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Firefighters' Unified Retirement System of the State of Montana

MPERA
MONTANA PUBLIC EMPLOYEE RETIREMENT ADMINISTRATION

Actuarial Valuation
As of June 30, 2018

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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 Firefighters' Unified Retirement System of the State of Montana (FURS), 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 reflecting all anticipated contribution increases are sufficient to amortize the unfunded accrued liability within a 10-year period. 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,

Edward A. Macdonald, ASA, FCA, MAAA
President

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

Matthew Yonz, ASA, FCA, MAAA
Actuary

Firefighters' Unified Retirement System
State of Montana

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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**
Participant Counts				
Active Members		691		678
Retirees and Beneficiaries		643		624
Disabled Members*		9		6
Terminated Vested Members		41		39
Terminated Non-Vested Members		66		54
Total**		1,450		1,401
Annual Covered Payroll of Active Members	$	47,934,517	$	45,208,091
Average Salaries from Covered Payroll	$	69,370	$	66,679
Annual Retirement Allowances for Retired Members and Beneficiaries	$	24,496,522	$	22,875,577
Assets				
Actuarial value	$	429,094,690	$	397,632,831
Market value		433,934,506		395,506,080
Actuarial Accrued Liability (AAL)	$	548,240,945	$	522,287,639
Unfunded Actuarial Accrued Liability (UAAL)	$	119,146,255	$	124,654,808
Funded Ratio		78.27%		76.13%
Market Value Rate of Return		8.63%		11.56%
Annual Cost				
Statutory Funding Rate***		57.67%		57.67%
Total Normal Rate		24.94%		24.76%
Employee Contribution Rate****		10.69%		10.69%
Employer Normal Rate		14.25%		14.07%
Employer Contribution Rate				
Normal Rate		14.25%		14.07%
Administrative Expense Load		0.25%		0.23%
UAAL Rate		32.47%		32.67%
Total Rate		46.97%		46.97%
Amortization Period		10 years		10 years
Employer Contribution Rate Necessary to Amortize UAAL over 30 Years				
Normal Rate		14.25%		14.07%
Administrative Expense Load		0.25%		0.23%
UAAL Rate (30-Year Rate)		14.00%		15.27%
Total Rate		28.50%		29.58%
Shortfall/(Surplus)		(18.47%)		(17.39%)

* Based on PERB categorization for the annual report. For actuarial purposes, 61 members in 2017 and 53 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.

*** The statutory funding rate consists of the member contribution rate of 10.69% of compenstation plus the employer contribution rate of 46.97% of compensation.

**** Members who have elected GABA contribute 10.70% of compensation. Members who have not elected GABA contribute 9.50% of compensation. The employee contribution rate reflects that 4 active members did not elect GABA and are contributing 9.50%.

As a result of this actuarial valuation of the benefits in effect under the Firefighters' Unified 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 10 years. The Funded Ratio is 78.27%.

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 $4,839,816 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 9 years, and the Funded Ratio would be 79.19%.

Additional Details

MCA 19-13 sets the employer contribution at 14.36% of salary, the state contribution at 32.61% and the employee contribution at 9.50% for non-GABA actives and 10.70% for GABA 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 8.63% net of investment and operating expenses. As a result of prior years' unrecognized gains, the actuarial assets earned 6.84%, which is 0.81% 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	(20.08)	(0.17)	8.00	(28.08)	(8.17)
7/1/2009 to 6/30/2010	11.99	(0.83)	7.75	4.24	(8.58)
7/1/2010 to 6/30/2011	20.71	0.84	7.75	12.96	(6.91)
7/1/2011 to 6/30/2012	2.42	3.87	7.75	(5.33)	(3.88)
7/1/2012 to 6/30/2013	12.43	11.05	7.75	4.68	3.30
7/1/2013 to 6/30/2014	16.53	12.44	7.75	8.78	4.69
7/1/2014 to 6/30/2015	4.52	9.32	7.75	(3.23)	1.57
7/1/2015 to 6/30/2016	2.15	8.33	7.75	(5.60)	0.58
7/1/2016 to 6/30/2017	11.56	8.00	7.75	3.81	0.25
7/1/2017 to 6/30/2018	8.63	6.84	7.65	0.98	(0.81)

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

Amortization of the UAAL

The June 30, 2017, actuarial valuation calculated a 10-year amortization period for the UAAL. The resulting amortization period at June 30, 2018 is 10 years.

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 asset smoothing that recognizes gains and losses over a four-year period. Finally, the amortization period as of June 30, 2018 is 10 years based on actuarial value of assets. The current employer and employee statutory rates keep the System's funding within Board policy guidelines.
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 employer and employee contributions provided for in statute are sufficient to amortize the unfunded actuarial accrued liability within a 10-year period. This ensures that the System is financially sound and will be able to pay all promised benefits 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 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.

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	
	Funded Ratio
Current Assumption 7.65%	78.27%
Lower Assumption 6.65%	68.09%
Increase / (Decrease)	(10.18)%
	Amortization Period Increase / (Decrease)
Current Assumption 7.65%	10 Years
Lower Assumption 6.65%	24 Years
Increase / (Decrease)	14 Years

Impact of Assuming 0.50% Lower Investment Return	
	Funded Ratio
Current Assumption 7.65%	78.27%
Lower Assumption 7.15%	73.11%
Increase / (Decrease)	(5.16)%
	Amortization Period Increase / (Decrease)
Current Assumption 7.65%	10 Years
Lower Assumption 7.15%	15 Years
Increase / (Decrease)	5 Years

Impact of Assuming 0.50% Higher Investment Return	
	Funded Ratio
Current Assumption 7.65%	78.27%
Lower Assumption 8.15%	83.56%
Increase / (Decrease)	5.29%
	Amortization Period Increase / (Decrease)
Current Assumption 7.65%	10 Years
Lower Assumption 8.15%	6 Years
Increase / (Decrease)	(4) Years

Impact of Assuming 1.00% Higher Investment Return	
	Funded Ratio
Current Assumption 7.65%	78.27%
Lower Assumption 8.65%	88.98%
Increase / (Decrease)	10.71%%
	Amortization Period Increase / (Decrease)
Current Assumption 7.65%	10 Years
Lower Assumption 8.65%	4 Years
Increase / (Decrease)	(6) 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 year 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.

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 Tables 10 and 11.

Changes in the Unfunded Actuarial Accrued Liability (UAAL)

June 30, 2017 Valuation UAAL	$124,654,808
Normal Cost (Including Expenses)	11,308,511
Contributions	(28,495,431)
Interest	9,311,243
Expected June 30, 2018 UAAL	$116,779,131
Experience (Gain)/Loss on Actuarial Liabilities	$(877,617)
Experience (Gain)/Loss on Actuarial Assets	3,244,741
Assumption & Method Changes	0
Plan Changes	0
Total (Gain) / Loss	$2,367,124
June 30, 2018 Valuation UAAL	$119,146,255

Summary

* The System's actuarial value investment return of 6.84% for the year ended June 30, 2018 is 0.81% less than the expected return of 7.65%. This represents an asset loss of $3,244,741 due to investment return being less than anticipated. As of June 30, 2018, the market value of assets was $433,934,506. As of June 30, 2018, the actuarial value of assets was $429,094,690. 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.

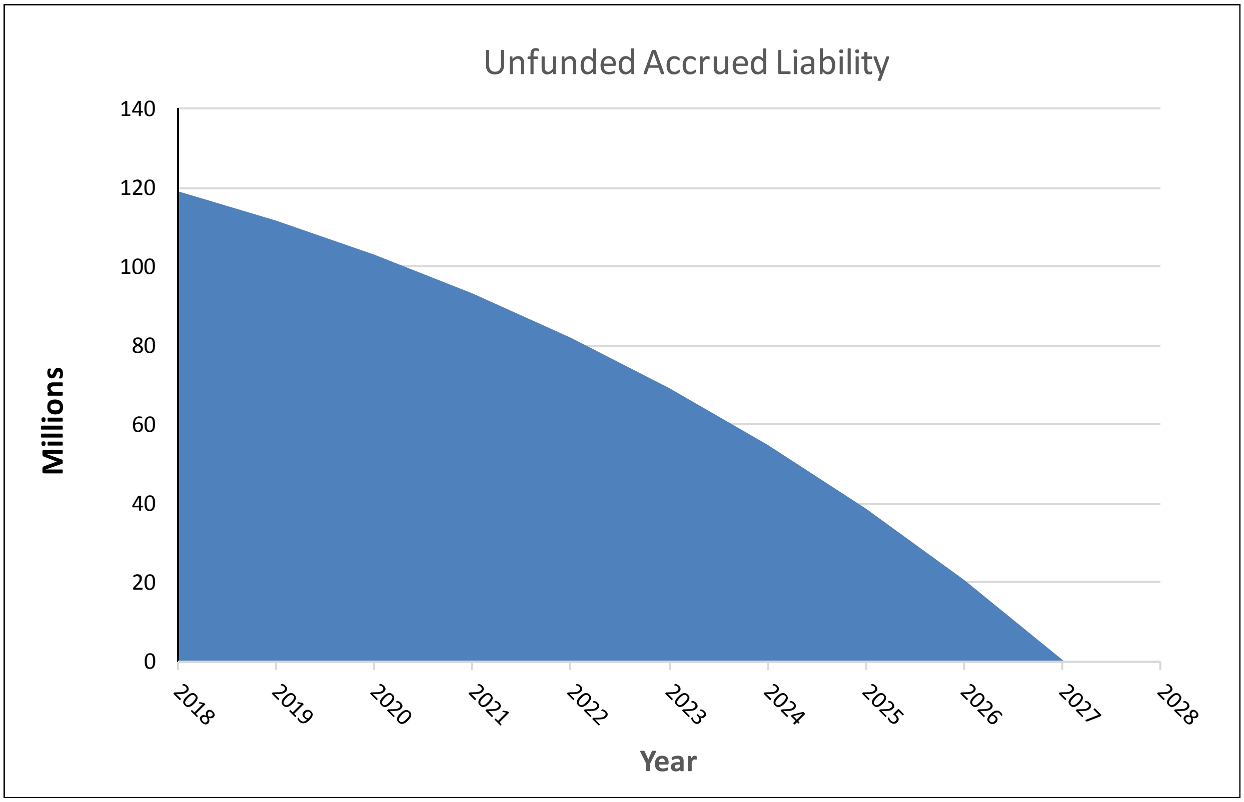
* As of June 30, 2018, the amortization period of the UAAL is 10 years. Prior to this valuation, the funding period was 10 years. An investment loss offset by an actuarial experience gain has accounted for no change in the amortization period. The System is currently being funded within the parameters 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%.

Projected Progress toward 100% Funding

The table below shows the projected progress toward reaching 100%. When the System is 100% funded, the Unfunded Actuarial Accrued Liability will be fully amortized. This is scheduled to occur within 10 years. The ultimate goal of the FURS System is to become at least 100% funded and to establish a reserve equal to 10% of the System's Actuarial Accrued Liability.



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 lesser 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.

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

	2018	2017
ASSETS		
Cash and Short Term Investments	$ 8,522,791	$ 9,784,215
Securities Lending Collateral	$ 2,660,305	$ 2,170,708
Receivables:		
Interest Receivable	$ 14,819	$ 8,882
Accounts Receivable	386,226	288,445
Due from Other Funds	-	-
Due from Primary Government	16,156,512	14,438,412
Notes Receivable	-	-
Total Receivables	$ 16,557,557	$ 14,735,739
Investments, at fair value:		
Investment Pools	408,718,147	371,008,295
Other Investments	-	-
Total Investments	$ 408,718,147	$ 371,008,295
Capital Assets		
Property and Equipment, at cost, net of Accumulated Depreciation	$ 324	$ 324
Intangible Assets, at cost, net of Amortization Expense	362,717	336,681
Total Capital Assets	$ 363,041	$ 337,005
TOTAL ASSETS	$ 436,821,841	$ 398,035,962
LIABILITIES		
Securities Lending Liability	$ 2,660,305	$ 2,170,709
Accounts Payable	90,626	221,799
Unearned Revenue	29,726	17,840
Due to Other Funds	106,679	110,990
Compensated Absences	-	47
OPEB Implicit Rate Subsidy LT	-	8,497
TOTAL LIABILITIES	$ 2,887,336	$ 2,529,882
NET POSITION - RESTRICTED FOR PENSION BENEFITS	$ 433,934,506	$ 395,506,080

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

	2018	2017
ADDITIONS		
Contributions:		
Employer	$ 7,053,165	$ 6,499,776
Plan Member	5,314,833	4,925,425
Other	16,127,433	14,438,412
Total Contributions	$ 28,495,431	$ 25,863,613
Misc Income	$ -	$ -
Investment Income:		
Net Appreciation/(Depreciation) in Fair Value of Investments	$ 35,638,585	$ 27,074,895
Investment Earnings	1,129,780	15,611,144
Security Lending Income	79,643	108,313
Investment Income/(Loss)	$ 36,848,008	$ 42,794,352
Investment Expense	(2,531,506)	(1,913,111)
Security Lending Expense	(31,781)	(42,672)
Net Investment Income/(Loss)	$ 34,284,721	$ 40,838,569
Total Additions	$ 62,780,152	$ 66,702,182
DEDUCTIONS		
Benefit Payments	$ 23,863,193	$ 22,335,636
Refunds/Distributions	173,278	168,422
Refunds to Other Plans	-	-
Transfers to DCRP	-	-
Transfers to MUS-RP	-	-
OPEB Expense	-	485
Administrative Expense	329,234	320,213
Total Deductions	$ 24,365,705	$ 22,824,756
NET INCREASE (DECREASE) IN PLAN NET ASSETS	$ 38,414,447	$ 43,877,426
NET POSITION - RESTRICTED FOR PENSION BENEFITS BEGINNING OF YEAR	$ 395,506,080	$ 351,628,654
ADJUSTMENT	13,978	$ -
END OF YEAR	$ 433,934,505	$ 395,506,080

Table 3:
Determination of Actuarial Value of Assets

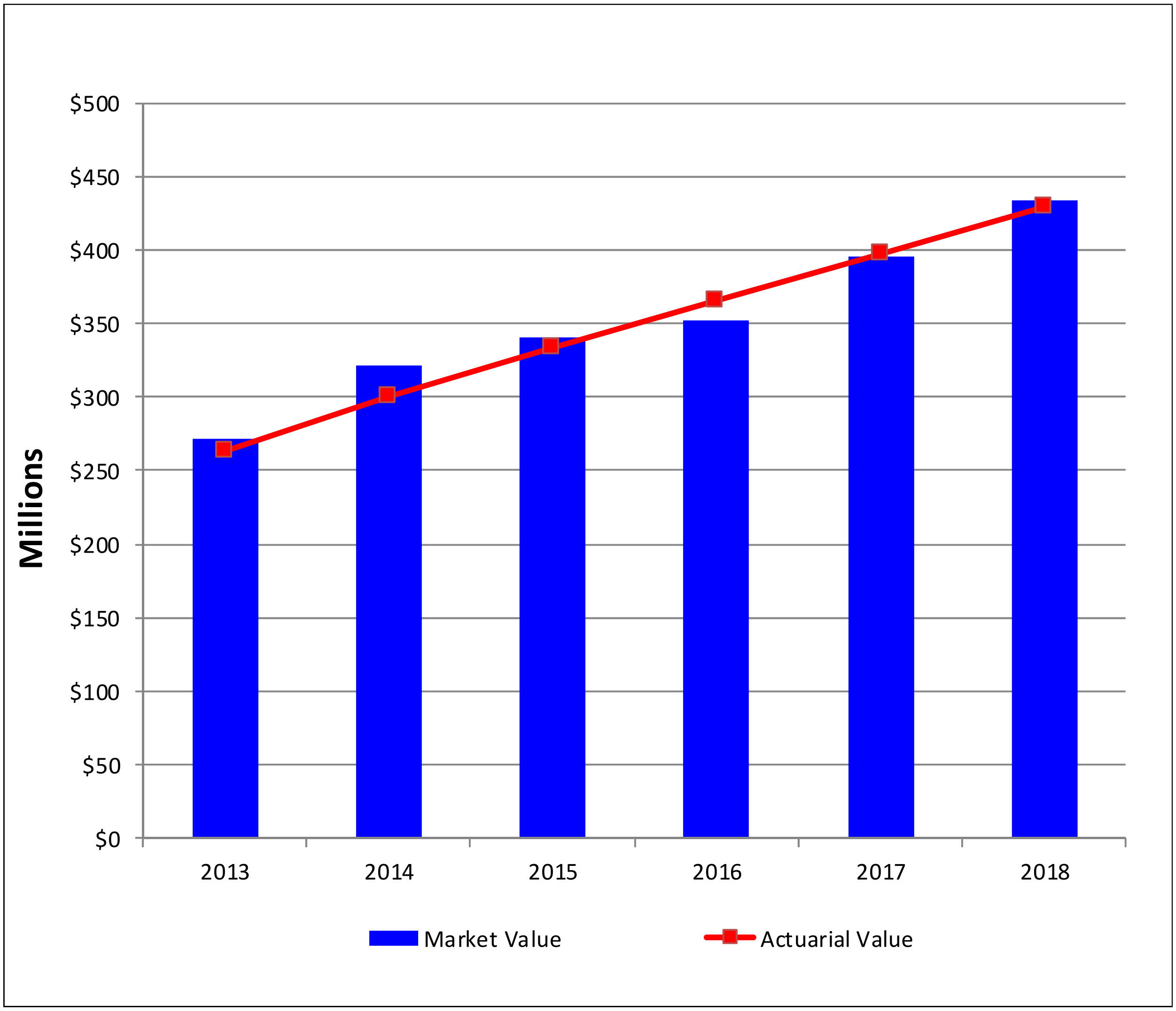
Valuation Date June 30:	2017	2018	2019	2020	2021
A. Actuarial Value Beginning of Year	$ 365,258,501	$ 397,632,831			
B. Market Value End of Year	395,506,080	433,934,506			
C. Market Value of Beginning of Year	351,628,654	395,506,080			
D. Cash Flow					
D1. Contributions	25,863,613	28,495,431			
D2. Benefit Payments	(22,504,058)	(24,036,471)			
D3. Administrative Expenses	(320,213)	(329,234)			
D4. Investment Expenses	(1,955,783)	(2,563,287)			
D5. Net	$ 1,083,559	$ 1,566,439			
E. Investment Income					
E1. Market Total: B. - C. - D5.	$ 42,793,867	$ 36,861,987			
E2. Assumed Rate	7.75%	7.65%			
E3. Amount for Immediate Recognition C*E2. + ((D1. +D2. + D3.) * E2. * 0.5) - D4.	29,324,778	32,977,464			
E4. Amount for Phased-in Recognition E1. - E3.	13,469,089	3,884,523			
F. Phased-In Recognition of Investment Income					
F1. Current Year: 0.25 * E4.	$ 3,367,272	$ 971,131	$ -	$ -	$ -
F2. First Prior Year	(4,808,123)	3,367,272	971,131	-	-
F3. Second Prior Year	(2,612,324)	(4,808,123)	3,367,272	971,131	-
F4. Third Prior Year	6,019,168	(2,612,324)	(4,808,123)	3,367,272	971,131
F5. Total Recognized Investment Gain	$ 1,965,993	$ (3,082,044)	$ (469,720)	$ 4,338,403	$ 971,131
G. Actuarial Value End of Year A. + D5. + E3. + F5.	$ 397,632,831	$ 429,094,690			

Table 4:
Historical Investment Returns*

Fiscal Year Ending	Market Returns	Actuarial Returns	Actuarial Assumption	Actuarial Return Over Assumption
June 30, 2009	(20.08)%	(0.17)%	8.00%	(8.17)%
June 30, 2010	11.99%	(0.83)%	7.75%	(8.58)%
June 30, 2011	20.71%	0.84%	7.75%	(6.91)%
June 30, 2012	2.42%	3.87%	7.75%	(3.88)%
June 30, 2013	12.43%	11.05%	7.75%	3.30%
June 30, 2014	16.53%	12.44%	7.75%	4.69%
June 30, 2015	4.52%	9.32%	7.75%	1.57%
June 30, 2016	2.15%	8.33%	7.75%	0.58%
June 30, 2017	11.56%	8.00%	7.75%	0.25%
June 30, 2018	8.63%	6.84%	7.65%	(0.81)%
10 Year Average	6.49%	5.87%		(1.90)%

* 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



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, retirees, and 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.

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

	June 30, 2018 Total	June 30, 2017 Total
A. Active Members Liability Due to Probability of		
Retirement	$ 265,419,159	$ 256,099,839
Disabilty	$ 17,609,803	$ 16,799,748
In-Service Death	$ 7,943,628	$ 7,898,989
Termination	$ 11,288,517	$ 10,627,556
Total	$ 302,261,107	$ 291,426,132
B. Inactive Members and Annuitants		
Service Retirement	$ 288,022,673	$ 268,712,112
Disability Retirement	$ 26,801,455	$ 25,209,236
Beneficiaries*	$ 38,509,607	$ 37,779,862
Vested Terminated Members	$ 6,067,765	$ 6,232,873
Refund of Member Contributions	$ 253,351	$ 416,617
Total	$ 359,654,851	$ 338,350,700
C. Grand Total	$ 661,915,958	$ 629,776,832

* Includes survivors of active and retired members.

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.

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 coast 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 Findings.

Table 7:
Normal Cost Contribution Rates
As Percentages of Salary

	June 30, 2018 Total	June 30, 2017 Total
Service retirement	19.14%	19.00%
Disability retirement	2.50%	2.46%
In Service Death	1.08%	1.12%
Termination	2.22%	2.18%
Total Normal Rate	24.94%	24.76%
Employee Normal Rate*	10.69%	10.69%
Employer Normal Rate	14.25%	14.07%
Administrative Expense Load	0.25%	0.23%
Rate Available to Amortize Unfunded Actuarial Liability	32.47%	32.67%
Statutory Funding Rate**	57.67%	57.67%

* Members who have elected GABA contribute 10.69% of compensation. Members who have not elected GABA contribute 9.50% of compensation. The employee contribution rate reflects the average contribution rate of all employees.

** The statutory funding rate consists of the member contribution rate plus the employer statutory rate of 46.97% of compensation.

Table 8:
Unfunded Actuarial Accrued Liability

	June 30, 2018	June 30, 2017
A. Actuarial present value of all future benefits for present and retirees and their survivors (Table 6)	$ 661,915,958	$629,776,832
B. Less actuarial present value of total future normal costs for present members	$ 113,675,013	$107,489,193
C. Actuarial accrued liability	$ 548,240,945	$522,287,639
D. Less assets available for benefits	$ 429,094,690	$ 397,632,831
E. Unfunded actuarial accrued liability	$ 119,146,255	$124,654,808

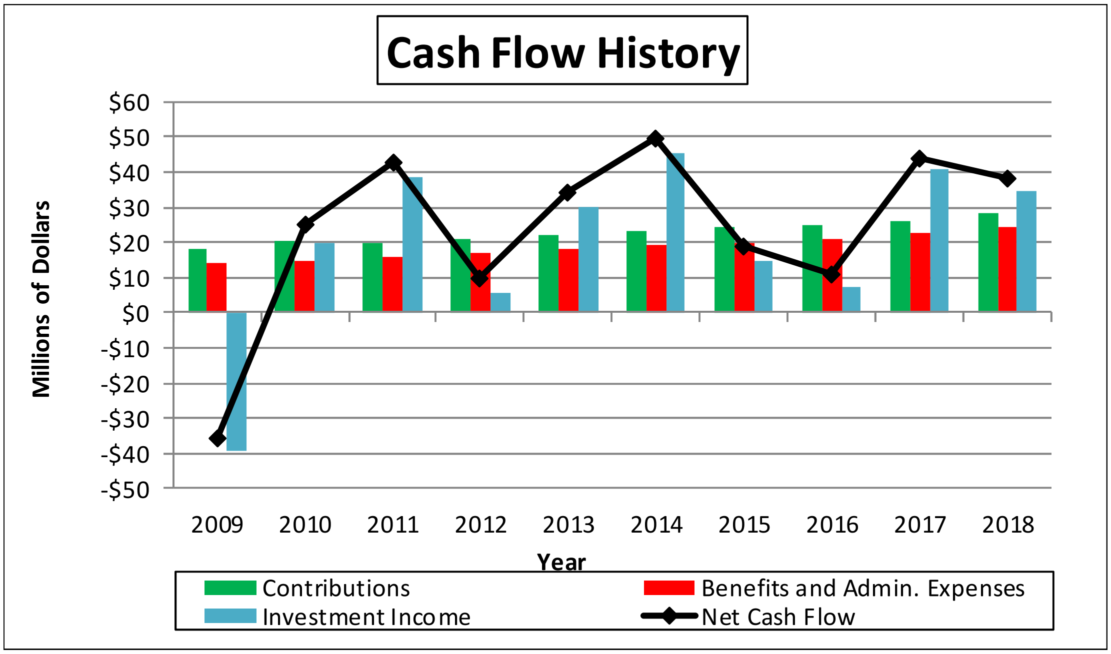
Cash Flows

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 $38.4 million. Of the $38.4 million, $34.3 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.

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



Historical Cash Flows

Year Ended June 30	Contributions	Benefits & Administrative Expenses	Investment Income	Net Cash Flow
2009	$ 18.0	$ 14.1	$ (39.4)	$ (35.5)
2010	20.4	14.8	19.6	25.2
2011	20.0	15.8	38.8	43.0
2012	21.2	16.8	5.7	10.1
2013	22.1	17.9	30.0	34.2
2014	23.4	19.2	45.5	49.7
2015	24.4	19.9	14.6	19.1
2016	24.9	21.2	7.3	11.0
2017	25.9	22.8	40.8	43.9
2018	28.5	24.4	34.3	38.4

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.

Each gain or loss shown represents our estimate of how much the given type of experience caused the UAAL 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 assumption studies.

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

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

A. ACTUARIAL ACCRUED LIABILITY (GAIN) / LOSS ANALYSIS		
1. Actual Actuarial Accrued Liability as of June 30, 2017:	$	522,287,639
2. Normal Cost for this Plan Year (Including Expenses)		11,308,511
3. Interest on items 1 and 2 [(1+2) x 7.65%]		40,820,105
4. Benefit Payments for this Plan Year (Including Expenses)		(24,365,705)
5. Interest on item [4 x 7.65% x .5]		(931,988)
6. Expected Actuarial Accrued Liability as of June 30, 2018:		549,118,562
7. Changes due to:		
a. Assumption Changes		0
b. Plan Amendments		0
c. Funding Method		0
d. Actuarial (Gain) / Loss	$	(877,617)
8. Actual Actuarial Accrued Liability as of June 30, 2018:	$	548,240,945
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:	$	397,632,831
2. Interest on item [1 x 7.65%]:		30,418,912
3. Contributions for this Plan Year:		28,495,431
4. Interest on item [3. x 7.65% x .5]:		1,089,950
5. Benefit Payments for this Plan Year (Including Expenses):		(24,365,705)
6. Interest on item [5. x 7.65% x .5]:		(931,988)
7. Expected Actuarial Value of Assets as of June 30, 2018:	$	432,339,431
8. Actuarial Value of Assets as of June 30, 2018:	$	429,094,690
9. (Gain) / Loss	$	3,244,741
C. UNFUNDED ACTUARIAL ACCRUED LIABILITY (GAIN) / LOSS ANALYSIS		
1. Actual Unfunded Actuarial Accrued Liability as of June 30, 2017:	$	124,654,808
2. Normal Cost for this Plan Year (Including Expenses):		11,308,511
3. Contributions for this Plan Year:		(28,495,431)
4. Interest on items 1 - 3: [(1+2) x 7.65% + (3 x 7.65% x .5)]:		9,311,243
5. Expected Unfunded Actuarial Accrued Liability as of June 30, 2018:	$	116,779,131
6. Changes due to:		
a. Assumption Changes:		-
b. Plan Amendments:		-
c. Funding Method:		-
d. Actuarial (Gain) / Loss:	$	2,367,124
7. Actual Unfunded Actuarial Accrued Liability as of June 30, 2018:	$	119,146,255

* 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.

Table 11:
Historical Actuarial (Gains) or Losses*
(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.	$ 3,244.7	$ (909.7)	$ (1,947.2)
Pay Increases			
Pay increases were (less) greater than expected.	$ (1,906.7)	$ 4,505.7	$ (433.8)
Age & Service Retirements			
Members retired at (older) younger ages or with (less) greater final average pay than expected	$ 941.1	$ 409.0	$ 1,471.9
Disability Retirements			
Disability claims were (less) greater than expected	$ 970.2	$ (558.2)	$ 80.5
Death-in-Service Benefits			
Survivor claims were (less) greater than expected	$ (231.4)	$ 346.7	$ 90.0
Withdrawal From Employment			
(More) less reserves were released by withdrawals than expected	$ (196.9)	$ 843.1	$ 456.8
Death After Retirement			
Retirees (died younger) lived longer than expected	$ (1,125.5)	$ (2,920.4)	$ 84.5
Data Adjustments and Benefit Payment Timing			
Service purchases, data corrections, etc.	$ 684.3	$ 10,423.2	$ (229.4)
Other			
Miscellaneous (gains) and losses	$ (12.7)	$ 244.0	$ (421.5)
Total (Gain) or Loss During Period From Financial Experience	$ 2,367.1	$ 12,383.4	$ (848.2)
Non-Recurring Items.			
Changes in actuarial assumptions and methods	$ -	$ 17,702.1	$ -
Changes in benefits caused a (gain) loss	$ -	$ -	$ -
Composite (Gain) Loss During Period	$ 2,367.1	$ 30,085.5	$ (848.2)

* 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.

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-3 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 has been supplied by the System and was 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 0.25% of payroll.

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 among members eligible for service retirement. Separate rates are used when a member is eligible for reduced benefits, for the first year a member is eligible for full benefits, and for the years following the first year a member is eligible for full benefits.

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.

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 their male spouse.

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.

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	0.25%
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, males set back 1 year.	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

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

Table B-3

Retirement
Annual Rates

Age	20 or More Years of Service
Less than 50	5.0%
50	10.0%
51	10.0
52	10.0
53	10.0
54	10.0
55	25.0
56	25.0
57	25.0
58	25.0
59	25.0
60	50.0
61	50.0
62	50.0
63 & Over	100.0

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

Table B-4

Disablement
Annual Rates

Age	All Members
22	.00%
27	.10
32	.10
37	.10
42	.50
47	.50
52	.50
57	.50
62	.00

All disabilities are assumed to be permanent and without recovery.

Table B-5

Mortality
Annual Rates

	Contributing Members, Service Retired Members and Beneficiaries		Disabled Members	
Age	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

Table B-6

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

Years of Service	All Members
0	4.25%
1	4.25
2	4.25
3	4.25
4	3.00
5	3.0
6	3.0
7	2.0
8	2.0
9	2.0
10	2.0
11 & Over	1.0

Table B-7

Probability of Retaining Membership in the System
Upon Vested Termination

Age	Probability of Retaining Membership
Under 35	50%
35	80
36	80
37	80
38	80
39	80
40	80
41	80
42	80
43	80
44	80
45	80
46	80
47	80
48	80
49	80
50 & Over	0

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.

Service credit

- 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

- 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

- Member contributions are made through an "employer pick-up" arrangement which results in deferral of taxes on the contributions.

Compensation

- 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

- 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)

- Interest is credited to member accounts at the rates determined by the Board.
- The current interest rate credited to member accounts is 0.77%.

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.

Second Retirement Benefit (continued)	• 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: ○ is awarded service credit for the period of reemployment; ○ starting the first month following termination of service, receives: * 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: * 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	• 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	• 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	• Multiple-employer cost sharing
Membership eligibility	• Firefighters of first- and second-class cities • Firefighters of other cities that adopt the plan • Firefighters of rural fire district departments that adopt the plan • Firefighters hired by the Montana Air National Guard (MANG) on or after October 1, 2001
Member contributions	• Members hired **before** 7/1/1997 and **not electing** GABA**:** 9.5% of member's compensation • Members hired **on or after** 7/1/1997 or **electing** GABA: 10.7% of member's compensation
Employer contributions	• 14.36% of each member's compensation • 14.36% of each working retiree's compensation

State contributions	• 32.61% of each member's compensation • 32.61% of each working retiree's compensation
Compensation period used in benefit calculation	• HAC = Highest Average Compensation • HAC is average of the highest 36 consecutive months (or shorter period of total service) of compensation paid to member. • **Part-time firefighter:** 15% of regular compensation of a newly confirmed full-time firefighter. • 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	Member hired **on or after** July 1, 1981, **or** a member who has **elected** to be covered by GABA: ○ 20 years of membership service ○ 2.5% of HAC x years of service credit Member hired **prior to** July 1, 1981, **and** who had **not elected** to be covered by GABA, **the greater of above, or:** If membership service is **less than 20 years**: ○ 2% of highest monthly compensation (HMC) x years of membership service and If membership service is **greater or equal to 20 years**: ○ 50% of HMC + 2% of HMC x years of membership service in excess of 20
Early retirement eligibility and benefit	• Age 50 with 5 years of membership service • Normal retirement benefit calculated using HAC and service credit at early retirement.
Disability retirement eligibility and benefit formula	• Any active member • The greater of: a. 50% of HAC, or b. 2.5% of HAC x years of service credit
Survivor's eligibility and benefit formula	• Any active or inactive member • For deaths of active members with **less than 20 years** of membership service, a monthly survivor benefit to the surviving spouse (or equally to dependent children if there is no surviving spouse or after a surviving spouse dies, for as long as they remain dependent children) equal to 50% of HAC. • For active or inactive members with **more than 20 years** of membership service, a benefit equal to the accrued retirement benefit at the date of death.

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	• The retirement benefit is paid for the retired member's life. • Upon the death of the retired member, the benefit is paid to the surviving spouse. • If there is no surviving spouse, or after the death of a surviving spouse, benefits are paid to the dependent children, if any, for as long as they remain dependent children.
Post retirement benefit increases	• For retired members who became active members **on or after** July 1, 1997 and those who elected to be **covered under** GABA and who have been retired at least 12 months, a GABA will be paid each year in January equal to 3%. • For retired members who were hired **prior to** July 1, 1997 and who did **not elect GABA**, the minimum benefit adjustment should not be less than 50% of the current base compensation of a newly confirmed active firefighter of the employer that last employed the member as a firefighter.
Changes since last valuation	• None

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 Financial Statements at the request of the Board. The differences between counts, if any, have no material effect upon the liability calculation.

	Active	Disabled	Retirees and Beneficiaries	Terminated Vested Members	Terminated Non-Vested Members	Total
Participant Counts Used for Valuation	691	62	590	41	66	1,450
Disabled Members having attained normal retirement age		(53)	53			
Beneficiaries of Disabled Members						
Beneficiaries with less than one year of certain payments remaining						
Other Adjustments						
Participant Counts shown in the Annual Financial Report	691	9	643	41	66	1,450

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

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

Active Members	Number	Valuation Projected Salaries
Full-Time Members	655	$ 48,851,312
Part-Time Members	36	$ 305,704
Total Active Members	691	$ 49,157,016

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.

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.

Type of Annuitant	Number	Annual Benefits	Average Annual Benefits
Service Retirement	453	$ 18,772,856	$ 41,441
Survivors of Deceased Retired Members	117	3,431,714	29,331
Survivors of Deceased Active Members	20	538,145	26,907
Total Retirees and Beneficiaries	590	$ 22,742,715	$ 38,547
Disability Retirement	62	1,753,807	28,287
Total Annuitants	652	$ 24,496,522	$ 37,571

Terminated Members with Contributions Not Withdrawn	Number
Vested Terminated Members	41
Non-Vested Terminated Members	66
Total Terminated Members	107

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

Number of Employees

	Completed Years of Service												
Age	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+	Totals
<25	10	6	5	2									23
25 to 29	15	11	18	15	15								74
30 to 34	12	10	12	9	57	21	1						122
35 to 39	6	9	6	16	30	56	10						133
40 to 44	1	4	2	3	24	48	32	4					118
45 to 49		2	1		7	21	42	25	2				100
50 to 54	1		1		2	3	10	18	12				47
55 to 59			1			2	1	7	10	5			26
60 to 64			1	2	3	1	1		2	1			11
65 to 69													
70 and up							1						1
Totals	45	42	47	47	138	152	98	54	26	6	-	-	655

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

Annual Salaries in Thousands

	Completed Years of Service												
Age	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+	Totals
<25	405	331	322	135									1,193
25 to 29	699	604	988	955	1,028								4,274
30 to 34	640	579	752	607	3,820	1,585	73						8,058
35 to 39	306	473	443	1,059	2,165	4,339	836						9,622
40 to 44	69	202	125	170	1,780	3,819	2,844	373					9,381
45 to 49		148	48		622	1,689	3,739	2,158	187				8,591
50 to 54	48		81		191	254	879	1,607	1,179				4,238
55 to 59			113			136	135	628	892	497			2,401
60 to 64			79	171	273	110	93		187	99			1,011
65 to 69													
70 and up							83						83
Totals	2,167	2,337	2,950	3,097	9,880	11,933	8,682	4,766	2,445	596	-	-	48,851

The salary shown in the above chart was used for valuation purposes and assumes pay increases for the year.

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

Average Annual Salary

	Completed Years of Service												
Age	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+	Totals
<25	40,494	55,124	64,380	67,555									51,856
25 to 29	46,616	54,886	54,862	63,638	68,566								57,751
30 to 34	53,340	57,926	62,700	67,486	67,021	75,477	73,376						66,046
35 to 39	50,945	52,595	73,772	66,198	72,171	77,487	83,637						72,343
40 to 44	68,666	50,430	62,317	56,515	74,181	79,569	88,864	93,338					79,502
45 to 49		73,898	48,064		88,811	80,452	89,025	86,320	93,361				85,908
50 to 54	48,320		80,539		95,483	84,509	87,877	89,269	98,272				90,175
55 to 59			113,220			68,007	134,935	89,677	89,233	99,390			92,353
60 to 64			78,797	85,500	91,012	110,482	92,675		93,300	98,605			91,927
65 to 69													
70 and up							83,179						83,179
Totals	48,154	55,634	62,759	65,889	71,593	78,507	88,592	88,258	94,035	99,259			74,582

The salary shown in the above chart was used for valuation purposes and assumes pay increases for the year.

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

Number of Employees

	Completed Years of Service												
Age	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+	Totals
<25	1	1		1									3
25 to 29	3	2	1	1									7
30 to 34	2	1			5								8
35 to 39	2	1		1		1							5
40 to 44				1		2	1						4
45 to 49			1			2	2						5
50 to 54					1		1						2
55 to 59			1										1
60 to 64			1										1
65 to 69													
70 and up													
Totals	8	5	4	4	6	5	4	-	-	-	-	-	36

Table D-2:
Distribution of Inactive Lives

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

Service Retirement			
Age	Number of Persons	Annual Benefits	Average Annual Benefits
<50	12	$ 449,680	$ 37,473
50 to 54	40	1,351,889	33,797
55 to 59	74	2,957,316	39,964
60 to 64	85	4,084,068	48,048
65 to 69	74	3,544,031	47,892
70 to 74	68	3,004,842	44,189
75 to 79	55	2,230,692	40,558
80 to 84	27	685,240	25,379
85 to 89	12	354,076	29,506
90 and up	6	111,021	18,503
Totals	453	$ 18,772,856	$ 41,441

Members Receiving Disability Retirement Benefits as of June 30, 2018

Disability Retirement			
Age	Number of Persons	Annual Benefits	Average Annual Benefits
<50	8	$ 221,652	$ 27,706
50 to 54	6	223,676	37,279
55 to 59	4	108,729	27,182
60 to 64	7	190,154	27,165
65 to 69	13	395,773	30,444
70 to 74	11	290,180	26,380
75 to 79	3	72,749	24,250
80 to 84	5	132,544	26,509
85 to 89	4	93,051	23,263
90 and up	1	25,299	25,299
Totals	62	$ 1,753,807	$ 28,287

Table D-2:
Distribution of Inactive Lives

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

Survivors of Retired Members

Age	Number of Persons	Annual Benefits	Average Annual Benefits
<50	-	$ -	$ -
50 to 54	3	116,298	38,766
55 to 59	5	146,632	29,326
60 to 64	7	278,302	39,757
65 to 69	10	258,350	25,835
70 to 74	13	551,726	42,440
75 to 79	22	628,897	28,586
80 to 84	20	528,123	26,406
85 to 89	21	553,428	26,354
90 and up	16	369,958	23,122
Totals	117	$ 3,431,714	$ 29,331

Survivors of Deceased Active Members as of June 30, 2018

Survivors of Active Members

Age	Number of Persons	Annual Benefits	Average Annual Benefits
<50	4	$ 117,063	$ 29,266
50 to 54	-	-	-
55 to 59	2	44,271	22,136
60 to 64	1	27,016	27,016
65 to 69	2	59,967	29,984
70 to 74	2	71,937	35,969
75 to 79	1	21,756	21,756
80 to 84	4	94,787	23,697
85 to 89	-	-	-
90 and up	4	101,347	25,337
Totals	20	$ 538,145	$ 26,907

Table D-2:

Distribution of Inactive Lives

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

Age	Number
<25	
25 to 29	
30 to 34	4
35 to 39	12
40 to 44	13
45 to 49	9
50 to 54	1
55 to 59	2
60 to 64	
65 to 69	
70 and above	
Total	41

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.

	Active Contributing Members	Terminated Vested Members	Service Retired Members	Disabled Members	Survivors and Beneficiaries
June 30, 2017 Valuation	678	39	434	61	135
Refunds and Non-Vested Terminations	(17)				
Vested Terminations	(8)	8			
Service Retirements	(19)	(4)	23		
Disability Retirements	(1)	(1)		2	
Deaths			(6)	(3)	(4)
New Entrants	58		1		6
Rehires		(1)			
Other			1	2	
June 30, 2018 Valuation	691	41	453	62	137

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

Valuation Date (June 30)	Actives	Annual Salaries in Thousands	Average Annual Salary	Average Age	Average Years of Service	Average Hire Age
2018	691	47,935	69,370	39.6	10.5	29.1
2017	678	45,208	66,679	39.9	10.6	29.3
2016	644	43,119	66,955	40.1	10.8	29.3
2015	627	41,041	65,457	39.1	11.0	28.1
2014	616	39,495	64,155			
2013	610	37,727	61,848			
2012	590	35,849	60,762			

Table E-2:
Retired and Inactive Membership Data

		All Annuitants					Terminated Members	
Valuation Date (June 30)	Number	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	652	24,497	37,571	66.6	51.7	23.9	41	66
2017	630	22,876	36,310	68.5	51.8	20.1	39	54
2016	621	21,568	34,731	69.3	52.6	23.7	77	27
2015	609	20,322	33,369	68.4	50.5	24.1	71	21
2014	595	19,208	32,282				66	19
2013	587	18,234	31,063				63	15
2012	571	17,066	29,889				62	13

Table E-3:
Contribution Rates

Valuation Date (June 30)	Contribution Rates Employee***	Employer/State	Total	Normal Cost Rate*	UAAL Rate**
2018	10.69%	46.97%	57.66%	25.19%	32.47%
2017	10.69	46.97	57.66	24.99	32.67
2016	10.69	46.97	57.66	26.67	30.99
2015	10.69	46.97	57.66	26.70	30.96
2014	10.69	46.97	57.66	26.70	30.96
2013	10.69	46.97	57.66	26.59	31.07
2012	10.69	46.97	57.66	26.50	31.16

* 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.

*** Members who have elected GABA contribute 10.70% of compensation. Members who have not elected GABA contribute 9.50% of compensation. The employee contribution rate reflects the average contribution rate of all employees.

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	10 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%

Gain and Loss in Accrued Liability During Years Ended June 30 Resulting from Differences Between Assumed Experience and Actual Experience						
	Gain or (Loss) for Year Ending June 30, (expressed in thousands)					
Type of Activity	2013	2014	2015	2016	2017	2018
Investment Income on Actuarial Value of Assets	$ 7,762	$ 12,459	$ 4,748	$ 1,947	$ 910	$ (3,245)
Combined Liability Experience	1,384	160	1,079	(1,099)	(13,293)	878
(Loss)/Gain During Year from Financial Experience	$ 9,146	$ 12,619	$ 5,827	$ 848	$ (12,383)	$ (2,367)
Non-Recurring Items	0	0	0	0	(17,702)	0
Composite Gain of (Loss) During Year	$ 9,146	$ 12,619	$ 5,827	$ 848	$ (30,085)	$ (2,367)

Schedule of Funding Progress (expressed in thousands)						
Valuation Date June 30,	Actuarial Value of Assets	Actuarial Accrued Liability (AAL)	Funded Ratio	Unfunded AAL (UAAL)	Covered Payroll	UAAL as a Percentage of Covered Payroll
2018	$ 429,095	$ 548,241	78%	$ 119,146	$ 47,935	249%
2017	397,633	522,288	76%	124,655	45,208	276%
2016	365,259	466,671	78%	101,413	43,119	235%
2015	333,629	441,834	76%	108,205	41,627	260%
2014	300,949	419,013	72%	118,064	39,892	296%
2013	263,483	396,769	66%	133,286	37,963	351%

Solvency Test
Aggregate Accrued Liabilities for
(expressed in thousands)

Valuation Date June 30,	Active Member Contributions (1)	Retirees & Beneficiaries (2)	Active Member Employer Financed Contributions (3)	Actuarial Value of Reported Assets	Portion of Accrued Liability Covered by Reported Assets (1)	(2)	(3)
2018	$ 45,908	$ 353,334	$ 148,999	$ 429,095	100%	100%	20%
2017	44,351	331,701	146,236	397,633	100%	100%	15%
2016	43,046	292,423	131,203	365,259	100%	100%	23%
2015	41,278	274,505	126,051	333,629	100%	100%	14%
2014	38,805	260,538	119,670	300,949	100%	100%	1%
2013	36,441	248,723	111,606	263,483	100%	91%	0%

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 Firefighters' Unified 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.

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.