City of Madison Heights
Police and Fire Retirement System
Actuarial Valuation Report
June 30, 2017

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December 8, 2017

Retirement Board
City of Madison Heights Police
and Fire Retirement System
Madison Heights, Michigan

Dear Board Members:

Submitted in this report are the results of the Sixty-First Annual Actuarial Valuation of the City of Madison Heights Police and Fire Retirement System, based upon Act No. 345 of the Public Acts of 1937, as amended. The purpose of the June 30, 2017 valuation and gain/loss analysis is to measure funding progress in relation to the actuarial cost method and to determine employer contribution rates for the fiscal year ending June 30, 2019. The results of the valuation are not applicable for other purposes. No adjustments have been made for events after June 30, 2017.

The computed contribution rate shown on page B-1 may be considered as a minimum contribution rate that complies with the Board's funding policy. Users of this report should be aware that contributions made at that rate do not guarantee benefit security. Given the importance of benefit security to any retirement system, we suggest that contributions to the System in excess of those presented in this report be considered.

While this report includes status measures of the Retirement System, it does not include a more robust assessment of the risks of future experiences not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment. We encourage a review and assessment of investment and other significant risks that may have a material effect on the plan's financial condition.

Calculations required for compliance with the Governmental Accounting Standards Board (GASB) Statement Nos. 67 and 68 were issued in a separate report dated August 16, 2017.

This report was prepared at the request of the Board and is intended for use by the Retirement System and those designated or approved by the Board. This report may be provided to parties other than the System only in its entirety and only with the permission of the Board. This report should not be relied on for any purpose other than the purpose described. GRS is not responsible for unauthorized use of this report.

The valuation was based upon information, furnished by the Assistant City Manager, concerning the Retirement System's benefits, financial transactions, and active members, terminated members, retirees and beneficiaries. We checked for internal and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the data provided.

The valuation results summarized in this report involve actuarial calculations that require assumptions about future events. We believe that the assumptions and methods used in this report are reasonable and appropriate for the purpose for which they have been used. However, other assumptions and methods could also be reasonable and could result in materially different results. In addition, because it is not possible or practical to consider every possible contingency, we may use summary information, estimates or simplifications of calculations to facilitate the modeling of future events. We may also exclude factors or data that are deemed to be immaterial. The actuarial method and assumptions used in the actuarial valuation are summarized in Section D of this report. The assumptions are established by the Board after consulting with the actuary.

The findings in this report are based on data and other information through June 30, 2017. Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as: plan experience differing from that anticipated by the economic and demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. Due to the limited scope of the actuary's assignment, the actuary did not perform an analysis of the potential range of such future measurements.

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. To the best of our knowledge the information contained in this report is accurate and fairly presents the actuarial position of the Madison Heights Police and Fire Retirement System as of the valuation date. All calculations have been made in conformity with generally accepted actuarial principles and practices, with the Actuarial Standards of Practice issued by the Actuarial Standards Board, and with applicable statutes.

Brad Lee Armstrong and Heidi G. Barry are independent of the plan sponsor, are Members of the American Academy of Actuaries (MAAA), and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

Respectfully submitted,

Brad Lee Armstrong, ASA, EA, FCA, MAAA

Heidi G. Barry, ASA, MAAA

BLA/HGB:rmn

SECTION A

BASIC FINANCIAL OBJECTIVE AND OPERATION OF THE RETIREMENT SYSTEM

Basic Financial Objective and Operation of the Retirement System

Benefit Promises Made Which Must Be Paid For. A retirement system is an orderly means of handing out, keeping track of, and financing contingent pension promises to a group of employees. As each member of the retirement system acquires a unit of service credit each member is, in effect, handed an "IOU" which reads: "The Employees Retirement System promises to pay you one unit of retirement benefits, payments in cash commencing when you retire."

The principal related financial question is: When shall the money required to cover the "IOU" be contributed? This year, when the benefit of the member's service is received? Or, some future year when the "IOU" becomes a cash demand?

The constitution of the State of Michigan is directed to the question:

> "Financial benefits arising on account of service rendered in each fiscal year shall be funded during that year and such funding shall not be used for financing unfunded accrued liabilities."

Section 9(2) of Act 345 is also directed to the question:

> "Sec. 9(2). - - - For the purpose of creating and maintaining a fund for the payment of the pensions and other benefits payable hereunder the said city, village or municipality, subject to the provisions of this act, shall appropriate, at the end of such regular intervals as may be adopted, quarterly, semi-annually, or annually, an amount sufficient to maintain actuarially determined reserves covering pensions payable or which might be payable on account of service performed and to be performed by active members and pensions being paid retired members and beneficiaries - - - ."

This retirement system meets this constitutional requirement by having as its ***financial objective to establish and receive contributions, expressed as percents of active member payroll, which will remain approximately level from year-to-year*** and will not have to be increased for future generations of taxpayers.

Translated into actuarial terminology, a level percent-of-payroll contribution objective means that the contribution rate must be at least:

> **Normal Cost** (the current value of benefits likely to be paid on account of members' service being rendered in the current year)
> ... plus ...
> Interest on the Unfunded Actuarial Accrued Liability (the difference between the actuarial accrued liability and current system assets).

A by-product of the level percent-of-payroll contribution objective is the accumulation of invested assets for varying periods of time. ***Invested assets are a by-product of level percent-of-payroll contributions, not the objective***. Investment income becomes a major contributor to the retirement system and the amount is directly related to the amount of contributions and investment performance.

If contributions to the retirement system are less than the preceding amount, the difference, plus investment earnings not realized thereon, will have to be contributed at some later time, or, benefits will have to be reduced, to satisfy the fundamental fiscal equation under which all retirement programs must operate; that is:

$$B = C + I - E$$

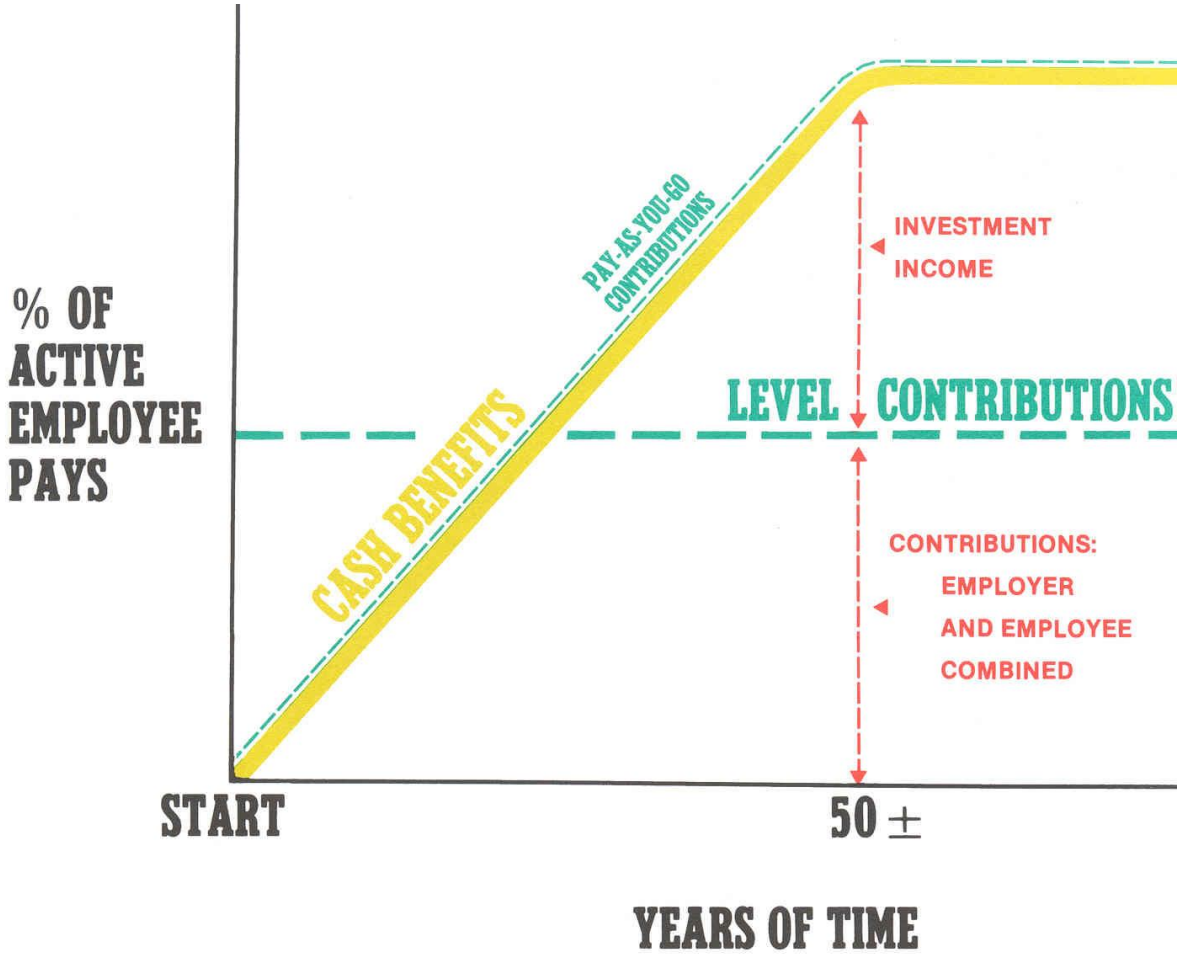
The aggregate amount of **B**enefit payments to any group of members and their beneficiaries cannot exceed the sum of:

The aggregate amount of **C**ontributions received on behalf of the group
... plus ...
Investment earnings on contributions received and not required for immediate payment of benefits
... minus ...
The **E**xpenses of operating the program.

There are retirement systems designed to defer the bulk of contributions far into the future. Lured by artificially low present contributions, the inevitable consequence of a relentlessly increasing contribution rate -- to a level greatly in excess of the level percent-of-payroll rate -- is ignored.

This method of financing is prohibited in Michigan by the state constitution.

Computed Contribution Rate Needed to Finance Benefits. From a given schedule of benefits and from the data furnished, the actuary calculates the contribution rate by means of an actuarial valuation - the technique of assigning monetary values to the risks assumed in operating a retirement system.



CASH BENEFITS LINE. This relentlessly increasing line is the fundamental reality of retirement plan financing. It happens each time a new benefit is added for future retirements (and happens regardless of the design for contributing for benefits).

LEVEL CONTRIBUTION LINE. Determining the level contribution line requires detailed assumptions concerning a variety of experiences in future decades, including:

- Economic Risk Areas
  - Rates of investment return
  - Rates of pay increase
  - Changes in active member group size
- Non-Economic Risk Areas
  - Ages at actual retirement
  - Rates of mortality
  - Rates of withdrawal of active members (turnover)
  - Rates of disability

SECTION B

VALUATION RESULTS

City's Computed Contributions for the Fiscal Year Beginning July 1, 2018

Contributions for	Contributions Expressed as Percents of Annual Pay: Department Heads	Police: Command	Police: Other	Fire: Command	Fire: Other	Totals
NORMAL COST						
Age and service pensions	19.82 %	18.29 %	16.82 %	17.14 %	14.46 %	16.93 %
Disability pensions	0.74	1.00	1.17	1.19	1.37	1.15
Death pensions	0.28	0.26	0.24	0.30	0.29	0.26
Totals	20.84	19.55	18.23	18.63	16.12	18.34
MEMBERS' CONTRIBUTIONS						
Gross contributions	8.90	8.90	8.90	8.90	8.90	8.90
Less prospective refunds	0.59	0.69	0.68	0.46	0.48	0.61
Available for pensions	8.31	8.21	8.22	8.44	8.42	8.29
CITY'S NORMAL COST	12.53	11.34	10.01	10.19	7.70	10.05
UNFUNDED ACTUARIAL ACCRUED LIABILITIES						
Retirees and beneficiaries						12.12
Active members*						25.87
Totals						37.99
CITY'S TOTAL CONTRIBUTION (PENSIONS)						48.04 %
Administrative and Investment Expenses						6.46 %
CITY'S TOTAL CONTRIBUTION (PENSIONS & EXPENSES)						54.50 %

Retiree health insurance costs are not included in this report.

* *Financed as a level percent-of-payroll over a closed period of 27 years.*

In financing the actuarial accrued liabilities, the funding value of assets, $44,678,218 were distributed as shown at the bottom of the page. Please see page C-10 for information concerning the reporting of assets, and page C-11 for the derivation of the funding value of assets.

	Present Reserves Reported for		
Market Value	Member Actuarial Accrued Liabilities	Retired Life Actuarial Liabilities	Totals
Employees Contributions	$ 7,128,995		$ 7,128,995
Employer Contributions	(23,002,788)	$ 29,414,203	6,411,415
Retired Benefit Payments		28,824,508	28,824,508
Totals *	$ (15,873,793)	$ 58,238,711	$ 42,364,918

** As reported.*

Assets were applied against actuarial accrued liabilities in determining unfunded actuarial accrued liabilities as follows:

	Retired Lives	Active Members	Totals
Computed Actuarial Accrued Liabilities	$ 58,238,711	$ 23,706,837	$ 81,945,548
Applied Assets (4-yr. smoothed market value)	44,678,218	0	44,678,218
Unfunded Actuarial Accrued Liabilities	$ 13,560,493	$ 23,706,837	$ 37,267,330

Derivation of Experience Gain (Loss)
Year Ended June 30, 2017

Actual experience will never (except by coincidence) coincide exactly with assumed experience. It is hoped that aggregate gains and losses will cancel each other over a period of years, but sizeable year-to-year fluctuations are common. Detail on the derivation of the experience gain (loss) is shown below, along with a year-by-year comparative schedule.

		Total
(1)	UAAL* at start of year	$ 32,203,926
(2)	Employer normal cost from the last valuation	527,197
(3)	Actual employer contributions	2,473,172
(4)	Interest accrual: [(1) + 1/2 [(2) - (3)]] x .075	2,342,320
(5)	Expected UAAL before changes: (1) + (2) - (3) + (4)	$ 32,600,271
(6)	Change from the benefit provision application	-
(7)	Change from the revised actuarial assumptions and methods	1,680,086
(8)	Expected UAAL after changes: (5) + (6) + (7)	$ 34,280,357
(9)	Actual UAAL at end of year	37,267,330
(10)	Gain (loss): (8) - (9)	(2,986,973)
(11)	Actuarial accrued liability at the start of the year	77,750,883
(12)	Gain (loss) as a percent of actuarial accrued liabilities at start of year	**(3.8)%**

* *Unfunded Actuarial Accrued Liabilities.*

Valuation Date June 30,	Experience Gain (Loss) as % of Beginning Accrued Liability Total
2008	(1.2) %
2009	(5.2)
2010	(2.1)
2011	(9.0)
2012	(8.5)
2013	(1.5)
2014	(2.3)
2015	(4.6)
2016	(2.3)
2017	(3.8)

Summary Statement of Retirement System Resources and Obligations

Present Resources and Expected Future Resources

A. Present valuation assets:	
1. Net assets from Retirement System financial statements	$ 42,364,918
2. Market value adjustment	2,313,300
3. Valuation assets	44,678,218
B. Actuarial present value of expected future employer contributions:	
1. For normal costs	4,956,227
2. For unfunded actuarial accrued liability	37,267,330
3. Total of (1) + (2)	42,223,557
C. Actuarial present value of expected future member contributions	4,644,830
D. Total present and expected future resources	$ 91,546,605

Actuarial Present Value of Expected Future Benefit Payments

A. To retirees and beneficiaries	$ 58,238,711
B. To vested terminated members	1,370,211
C. To present active members:	
1. Allocated to service rendered prior to valuation date - actuarial accrued liability	22,336,626
2. Allocated to service likely to be rendered after valuation date	9,601,057
3. Total	31,937,683
D. Total actuarial present value of expected future benefit payments	$ 91,546,605

Comments, Recommendation and Conclusion

COMMENT A: The overall actuarial experience was far less favorable than anticipated as shown on page B-3 primarily due to more retirements than expected, a recognized investment return rate of 5.4% compared to the assumed rate of 7.5%, salary increases that were greater than expected, and retiree mortality experience. Market performance from 2014 to 2017 was smoothed over four years by the Board's use of an asset smoothing technique. Unrecognized losses in investment return from 2015 to 2016 will put upward pressure on the City's contribution rate in each of the 2018 and 2019 reports. As an indication of the magnitude, the contribution rate in this valuation would increase from 48.04% to 50.50% of payroll (excluding expenses) on a market value basis.

COMMENT B: The assumed rated of investment return was reduced from 7.5% to 7.25% which resulted in an increase of approximately $1.7 million in liabilities and increased the employer contribution rate by 3.16% of payroll. Accordingly, both assumed wage inflation and the interest assumption used for annuitizing accumulated contributions at retirement were reduced from 4.00% to 3.75%. Based on a schedule the Board adopted at the June 20, 2017 Police and Fire Pension Board meeting, the actuarially assumed rate of return will be adjusted as follows:

Valuation Date	Rate of Return
June 30, 2017	7.25%
June 30, 2018	7.00%
June 30, 2019	6.75%
June 30, 2020	6.50%

COMMENT C: A 27-year closed amortization period was used for this valuation. Historical funded ratios are shown on page B-8. As of June 30, 2017, the Retirement System's funded ratio was 54.5% compared to 58.6% as of June 30, 2016. On a market value basis, the funded ratio would be 51.7% compared to 53.5% last year.

COMMENT D: The ratio of the funding value of assets to the market value of assets is 105.5%. Over time, this ratio is intended to stay near 100%. However, highly volatile markets can create distortions in this ratio. The Board may wish to establish a "corridor" around the market value of assets such as 80% to 120%, so that the funding value of assets does not deviate from the market value of assets by an unreasonably large amount.

COMMENT E: The retiree liability is only 76.7% funded. In addition, the amortization period (currently 27 years) exceeds the average expected future lifetime of the current retired members (which is approximately 20 years). We recommend that the Board consider lowering the amortization period for at least the portion of the unfunded liability attributable to retiree liability. For comparison, the table below provides the computed contribution rates if the unfunded retiree liabilities were to be amortized over a shorter time period.

Amortization Period		
Unfunded Retiree Liability	**Unfunded Remaining Liability**	**Contribution Rate**
10 years	27 years	61.31%
15	27	54.21%
20	27	50.70%
27	27	48.04%

COMMENT F: This valuation does not include funding requirements for retiree health care insurance (this is submitted in a separate report).

CONCLUSION: The City's contributions (member contributions are additional) to the City of Madison Heights Police and Fire Retirement System, for the fiscal year beginning July 1, 2018, have been computed to be 48.04% of active member payroll for pensions with an additional 6.46% for administrative and investment expenses.

It is the actuary's opinion that the required contribution rates determined by the most recent actuarial valuation are sufficient to meet the Retirement System's funding objective, presuming continued timely receipt of required contributions.

Other Observations

General Implications of Contribution Allocation Procedure or Funding Policy on Future Expected Plan Contributions and Funded Status

Given the plan's contribution allocation procedure, if all actuarial assumptions are met (including the assumption of the plan earning 7.25% on the actuarial value of assets), it is expected that:

1) The unfunded actuarial accrued liabilities will be fully amortized after 27 years;
2) The funded status of the plan will increase gradually towards a 100% funded ratio; and
3) The unfunded accrued liability will increase for an extended period before beginning to decline. This is particularly true when the plan sponsor is contributing on a percent-of-payroll basis and there is no payroll growth.

Limitations of Funded Status Measurements

Unless otherwise indicated, a funded status measurement presented in this report is based upon the actuarial accrued liability and the actuarial value of assets. Unless otherwise indicated, with regard to any funded status measurements presented in this report:

1) The measurement is inappropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations, in other words, of transferring the obligations to an unrelated third party in an arm's length market value type transaction.
2) The measurement is dependent upon the actuarial cost method which, in combination with the plan's amortization policy, affects the timing and amounts of future contributions. A funded status measurement in this report of 100% is not synonymous with no required future contributions. If the funded status were 100%, the plan would still require future normal cost contributions (i.e., contributions to cover the cost of the active membership accruing an additional year of service credit).
3) The measurement would produce a different result if the market value of assets were used instead of the actuarial value of assets, unless the market value of assets is used in the measurement.

Limitations of Project Scope

Actuarial standards do not require the actuary to evaluate the ability of the plan sponsor or other contributing entity to make required contributions to the plan when due. Such an evaluation was not within the scope of this project and is not within the actuary's domain of expertise. Consequently, the actuary performed no such evaluation.

Risks to Future Employer Contribution Requirements

There are ongoing risks to future employer contribution requirements to which the Retirement System is exposed, such as:

- Actual and Assumed Investment Rate of Return
- Actual and Assumed Mortality Rates
- Amortization Policy

Comparative Statement

Valuation Date June 30	Fiscal Year	Actuarial Accrued Liabilities & Reserves	Actuarial Accrued Assets	Funded Ratio	Unfunded Actuarial Accrued Liabilities & Reserves			City's Contribution Rate		
									Dollars	
					Dollars	Amortiz. Period	% of Payroll	Percents	Recommended	Actual
1998	99-00	$ 40,087,394	$ 41,907,540	104.5 %	$(1,820,146)	17	-	14.25 %	$ 750,633	$ 909,016
1999 #	00-01	44,416,775	45,285,637	102.0	(868,862)	16	-	14.44	802,364	850,457
2000	01-02	46,244,023	47,689,403	103.1	(1,445,380)	15	-	13.45	727,203	845,881
2001	02-03	48,139,671	48,997,093	101.8	(857,422)	14	-	13.76	798,609	951,923
2002 #	03-04	50,633,078	49,200,870	97.2	1,432,208	13	22.3 %	17.31	1,113,946	1,221,459
2003 #	04-05	51,665,535	48,919,496	94.7	2,746,039	12	43.5	20.49	1,292,438	1,513,225
2004 *#	05-06	56,133,839	48,976,377	87.2	7,157,462	20	102.4	23.15	1,618,638	1,656,681
2005	06-07	57,733,862	49,887,362	86.4	7,846,500	19	110.3	23.86	1,697,809	1,794,618
2006 @	07-08	59,879,584	51,533,008	86.1	8,346,576	25	118.2	22.88	1,615,365	1,745,795
2007	08-09	61,959,805	55,004,366	88.8	6,955,439	25	96.3	21.90	1,581,304	1,625,338
2008 *	09-10	61,187,814	57,130,630	93.4	4,057,184	25	53.4	17.48	1,327,971	1,589,770
2009 @	10-11	63,175,083	56,156,781	88.9	7,018,302	30	93.6	18.82	1,411,463	1,391,859
2010	11-12	63,161,498	54,888,388	86.9	8,273,110	30	120.9	19.92	1,363,478	1,240,859
2011 #	12-13	65,466,348	51,374,542	78.5	14,091,806	30	234.5	22.72	1,365,401	1,338,103
2012	13-14	67,929,700	47,691,751	70.2	20,237,949	30	356.5	27.82	1,711,368	1,566,747
2013 **	14-15	67,745,324	48,067,300	71.0	19,678,024	30	335.4	24.99	1,588,802	1,408,153
2014 @	15-16	70,493,480	49,322,706	70.0	21,170,774	30	380.7	27.94	1,683,896	1,698,569
2015 *#	16-17	78,426,714	47,383,538	60.4	31,043,176	29	587.7	39.35	2,252,379	2,473,172
2016 *	17-18	77,750,883	45,546,957	58.6	32,203,926	28	586.4	41.10	2,393,830	
2017	**18-19**	**80,265,462**	**44,678,218**	**55.7**	**35,587,244**	**27**	**643.1**	**44.88**	**2,633,851**	
2017 *	**18-19**	**81,945,548**	**44,678,218**	**54.5**	**37,267,330**	**27**	**673.5**	**48.04**	**2,809,141**	

** Revised actuarial assumptions and methods.* *# Retirement System was amended.*
*** Changes in the application of the benefit provisions.* *@ Amortization policy of Unfunded Actuarial Accrued Liabilities was changed.*

The Ratio of Valuation Assets to Actuarial Accrued Liabilities is a traditional measure of a system's funding progress. Except in years when the system is amended or actuarial assumptions are revised, this ratio can be expected to increase gradually toward 100%.

The Ratio of Unfunded Actuarial Accrued Liabilities to Valuation Payroll is another relative index of condition. Unfunded actuarial accrued liabilities represent debt, while active member payroll represents the system's capacity to collect contributions to pay toward the debt. The lower the ratio, the greater the financial strength and vice-versa.

SECTION C

SUMMARY OF BENEFIT PROVISIONS AND VALUATION DATA

Brief Summary of Act 345 Benefit Provisions
(June 30, 2017)

Eligibility	Amount
Service Retirement	
Members hired after 7/1/2009 (excluding Dept. Heads) Age 55 with 25 or more years of service or age 60 with 10 years of service.	Straight life pension equals 2.0% (2.5% if member has at least 25 years of service) of 3-year Average Final Compensation (AFC) times the first 25 years of service plus 1.0% of AFC times years of service in excess of 25 years.
Dept. Heads and Members hired before 7/1/2009 25 or more years of service regardless of age or age 60 with 10 years of service.	Straight life pension equals 2.0% (2.8% if member has at least 25 years of service) of 3-year AFC times first 25 years of service plus 1.0% of AFC times years of service in excess of 25 years.
Deferred Retirement	
10 or more years of service.	Computed as service retirement but based upon service, AFC and benefits in effect at termination. Benefit begins at the date retirement would have occurred had the member remained in employment.
Death after Retirement Survivor's Pension	
Payable to a surviving spouse, if any, upon the death of a retired member who was receiving a straight life pension which was effective July 1, 1975 or later.	Spouse's pension equals 60% of the straight life pension the deceased retiree was receiving.
Non-Duty Death-in-Service Survivor's Pension	
Payable to a surviving spouse, if any, upon the death of a member with 20 or more years of service.	Accrued straight life pension actuarially reduced in accordance with an Option I election.

Duty Death-in-Service Survivor's Pension

Payable upon the expiration of Workers' Compensation to the survivors of a member who died in the line of duty.	Same amount that was paid by Workers' Compensation.

Non-Duty Disability

Payable upon the total and permanent disability of a member with 5 or more years of service.	**To earliest projected service retirement eligibility:** 1.5% of AFC times years of service. **At earliest projected service retirement eligibility:** Same as Service Retirement Pension.

Duty Disability

Payable upon the total and permanent disability of a member in the line of duty.	**To earliest projected service retirement eligibility:** 50% of AFC. **At earliest projected service retirement eligibility:** Same as Service Retirement Pension with service credit from the date of disability to projected age of retirement eligibility.

Member Contributions

8.90% of pay for Firefighters
8.90% of pay for Fire Command
8.90% for Police
8.90% for Police Command
8.90% for Department Heads

Annuity withdrawal based on Merrill Lynch Bond Index available at retirement with 25 years of service.

Interest earned on Member Contributions is 3.5% annually effective July 1, 2011.

Retirees and Beneficiaries Added to and Removed from Rolls
Comparative Statement

Year Ended June 30	Added to Rolls No.	Added to Rolls Annual Pensions	Removed from Rolls No.	Removed from Rolls Annual Pensions	Rolls End of Year No.	Rolls End of Year Active Per Retired	Rolls End of Year Annual Pensions Dollars	Rolls End of Year Annual Pensions % of Pay	% Incr. in Annual Pensions	Average Pension	Present Value of Pensions
1998	9	$ 239,598	3	$ 50,033	80	1.2	$ 1,899,460	36.1 %	11.1 %	$ 23,743	$ 20,770,987
1999	11	350,221	4	71,463	87	1.1	2,178,218	37.5	14.7	25,037	24,146,654
2000	13	515,306	3	59,400	97	1.0	2,634,124	47.1	20.9	27,156	29,462,600
2001	5	233,147	1	34,484	101	0.9	2,832,787	48.8	7.5	28,047	31,482,029
2002	2	38,323	2	63,872	101	1.0	2,807,238	43.6	(0.9)	27,794	30,706,301
2003	3	122,791	2	15,098	102	1.0	2,914,931	46.2	3.8	28,578	31,583,764
2004	4	99,475	3	76,875	103	1.0	2,937,531	42.0	0.8	28,520	31,928,907
2005	1	23,232	3	79,834	101	1.0	2,880,929	40.5	(1.9)	28,524	30,919,712
2006	3	170,036	1	3,880	103	0.9	3,047,085	43.2	5.8	29,583	32,399,560
2007	2	93,031	4	83,266	101	0.9	3,056,850	42.3	0.3	30,266	32,176,238
2008	5	78,960	4	114,827	102	0.9	3,020,983	39.8	(1.2)	29,617	30,142,812
2009	3	82,044	1	25,502	104	0.9	3,077,525	41.0	1.9	29,592	30,340,870
2010	5	142,333	4	104,122	105	0.8	3,115,736	45.5	1.2	29,674	30,412,190
2011	12	634,045	2	32,757	115	0.7	3,717,024	61.9	19.3	32,322	37,300,027
2012	7	440,833	2	27,202	120	0.6	4,130,655	72.8	11.1	34,422	41,541,931
2013	4	195,238	4	148,883	120	0.6	4,177,010	71.2	1.1	34,808	41,555,510
2014	4	223,638	0	0	124	0.5	4,400,648	79.1	5.4	35,489	43,344,843
2015	11	483,755	4	73,399	131	0.5	4,811,004	91.1	9.3	36,725	51,643,558
2016	8	401,007	4	108,444	135	0.5	5,103,567	92.9	6.1	37,804	54,304,406
2017	**6**	**300,680**	**0**	**0**	**141**	**0.5**	**5,404,247**	**97.7**	**5.9**	**38,328**	**58,238,711**

Retirees and Beneficiaries as of June 30, 2017
Tabulated by Type of Pensions Being Paid

Type of Pensions Being Paid	Number	Annual Pensions
Age and Service Pensions		
Regular pensions - benefit terminating at death of retiree	15	$ 492,680
Regular pensions - automatic 60% to spouse	82	4,013,438
Regular pension - survivor	27	484,337
Option 1 pension	1	55,531
Option 2 pension - modified joint and survivor benefit	0	0
Total age and service pensions	125	$ 5,045,986
Casualty Pensions		
Duty disability pensions	7	$ 196,134
Non-duty disability pensions	3	81,717
Duty disability pension - survivor	2	16,218
Non-duty disability pension - survivor	0	0
Duty death pension - survivor	1	14,484
Non-duty death pensions - survivor	3	49,708
Total casualty pensions	16	$ 358,261
Total Pensions Being Paid	**141**	**$ 5,404,247**

Retirees and Beneficiaries as of June 30, 2017
Tabulated by Attained Ages

Attained Ages	No.	Annual Pensions
36	1	$ 14,484
43	1	35,858
47	1	42,050
49	1	37,589
51	6	372,867
52	5	287,120
53	4	150,461
54	7	337,099
55	5	281,834
56	4	228,663
57	2	138,958
58	4	171,206
59	5	252,079
60	1	34,814
61	4	208,823
62	7	310,922
63	8	334,722
64	1	46,462
65	2	80,491
66	1	44,864
67	3	130,693
68	7	242,128
69	3	160,624
70	2	60,041
71	4	172,939
72	3	79,520
74	6	143,694
75	9	240,323
76	3	103,183
77	5	93,156
78	2	57,477
79	5	155,600
80	4	129,764
81	1	23,674
82	2	42,659
83	2	20,567
84	1	10,819
85	1	18,941
86	3	49,271
87	2	37,053
88	1	8,783
93	1	9,458
94	1	2,514
Totals	**141**	**$ 5,404,247**

Vested Terminated Members as of June 30, 2017*
Tabulated by Attained Ages

Attained Ages	No.	Estimated Annual Pensions
35	1	$ 30,664
38	1	23,125
32	1	23,998
45	1	23,876
48	1	36,997
52	1	36,724
Totals	**6**	**$ 175,384**

* *Includes members currently on leave of absence from service.*

Active Members Included in Valuation by Division

Division	No.	Valuation Payroll	Average Pay
Police - Command	12	$ 1,194,400	$ 99,533
- Other	30	2,293,939	76,465
Fire - Command	7	674,759	96,394
- Other	18	1,028,546	57,141
Department Heads	3	341,709	113,903
Totals	**70**	**$5,533,353**	**$ 79,048**

Active Members Added to and Removed from Rolls

Year Ended June 30	Number Added During Year		Terminations										Active Members End of Year
			Normal Retirement		Disabled		Died-in Service		Withdrawal				
									Vested	Other	Total		
	A	E	A	E	A	E	A	E	A	A	A	E	
1998	8	8	5	1.8	1	0.2	0	0.2	0	2	2	1.2	98
1999	7	8	7	2.4	0	0.2	0	0.2	0	1	1	1.2	97
2000	8	11	11	1.0	0	0.2	0	0.1	0	0	0	1.0	94
2001	4	5	4	0.7	0	0.2	0	0.1	0	1	1	0.9	93
2002	6	0	0	0.2	0	0.2	0	0.1	0	0	0	1.0	99
2003	1	2	2	0.6	0	0.2	0	0.1	0	0	0	1.1	98
2004	1	1	1	1.0	0	0.2	0	0.1	0	0	0	1.1	98
2005	0	2	0	0.5	0	0.2	0	0.1	0	2	2	1.9	96
2006	1	3	3	0.4	0	0.3	0	0.1	0	0	0	1.6	94
2007	1	3	1	0.5	0	0.3	0	0.1	0	2	2	1.4	92
2008	0	0	0	0.4	0	0.3	0	0.1	0	0	0	1.3	92
2009	0	2	1	0.6	0	0.3	1	0.1	0	0	0	1.1	90
2010	0	8	1	0.6	1	0.4	0	0.2	0	6	6	1.0	82
2011	3	10	10	2.1	0	0.3	0	0.2	0	0	0	0.8	75
2012	4	9	7	1.5	0	0.3	0	0.2	2	0	2	0.7	70
2013	5	3	2	1.0	0	0.3	0	0.2	1	0	1	0.8	72
2014	2	6	4	3.0	0	0.3	0	0.1	0	2	2	1.3	68
2015	7	9	6	3.6	2	0.2	0	0.1	1	0	1	1.0	66
2016	13	7	6	2.8	0	0.1	0	0	0	1	1	1.4	72
2017	7	9	5	3.0	0	0.2	0	0.1	1	3	4	2.1	70
5-Yr. Totals	34	34	23	13.4	2	1.1	0	0.5	3	6	9	6.6	
Expected for 2018				2.3		0.2		0.0				2.1	

A = actual
E = expected

Active Members in Valuation
Comparative Schedule

Valuation Date June 30	No.	Valuation Payroll	Average Pay	% Incr.	Age	Service
1998	98	$ 5,267,598	$ 53,751	0.0 %	38.8 yrs.	12.2 yrs.
1999	97	5,801,619	59,811	11.3	38.5	11.5
2000	94	5,593,871	59,509	(0.5)	36.9	9.9
2001	93	5,799,631	62,362	4.8	37.1	9.8
2002	99	6,435,274	65,003	4.2	37.5	10.2
2003	98	6,307,652	64,364	(1.0)	38.1	10.8
2004	98	6,991,955	71,346	10.8	38.8	11.6
2005	96	7,115,713	74,122	3.9	39.9	12.6
2006	94	7,060,160	75,108	1.3	40.2	13.0
2007	92	7,220,564	78,484	4.5	41.0	13.8
2008	92	7,597,087	82,577	5.2	42.0	14.8
2009	90	7,499,803	83,331	0.9	43.1	15.8
2010	82	6,844,767	83,473	0.2	44.1	16.8
2011	75	6,009,688	80,129	(4.0)	44.0	16.6
2012	70	5,676,851	81,098	1.2	43.8	16.2
2013	72	5,867,119	81,488	0.5	43.8	15.8
2014	68	5,561,732	81,790	0.4	44.2	16.3
2015	66	5,282,238	80,034	(2.1)	43.0	14.7
2016	72	5,491,632	76,273	(4.7)	41.1	12.4
2017	70	5,533,353	79,048	3.6	40.3	11.6

Active Members as of June 30, 2017
By Near Age and Years of Service

Near Age	Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	No.	Valuation Payroll
20-24	2							2	$ 92,752
25-29	8							8	408,636
30-34	9	3	1					13	764,678
35-39	6		1	2				9	665,317
40-44	2			5	1			8	695,834
45-49	1			14	4	1		20	1,918,097
50-54				2	6			8	808,436
55-59				1				1	98,589
60+					1			1	81,014
Totals	**28**	**3**	**2**	**24**	**12**	**1**		**70**	**$ 5,533,353**

While not used in the financial computations, the following group averages are computed and shown because of their general interest.

Age:	40.3 years
Service:	11.6 years
Annual Pay:	$79,048

Summary of
Current Asset Information
Furnished for Valuation

Balance Sheet

Current Assets (Market Value)		Reserve for	
Accrued Interest & Dividends	$ 115,604	Employees Contributions	$ 7,128,995
Contributions Receivable	402,329	Employer Contributions	6,411,415
Stocks	28,494,851	Retired Benefit Payments	28,824,508
Stock Mutual Funds	3,158,209		
U.S. Government Bonds	3,463,535		
Corporate Bonds	3,913,955		
Bond Mutual Funds	635,480		
Mortgages	98,486		
Asset Backed Securities	1,032,239		
Other	1,050,230		
Accounts Payable	0		
Total Current Assets	$ 42,364,918	Total Reserves *	$ 42,364,918

* *As reported.*

Receipts and Disbursements

	2016-17	2015-16
Balance - July 1,	$ 41,606,219	$ 45,922,041
Receipts:		
Employees contributions	510,712	490,999
- for EE service purchase	0	0
Employer contributions	2,473,172	1,698,569
- for retiree health insurance	0	0
- for admin. & inv. expenses	357,593	393,028
Investment income	3,979,960	(462,587)
Disbursements:		
Benefit payments	5,281,950	4,969,535
Refund of member contributions	923,195	1,073,439
Retiree health insurance	0	0
Administrative expenses	197,525	231,781
Investment expenses	160,068	161,247
Audit Adjustment	0	171
Balance June 30,	$ 42,364,918	$ 41,606,219

Development of Funding Value of Retirement System Assets

Year Ended June 30:	2015	2016	2017	2018	2019	2020
(A) Funding Value Beginning of Year	$49,322,706	$47,383,538	$45,546,957			
(B) Market Value End of Year	45,922,041	41,606,219	42,364,918			
(C) Market Value Beginning of Year	49,685,203	45,922,041	41,606,219			
(D) Non Investment Net Cash Flow (EE + ER cont.) - (Ret. Ben. + Refunds)	(3,757,407)	(3,853,406)	(3,221,261)			
(E) Investment Income:						
(E1) Market Total: B-C-D	(5,755)	(462,416)	3,979,960			
(E2) Assumed Rate	7.50%	7.50%	7.50%	7.25%	7.00%	6.75%
(E3) Amount for Immediate Recognition E2 * (A + D/2)	3,558,300	3,409,263	3,295,224			
(E4) Amount for Phased-In Recognition: E1-E3	(3,564,055)	(3,871,679)	684,736			
(F) Phased-In Recognition Investment Income:						
(F1) From Current Year = .25 x (E3)	(891,014)	(967,920)	171,184			
(F2) First Year Prior	745,049	(891,014)	(967,920)	$ 171,184		
(F3) Second Year Prior	(278,552)	745,049	(891,014)	(967,920)	$ 171,184	
(F4) Third Year Prior	(1,315,544)	(278,553)	745,048	(891,013)	(967,919)	$171,184
(F5) Total Recognized Investment Gain	(1,740,061)	(1,392,438)	(942,702)	(1,687,749)	(796,735)	171,184
(G) Funding Value End of Year = (A) + (D) + (E3) + (F5)	**$47,383,538**	**$45,546,957**	**$44,678,218**			
(H) Difference between Market & Funding Value	(1,461,497)	(3,940,738)	(2,313,300)			
(I) Recognized Rate of Return	3.8%	4.4%	5.4%			
(J) Ratio of Funding Value of Assets to Market Value	103.2%	109.5%	105.5%			
(K) Market Rate of Return	(0.0)%	(1.1)%	10.0%			

The Funding Value of Assets recognizes assumed investment income (line E3) fully each year. Differences between actual and assumed investment income (line E4) are phased-in over a closed four-year period. During periods when investment performance exceeds the assumed rate, Funding Value of Assets will tend to be less than Market Value. During periods when investment performance is less than the assumed rate, Funding Value of Assets will tend to be greater than Market Value. The Funding Value of Assets is ***unbiased*** with respect to Market Value. At any time, it may be either greater or less than Market Value. If actual and assumed rates of investment income are exactly equal for three consecutive years, the Funding Value will become equal to Market Value.

SECTION D

SUMMARY OF ACTUARIAL COST METHOD AND ASSUMPTIONS

Actuarial Cost Method

Normal cost and the allocation of benefit values between service rendered before and after the valuation date was determined using an individual ***entry-age normal cost*** method having the following characteristics:

(i) The annual normal costs for each individual active member, payable from the date of employment to the date of retirement, are sufficient to accumulate the value of the member's benefit at the time of retirement; and

(ii) Each annual normal cost is a constant percentage of the member's year-by-year projected covered pay.

Financing of Unfunded Actuarial Accrued Liabilities. Unfunded actuarial accrued liabilities (the portion of total liabilities not covered by present assets or expected future normal cost contributions) were amortized by level (principal or interest combined) percent-of-payroll contributions over a closed period of 27 years beginning July 1, 2017.

Actuarial Assumptions Used for the Valuations

The actuary calculates the contribution requirements and benefit values of the Retirement System by applying actuarial assumptions to the benefit provisions and people information furnished, using the actuarial cost method described on the previous page. All actuarial assumptions used in this report are estimates of future experience, not market measures.

The principal areas of financial risk which require assumptions about future experiences are:

(i) Long-term rates of investment return to be generated by the assets of the Retirement System.
(ii) Patterns of pay increases to members.
(iii) Rates of mortality among members, retirees and beneficiaries.
(iv) Rates of withdrawal of active members (without entitlement to a retirement benefit).
(v) Rates of disability among members.
(vi) The age patterns of actual retirement.

In making a valuation, the actuary calculates the monetary effect of each assumption for as long as a present covered person survives - - a period of time which can be as long as a century.

Actual experience of the Retirement System will not coincide exactly with assumed experience, regardless of the wisdom of the assumptions, or the skill of the actuary and the precision of the many calculations made. Each valuation provides a complete recalculation of assumed future experience and takes into account all past differences between assumed and actual experience. The result is a continual series of adjustments (usually small) to the computed contribution rate.

From time-to-time it becomes appropriate to modify one or more of the assumptions, to reflect experience trends (but not random year-to-year fluctuations).

Valuation Assumptions

The rate of investment return was 7.25% a year, compounded annually. This assumption is used to make money payable at one point in time equal in value to a different amount of money payable at another point in time.

This rate is not the assumed real return which, for funding purposes, is the rate of return in excess of average salary increases. Considering other assumptions used in the valuation, the 7.25% translates to a real return of approximately 3.50%. Experience over the last five years has been as illustrated below:

		Year Ending June 30,					5-Year
		2017	2016	2015	2014	2013	Average
1)	Recognized rate*	5.4 %	4.4 %	3.8 %	7.5 %	5.6 %	5.3 %
2)	Increase in CPI	1.6	1.0	0.1	2.1	1.8	1.3
3)	Average salary increase	8.3	2.7	3.6	1.1	4.4	4.0
4)	Real return						
	- investment purposes	3.8	3.4	3.7	5.4	3.8	4.0
	- funding purposes	(2.9)	1.7	0.2	6.4	1.2	1.3

* *The recognized rate of return was computed using the approximate formula: i = I divided by 1/2 (A+B-I), where I is realized investment income, A is the beginning of year asset value and B is the end of year asset value.*

The rates of salary increase used for individual members are in accordance with the following table. This assumption is used to project a member's current salary to the salaries upon which benefit amounts will be based.

	Salary Increase Assumptions for an Individual Member		
Sample Ages	Merit & Seniority	Base (Economic)	Increase Next Year
20	3.00 %	3.75 %	6.75 %
25	3.00	3.75	6.75
30	2.60	3.75	6.35
35	1.10	3.75	4.85
40	0.20	3.75	3.95
45	0.20	3.75	3.95
50	0.20	3.75	3.95
55	0.10	3.75	3.85
60	0.00	3.75	3.75

If the number of active members remains constant, then the total active member payroll will increase 3.75% annually, the base portion of the individual salary increase assumptions. This increasing payroll was recognized in amortizing unfunded actuarial accrued liabilities.

The mortality table used to measure post-retirement mortality is the RP-2014 Healthy Annuitant Mortality for males and females projected forward, to 2017 with the MP-2017 Mortality Improvement Scales. The corresponding Disability and Employee tables were used to measure Disabled mortality and Pre-Retirement mortality, respectively. Mortality rates include some margin for future mortality improvements. The mortality table was last updated for the June 30, 2017 actuarial valuation.

	Single Life Retirement Values			
	Present Value of $1 Monthly for Life		Future Life Expectancy (Years)	
Sample Ages	Males	Females	Males	Females
45	$150.91	$154.52	36.45	39.10
50	145.16	149.56	32.01	34.54
55	138.15	143.08	27.72	30.04
60	129.53	134.91	23.58	25.67
65	118.94	124.79	19.60	21.47
70	106.13	112.38	15.82	17.45
75	91.16	97.76	12.30	13.72
80	74.73	81.38	9.17	10.35

For purposes of the pre-retirement death benefit, it was assumed that 100% of members were married at the time of death. 25% of pre-retirement deaths were assumed to be duty related.

Probabilities of retirement for members eligible to retire were:

Hired Before July 1, 2009			Hired On or After July 1, 2009		
	Percent of Active Members Retiring within Next Year			Percent of Active Members Retiring within Next Year	
Retirement Ages	Police	Fire & Dept. Heads	Retirement Ages	Police	Fire & Dept. Heads
45	40 %	20 %	55	62.5 %	50 %
46	40	20	56	47.5	30
47	40	20	57	47.5	30
48	40	20	58	47.5	30
49	40	20	59	47.5	30
50	40	20	60	100.0	100
51	35	15			
52	20	10			
53	15	10			
54	15	10			
55	15	10			
56	15	10			
57	15	10			
58	15	10			
59	25	20			
60	100	100			

Sample Rates of Separation from Active Employment before Retirement, Other than Death or Disability

Sample Ages	Years of Service	% of Active Members Separating within Next Year	
		Police	Fire & Dept. Heads
ALL	0	12.00 %	10.00 %
	1	9.00	7.00
	2	7.00	5.00
	3	5.00	4.00
	4	4.50	3.50
25	5 & Over	4.50	3.50
30		3.90	2.90
35		2.30	1.50
40		0.90	0.60
45		0.50	0.50
50		0.50	0.50
55		0.50	0.50
60		0.50	0.50

Sample Rates of Disability

Sample Ages	Probabilities of Becoming Disabled During Next Year	
	Males	Females
20	0.07 %	0.03 %
25	0.09	0.05
30	0.10	0.07
35	0.14	0.13
40	0.21	0.19
45	0.32	0.28
50	0.52	0.45
55	0.92	0.76
60	1.53	1.10

50% of disabilities were assumed to be duty related.

Summary of Assumptions Used
June 30, 2017

Pensions in an Inflationary Environment

Value of $1,000/month Retirement Benefit
To an Individual Who Retires at Age 50
In an Environment of 3.75% Wage Inflation

Age	Value
50	$ 1,000
51	964
52	929
53	895
54	863
55	832
60	692
65	576
70	479
75	398
80	331
85	276

Miscellaneous and Technical Assumptions

Marriage Assumption	100% of members are assumed to be married for purposes of death-in-service benefits. 90% of members are assumed to be married at time of retirement for purposes of death after retirement benefits.
Pay Increase Timing	Beginning of (fiscal) year. This is equivalent to assuming that reported pays represent amounts paid to members during the year ended on the valuation date.
Decrement Timing	Decrements of all types are assumed to occur at the middle of the year.
Eligibility Testing	Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.
Benefit Service	Exact fractional service is used to determine the amount of benefit payable.
Decrement Relativity	Decrement rates are used directly from tabular rates, without adjustment for multiple decrement table effects.
Decrement Operation	Disability and mortality decrements do not operate during the first five years of service. Disability and separation do not operate during retirement eligibility.
Normal Form of Benefit	The assumed normal form of benefit is straight life for single members and joint and 60% survivor for married members.
Loads	Normal Retirement Present Values were loaded by 5% of age and service actuarial liabilities for Police and Fire hired before July 1, 2009 and 20% of age and service actuarial liabilities for Department Heads hired before July 1, 2009 for lump sums payable at retirement.
Incidence of Contributions	Contributions are assumed to be received continuously throughout the year based upon the computed percent-of-payroll shown in this report, and the actual payroll payable at the time contributions are made. New entrant normal cost contributions are applied to the funding of new entrant benefits.
Annuity Withdrawal	It was assumed that 80% of all future retirees will elect to withdraw their employee contributions at retirement resulting in a corresponding reduction to the monthly annuity. A 3.75% interest rate assumption was used to determine the annuity equivalent of the member contribution balance at retirement.
Data Adjustments	Prior year salary was used for one member with a break in service.

Glossary

Actuarial Accrued Liability	The difference between (i) the actuarial present value of future plan benefits, and (ii) the actuarial present value of future normal cost. Sometimes referred to as "accrued liability" or "past service liability."
Accrued Service	The service credited under the plan which was rendered before the date of the actuarial valuation.
Actuarial Assumptions	Estimates of future plan experience with respect to rates of mortality, disability, turnover, retirement, rate or rates of investment income and salary increases. Decrement assumptions (rates of mortality, disability, turnover and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (salary increases and investment income) consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation.
Actuarial Cost Method	A mathematical budgeting procedure for allocating the dollar amount of the "actuarial present value of future plan benefits" between the actuarial present value of future normal cost and the actuarial accrued liability. Sometimes referred to as the "actuarial funding method."
Actuarial Equivalent	A single amount or series of amounts of equal value to another single amount or series of amounts, computed on the basis of the rate(s) of interest and mortality tables used by the plan.
Actuarial Present Value	The amount of funds presently required to provide a payment or series of payments in the future. It is determined by discounting the future payments at a predetermined rate of interest, taking into account the probability of payment.
Amortization	Paying off an interest-bearing liability by means of periodic payments of interest and principal, as opposed to paying it off with a lump sum payment.
Experience Gain (Loss)	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, in accordance with the actuarial cost method being used.
Funding Value of Assets	Also referred to as actuarial value of assets, smoothed market value of assets, or valuation assets. Valuation assets recognize assumed investment return fully each year. Differences between actual and assumed investment return are phased-in over a closed four-year period. During periods when investment performance exceeds the assumed rate, valuation assets will tend to be less than market value. During periods when investment performance is less than the assumed rate, valuation assets will tend to be greater than market value. If assumed rates are exactly realized for three consecutive years, valuation assets will become equal to market value.

Normal Cost The annual cost assigned, under the actuarial funding method, to current and subsequent plan years. Sometimes referred to as "current service cost." Any payment toward the unfunded actuarial accrued liability is not part of the normal cost.

Plan Termination Liability The actuarial present value of future plan benefits based on the assumption that there will be no further accruals for the future service and salary. The termination liability will generally be less than the liabilities computed on a "going concern" basis and is not normally determined in a routine actuarial valuation.

Reserve Account An account used to indicate that funds have been set aside for a specific purpose and are not generally available for other uses.

UAAL (Unfunded Actuarial Accrued Liability) The difference between the actuarial accrued liability and the funding value of assets. Sometimes referred to as "unfunded accrued liability."

Most retirement systems have unfunded actuarial accrued liability. An amount arises each time new benefits are added and each time an experience loss occurs.

The existence of unfunded actuarial accrued liability is not in itself bad, any more than a mortgage on a house is bad. Unfunded actuarial accrued liability does not represent a debt that is payable today. What is important is the ability to control the amount of unfunded actuarial accrued liability and the trend in the amount (after due allowance for devaluation of the dollar).