actuarial Gains and Losses

A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions during the period between two Actuarial Valuation dates, as determined in accordance with a particular Actuarial Cost Method.

Actuarial Present Value

The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of Actuarial Assumptions.

Actuarial Valuation

The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a pension plan.

Actuarial Value of Assets

The value of cash, investments and other property belonging to a pension plan, as used by the actuary for the purpose of an Actuarial Valuation.

Actuarially Equivalent

Of equal Actuarial Present Value, determined as of a given date with each value based on the same set of Actuarial Assumptions.



Appendix G: Glossary

Amortization Payment

That portion of the pension plan contribution which is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.

Entry Age Actuarial Cost Method

A method under which the Actuarial Present Value of the Projected Benefits of each individual included in an Actuarial Valuation is allocated on a level basis over the earnings of the individual between entry age and assumed exit ages. The portion of this Actuarial Present Value allocated to a valuation year is called the Normal Cost. The portion of this Actuarial Present Value not provided for at a valuation date by the Actuarial Present Value of future Normal Costs is called the Actuarial Accrued Liability.

Market Value of Assets

The fair value of cash, investments and other property belonging to a pension plan that could be acquired by exchanging them on the open market.

Normal Cost

That portion of the Actuarial Present Value of pension plan benefits and expenses which is allocated to a valuation year by the Actuarial Cost Method.

Projected Benefits

Those pension plan benefit amounts which are expected to be paid at various future times under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age and past and anticipated future compensation and service credits.

Unaccrued Benefit

The excess of an individual's Projected Benefits over the Accrued Benefits as of a specified date.

Unfunded Actuarial Accrued Liability

The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets.