City of Grand Rapids Police and Fire Retirement System

52nd Annual Actuarial Valuation

December 31, 2018

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June 24, 2019

Board of Trustees
City of Grand Rapids Police
and Fire Retirement System
Grand Rapids, Michigan

Dear Board Members:

The results of the ***December 31, 2018 Actuarial Valuation*** of the City of Grand Rapids Police and Fire Retirement System are presented in this report.

The purpose of the valuation and gain/loss analysis is to measure funding progress in relation to the actuarial cost method and to determine employer contribution rates. Calculations required for compliance with the GASB Statements No. 67 and No. 68 will be issued in a separate report. The results of the valuation may not be applicable for other purposes.

This report should not be relied on for any purpose other than those described above. It 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. GRS is not responsible for unauthorized use of this report.

The computed contribution rate shown on page A-1 may be considered as a minimum contribution rate that complies with the funding policy stated in the Ordinance. 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.

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.

The actuarial methods and assumptions used in the actuarial valuation are summarized in Section C of this report. The assumptions are established by the Board after consulting with the actuary.

The valuation was based upon statistical data, furnished by your Executive Director concerning Retirement System benefits, financial transactions, and individual members, terminated members, retirants and beneficiaries. Data was checked for internal and year-to-year consistency, but was not audited. We are not responsible for the accuracy or completeness of the information provided by the City.

This report has been prepared by individuals who have substantial experience valuing public employee retirement systems. To the best of our knowledge, this report is complete and accurate and was made in accordance with generally recognized actuarial methods in accordance with standards of practice prescribed by the Actuarial Standards Board and in compliance with the constitution of the State of Michigan. The actuarial assumptions used for the valuation produce results which we believe are reasonable.

James D. Anderson and Jeffrey T. Tebeau 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. The signing individuals are independent of the plan sponsor.

Respectfully submitted,

David L. Hoffman

James D. Anderson, FSA, EA, MAAA, FCA

Jeffrey T. Tebeau, FSA, EA, MAAA

DLH/JDA/JTT:sc

SECTION A

VALUATION RESULTS

Contributions to Provide Benefits
For the Fiscal Year Beginning July 1, 2020
Based upon a December 31, 2018 Valuation Date

Contributions for	% of Valuation Payroll	% of Gross-Up Payroll
Normal cost of benefits:		
Age & service pensions	20.25 %	18.07 %
Disability pensions	4.06 %	3.62 %
Death-in-service pensions	0.57 %	0.51 %
Refunds of member contributions	0.64 %	0.57 %
Totals	25.52 %	22.77 %
Member Contributions (weighted average)	11.49 %	10.26 %
Employer Normal Cost	14.03 %	12.51 %
Unfunded Actuarial Accrued Liabilities*	17.38 %	15.51 %
Section 1.263(2) Full Funding Credit*	0.00 %	0.00 %
INITIAL COMPUTED EMPLOYER RATE	31.41 %	28.02 %
Ordinance Section 1.263(3) Reduction+	N/A	N/A
ADJUSTED COMPUTED EMPLOYER RATE@	**31.41 %**	**28.02 %**

* *See the amortization schedule found on page A-17.*

@ *In addition to this percent-of-payroll contribution, the City contributes for (i) certain Supplemental Benefits for a small, closed group of retirants and beneficiaries in accordance with the provisions of Ordinance Section 1.292, and (ii) 0.5% of payroll to provide a Medicare Supplement for members retiring after June 30, 1990.*

\+ *See page A-3 for derivation of Ordinance Section 1.263(3) reduction.*

Determining Employer Dollar Contributions

For any period of time, the percent-of-payroll contribution rate needs to be converted to dollars – and then contributed to the Retirement System in a timely manner.

The recommended procedure is: (1) ***at the end of each payroll period, multiply the active member payroll for the period by the employer contribution percent***; and (2) ***promptly contribute the dollar amount so determined***.

Valuation payroll is $34,018,474.
"Gross-Up" payroll is $38,122,879.

Allocation of Valuation Assets
Year Ended December 31, 2018

In financing the actuarial accrued liabilities, Valuation Assets of $425,207,986 were distributed as follows:

	Present Valuation Assets Applied to			
Reserves for	Member Actuarial Accrued Liabilities	Retired Life Actuarial Accrued Liabilities	Contingency Reserve	Totals
Member Contributions (MDF)	$ 46,610,797			$ 46,610,797
Employer Contributions (EAF)	(45,339,112)			(45,339,112)
Retired Benefit Payments (BRF)	(12,151,132)	$ 331,374,152		319,223,020
Undistributed Income (IEF)	67,060,977			67,060,977
Valuation Asset Adjustment	37,652,304			37,652,304
Totals	**$93,833,834**	**$ 331,374,152**	**$0**	**$425,207,986**

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

	Retired Lives	Active Members	Total
Computed Actuarial Accrued Liabilities and Reserves	$ 331,374,152	$ 196,255,016	$ 527,629,168
Applied Assets	331,374,152	93,833,834	425,207,986
Unfunded Actuarial Accrued Liabilities/ (Full Funding Credit)	**$ -**	**$ 102,421,182**	**$ 102,421,182**

Derivation of Ordinance Section 1.263(3) Reduction
For the Fiscal Year Beginning July 1, 2020

Section 1.263(3) reads as follows:

> "Notwithstanding the offset to current service contributions under Section 1.263(2), the City shall make a contribution in the amount determined in this paragraph. **In the event the System has greater valuation assets than actuarial accrued liabilities, the City will pay its current service contribution during its fiscal year beginning 18 months after the valuation date, reduced by 10% for each 1%, or portion thereof, that Valuation Assets exceed the actuarial accrued liabilities."**

The 110% test specified in the second sentence is applied as follows:

	December 31, 2018
(1) Actuarial Accrued Liabilities	$527,629,168
(2) Valuation Assets	425,207,986
(3) Funding Ratio: (2)/(1)	80.59%
(4) City Current Service Contribution (Employer Normal Cost from page A-1)	12.51%
(5) Percentage reduction: [(3)-100%] x 10 (if greater than 100%, use 100%)	None
(6) Ordinance Section 1.263(3) rate: (4) - [(4) x (5)]	N/A
(7) Contribution rate after 1.263(3) reduction: Lessor of (i) initial computed employer rate, or (ii) Section 1.263(3) rate, but not less than zero.	28.02%

Derivation of Experience Gain (Loss)

Actual experience will never (except by coincidence) coincide exactly with assumed experience. Gains and losses often 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.

	December 31, 2018	December 31, 2017
(1) UAAL* at start of year	$ 84,575,445	$79,554,062
(2) Normal cost from last valuation	4,883,621	4,543,318
(3) Actual employer contributions	9,421,305	8,911,489
(4) Interest accrual: [(1) + 1/2 (2) - (3)] x 0.0715	5,884,922	5,609,323
(5) Expected UAAL before changes: [(1) + (2) - (3) + (4)]	85,922,683	80,795,214
(6) Effect of benefit changes	0	0
(7) Effect of revised actuarial assumptions or valuation methods	0	5,554,315
(8) Change in the SPDR (13th Check Reserve) Distribution Pension Reserve Account	1,094,706	0
(9) Expected UAAL after changes: (5) + (6) + (7) + (8)	87,017,389	86,349,529
(10) Actual UAAL at end of year	102,421,182	84,575,445
(11) Gain (loss): (9) - (10)	$ (15,403,793)	$1,774,084
(12) Gain (loss) as percent of the beginning liabilities at start of period ($506,255,138)	(3.0)%	0.4%

* *Unfunded Actuarial Accrued Liabilities.*

Valuation Date	Experience Gain (Loss) as % of Beginning Accrued Liability
12/31/2009	(9.0)%
12/31/2010	(3.0)%
12/31/2011	(3.1)%
12/31/2012	(2.5)%
12/31/2013	6.4 %
12/31/2014	2.2 %
12/31/2015	(1.8)%
12/31/2016	0.6 %
12/31/2017	0.4 %
12/31/2018	(3.0)%

Summary Statement of System Resources and Obligations
Year Ended December 31, 2018

Present Resources and Expected Future Resources

A.	Present valuation assets:	
	1. Net assets from System financial statements	$387,555,682
	2. Market (Funding) value adjustment	37,652,304
	3. Valuation assets	425,207,986
B.	Actuarial present value of expected future Employer contributions:	
	1. For normal costs	45,288,366
	2. For unfunded actuarial accrued liability	102,421,182
	3. Total	147,709,548
C.	Actuarial present value of expected future member contributions	31,196,215
D.	Total present and expected future resources	$604,113,749

Actuarial Present Value of Expected Future Benefit Payments

A.	To retired lives:	
	1. Annual allowances	$331,374,152
	2. Reserve	none
	3. Total	331,374,152
B.	To vested terminated members	13,223,365
C.	To present active members:	
	1. Allocated to service rendered prior to valuation date (actuarial accrued liability)	183,031,651
	2. Allocated to service likely to be rendered after valuation date	76,484,581
	3. Total	259,516,232
D.	Total present value of expected future benefit payments	$604,113,749

Comments, Recommendation and Conclusion

COMMENT A: Overall experience was worse than expected during the period ending December 31, 2018 (see page A-4). Less than expected investment return (on a funding value basis) along with more retirements than expected were the primary sources of the loss.

The ratio of Funding Value to Market Value of assets was 110% at the end of 2018. Over the next four years, if experience matches expectations, the employer contribution as a percent-of-payroll will increase as net investment losses are recognized (see Comment D below).

COMMENT B: The employer contribution rate increased from 24.79% to 28.02%. The year-to-year change is shown on pages A-13 and A-14. The funded ratio decreased from 83.3% in 2017 to 80.6% in 2018. It is worth noting that on a market value basis, the System's funded ratio is 73.5%.

COMMENT C: Effective June 28, 2019, Section 1.263 of Article 2, Chapter 7, Title I of the Grand Rapids City Code was amended to increase the time "lag" between the valuation date and the date to which contribution rates apply. The time lag was increased from 6 months to 18 months. This December 31, 2018 valuation was revised to develop the contribution rates for the Fiscal Year (FY) beginning July 1, 2020. This change increased the City's contribution rate by 0.20%.

If an 18 month lag were instituted, the contribution rates developed in the **December 31, 2017** valuation (adjusted for timing) would apply for the Fiscal Year beginning July 1, 2019. On this basis, the computed employer contribution rates based on the 2017 valuation are 24.79% for the FY Beginning July 1, 2018 and 24.95% for the FY beginning July 1, 2019.

COMMENT D: Below is the five-year contribution rate projection based on all future experience matching exactly with our assumptions of future experience and the current amortization policy for the Police and Fire Retirement System.

7.15% Market Return in 2018-2021								
Valuation Year	**Funding Value ($ millions)**	**Employer Rate**	**Employee Rate**	**Total Rate**	**Funded Ratio**	**MV Return**	**MV-FV ($ millions)**	**MV ($ millions)**
2018	$425	28.02%	10.26%	38.28%	81%	(6.04)%	$(38)	$388
2019	428	29.99%	10.26%	40.25%	77%	7.15%	(24)	405
2020	439	30.88%	10.26%	41.14%	76%	7.15%	(17)	422
2021	452	31.68%	10.26%	41.94%	75%	7.15%	(11)	441
2022	460	33.08%	10.26%	43.34%	72%	7.15%	0	460

Note: Contribution rates are for the fiscal year beginning 18 months after the valuation date. Gains and losses in other risk areas may also have a material effect on contribution rates in future years. Payroll growth or active member populations at rate levels that differ from assumptions are likely to affect this projection in a non-intuitive manner. The impact of future hire benefits are not modeled in this projection.

COMMENT E: The amortization policy is established by the City Commission. Unfunded actuarial accrued liabilities from December 31, 2015 are amortized over a closed 27-year period, unfunded actuarial accrued liabilities from December 31, 2016 are amortized over a closed 28-year period, unfunded actuarial accrued liabilities occurring during the year ended December 31, 2017 are amortized over a closed 29-year period and changes in actuarial accrued liabilities occurring during the year ended December 31, 2018 are amortized over a closed 30-year period.

COMMENT F: The mortality table was adopted in 2015 with the intent to provide approximately a four year margin of improvement. This intent is no longer being met. We recommend that the 2019 valuation be completed using a mortality assumption that projects future mortality improvements several years into the future. This will result in longer projected life expectancies and will increase the liabilities of the System.

RECOMMENDATION FOR REGULAR RESERVE TRANSFER: Inter-fund transfers are made either when: (i) there is a residual December 31 balance in the Income-Expense Fund (IEF) after regular interest credits have been made; or (ii) the year-end balance in the Benefit Reserve Fund (BRF) falls below the present value of benefits currently being paid. Transfers will be made between the appropriate funds so that the ending balances in the IEF and BRF are $0 and $331,374,152, respectively.

CONCLUSION. The City's contribution rate for the fiscal year beginning July 1, 2020 has been computed to be 28.02% of active member gross-up payroll based on the funding policy specified in the retirement ordinance.

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 7.15% on the actuarial value of assets), it is expected that:

1) The unfunded actuarial accrued liabilities will be fully amortized after 30 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

Risks Associated with Measuring the Accrued Liability and Actuarially Determined Contribution

The determination of the accrued liability and the actuarially determined contribution requires the use of assumptions regarding future economic and demographic experience. Risk measures, as illustrated in this report, are intended to aid in the understanding of the effects of future experience differing from the assumptions used in the course of the actuarial valuation. Risk measures may also help with illustrating the potential volatility in the accrued liability and the actuarially determined contribution that result from the differences between actual experience and the actuarial assumptions.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions due to changing conditions; 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. The scope of an actuarial valuation does not include an analysis of the potential range of such future measurements.

Examples of risk that may reasonably be anticipated to significantly affect the plan's future financial condition include:

1. Investment risk – actual investment returns may differ from the expected returns;
2. Asset/Liability mismatch – changes in asset values may not match changes in liabilities, thereby altering the gap between the accrued liability and assets and consequently altering the funded status and contribution requirements;
3. Contribution risk – actual contributions may differ from expected future contributions. For example, actual contributions may not be made in accordance with the plan's funding policy or material changes may occur in the anticipated number of covered employees, covered payroll, or other relevant contribution base;
4. Salary and Payroll risk – actual salaries and total payroll may differ from expected, resulting in actual future accrued liability and contributions differing from expected;
5. Longevity risk – members may live longer or shorter than expected and receive pensions for a period of time other than assumed; and
6. Other demographic risks – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future accrued liability and contributions differing from expected.

The effects of certain trends in experience can generally be anticipated. For example if the investment return since the most recent actuarial valuation is less (or more) than the assumed rate, the cost of the plan can be expected to increase (or decrease). Likewise, if longevity is improving (or worsening), increases (or decreases) in cost can be anticipated.

PLAN MATURITY MEASURES

Risks facing a pension plan evolve over time. A young plan with virtually no investments and paying few benefits may experience little investment risk. An older plan with a large number of members in pay status and a significant trust may be much more exposed to investment risk. Generally accepted plan maturity measures include the following:

	2018	2017
Ratio of the market value of assets to total payroll	11.4	12.2
Ratio of actuarial accrued liability to payroll	15.5	14.5
Ratio of actives to retirees and beneficiaries	0.7	0.7
Ratio of net cash flow to market value of assets	-3.3%	-2.5%

RATIO OF MARKET VALUE OF ASSETS TO PAYROLL

The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. For example, if the market value of assets is 2.0 times the payroll, a return on assets 5% different than assumed would equal 10% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in plan sponsor contributions as a percentage of payroll.

RATIO OF ACTUARIAL ACCRUED LIABILITY TO PAYROLL

The relationship between actuarial accrued liability and payroll is a useful indicator of the potential volatility of contributions for a fully funded plan. A funding policy that targets a funded ratio of 100% is expected to result in the ratio of assets to payroll and the ratio of liability to payroll converging over time. The ratio of liability to payroll may also be used as a measure of sensitivity of the liability itself. For example, if the actuarial accrued liability is 2.5 times the payroll, a change in liability 2% other than assumed would equal 5% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in liability (and also plan sponsor contributions) as a percentage of payroll.

RATIO OF ACTIVES TO RETIREES AND BENEFICIARIES

A young plan with many active members and few retirees will have a high ratio of active to retirees. A mature open plan may have close to the same number of actives to retirees resulting in a ratio near 1.0. A super-mature or closed plan may have significantly more retirees than actives resulting in a ratio below 1.0.

RATIO OF NET CASH FLOW TO MARKET VALUE OF ASSETS

A positive net cash flow means contributions exceed benefits and expenses. A negative cash flow means existing funds are being used to make payments. A certain amount of negative net cash flow is generally expected to occur when benefits are prefunded through a qualified trust. Large negative net cash flows as a percent of assets may indicate a super-mature plan or a need for additional contributions.

ADDITIONAL RISK ASSESSMENT

Additional risk assessment is outside the scope of the annual actuarial valuation. Additional assessment may include scenario tests, sensitivity tests, stochastic modeling, stress tests, and a comparison of the present value of accrued benefits at low-risk discount rates with the actuarial accrued liability.

Benefit Reserve Fund
Comparative Statement

Valuation Date		Allowances Being Paid @ No. *	Allowances Being Paid @ $/Month	BRF Assets	Actuarial Accrued Liabilities	Assets/ Liabilities&
6/30/1994		435	$ 541,725	$ 66,051,111	$ 68,845,704	95.9%
6/30/1995		459	627,560	77,220,497	80,150,076	96.3%
6/30/1996		461	677,015	83,301,082	87,177,204	95.6%
6/30/1997		487	794,296	102,380,668	103,260,072	99.1%
6/30/1998		493	851,973	107,928,659	110,669,460	97.5%
6/30/1999		499	898,586	111,412,944	115,585,584	96.4%
6/30/2000		507	944,958	117,164,662	120,407,496	97.3%
6/30/2001		513	990,722	120,396,308	127,594,608	94.4%
6/30/2002		520	1,039,831	129,873,949	133,501,368	97.3%
12/31/2003		531	1,112,249	136,051,587	140,824,416	96.6%
12/31/2004		542	1,176,973	153,594,184	148,382,784	103.5%
12/31/2005		541	1,183,651	147,281,966	143,974,800	102.3%
12/31/2006		604	1,359,707	167,979,383	167,852,376	100.1%
12/31/2007		614	1,408,709	172,944,949	172,445,604	100.3%
12/31/2008		606	1,424,517	173,901,558	173,015,040	100.5%
12/31/2009		614	1,498,088	180,866,587	184,218,288	98.2%
12/31/2010	#	612	1,509,644	184,087,532	187,767,588	98.0%
12/31/2011		616	1,572,805	193,606,183	195,045,000	99.3%
12/31/2012		623	1,620,628	201,092,608	200,723,004	100.2%
12/31/2013		627	1,678,815	210,047,473	208,857,372	100.6%
12/31/2014		655	1,798,182	231,751,026	226,179,926	102.5%
12/31/2015	#	672	1,926,599	234,273,173	258,431,113	90.7%
12/31/2016	#	673	2,006,172	264,786,598	270,846,337	97.8%
12/31/2017	#	677	2,135,122	289,782,044	298,365,023	97.1%
12/31/2018		**710**	**2,330,939**	**319,223,020**	**331,374,152**	**96.3%**

* *Alternate payees under EDROs counted as separate allowances beginning in 1997.*
@ *Includes disability benefits beginning with the 12/31/2006 valuation.*
# *Revised actuarial assumptions.*
& *Before reserve transfers.*

Actuarial Accrued Liabilities & Assets
Historical Comparative Schedule
($ amounts in millions)

		Actuarial Accrued		Unfunded Actuarial Accrued		
Valuation Date	Valuation Assets	Liability Dollar Amount	Liability Funded Ratio[1]	Dollar Amount	Ratio to Payroll[2]	Financing Period
9/30/1975	$ 18.7	$ 37.8	49.4%	$ 19.1	197 %	17 yrs.
9/30/1980 #	40.5	62.8	64.6%	22.3	184 %	17
9/30/1985	75.6	84.6	89.3%	9.0	58 %	23
6/30/1990	139.8	120.6	115.9%	(19.2)	-	18
6/30/1995 #	202.0	180.6	111.9%	(21.4)	-	15
6/30/1997	255.4	208.6	122.4%	(46.8)	-	15
6/30/1998	283.6	219.2	129.4%	(64.4)	-	15
6/30/1999	302.3	226.9	133.3%	(75.5)	-	15
6/30/2000	310.5	238.4	130.2%	(72.1)	-	15
6/30/2001 # *	305.3	249.2	122.5%	(56.1)	-	15
6/30/2002 #	287.1	265.8	108.0%	(21.4)	-	15
12/31/2003 #@	301.8	276.1	109.3%	(25.8)	-	15
12/31/2004	315.0	285.0	110.5%	(30.0)	-	15
12/31/2005 *	325.0	284.3	114.3%	(40.8)	-	15
12/31/2006	350.2	292.9	119.5%	(57.2)	-	15
12/31/2007	365.1	301.0	121.3%	(64.1)	-	15
12/31/2008 #	346.5	310.2	111.7%	(36.2)	-	30
12/31/2009 #	334.2	348.3	96.0%	14.0	42 %	30
12/31/2010 *	328.6	360.6	91.1% +	32.0	92 %	30
12/31/2011	321.2	365.3	87.9%	44.1	128 %	30
12/31/2012	321.3	375.8	85.5%	54.5	160 %	30
12/31/2013	354.8	385.9	91.9%	31.1	94 %	25
12/31/2014	381.5	404.0	94.4%	22.5	69 %	24
12/31/2015 *#	386.4	461.1	83.8%	74.7	223 %	30 &
12/31/2016 *#	399.8	479.4	83.4%	79.6	231 %	30
12/31/2017 *	421.7	506.3	83.3%	84.6	242 %	30
12/31/2018	**425.2**	**527.6**	**80.6%**	**102.4**	**301 %**	**30**

* *Revised actuarial assumptions.*
\# *Retirement System amended.*
@ *One-half year ended December 31.*
\+ *87% on a market value basis.*
& *Effective with 2015 valuation, a layered amortization approach applies.*

1. **Valuation Assets as a Percent of AAL** is a traditional measure of a system's funding progress. Except in years when the system is amended or actuarial assumptions are revised, this percent can be expected to move gradually toward 100%.

2. **UAAL as a Percent of 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 debt. The lower the percent, the greater the financial strength and vice versa.

City and Member Contributions
Historical Comparative Schedule

Valuation Date	Fiscal Year	Computed Contributions as %s of Active Member Payroll: Member	Employer	Total
9/30/1980 #	81/82	5.90%	27.60%	33.50%
9/30/1985	86/87	4.90%	17.79%	22.69%
6/30/1990	91/92	5.49%	9.03%	14.52%
6/30/1995 #	96/97	5.98%+	0.00%	5.98%
6/30/1997	98/99	5.90%+	0.00%	5.90%
6/30/1998	99/00	5.90%+	0.00%	5.90%
6/30/1999	00/01	5.90%+	0.00%	5.90%
6/30/2000	01/02	5.90%+	0.00%	5.90%
6/30/2001 # *	02/03	6.09%+	0.00%	6.09%
6/30/2002 #	03/04	8.13%+	2.96%	11.09%
12/31/2003 #@	04/05	7.12%+	1.08%	8.20%
12/31/2004	05/06	5.10%+	0.00%	5.10%
12/31/2005 *	06/07	5.10%+	0.00%	5.10%
12/31/2006	07/08	4.12%+	0.00%	4.12%
12/31/2007	08/09	4.12%+	0.00%	4.12%
12/31/2008 #	09/10	3.73%+	0.00%	3.73%
12/31/2009 #	10/11	4.19%+	20.96%	25.15%
12/31/2010 *	11/12	4.18%+	21.18%	25.36%
12/31/2011	12/13	5.24%+	22.26%	27.50%
12/31/2012	13/14	10.27%+	19.07%	29.34%
12/31/2013	14/15	10.27%+	16.31%	26.58%
12/31/2014	15/16	10.25%+	14.63%	24.88%
12/31/2015 *#	16/17	10.25%+	23.27%	33.52%
12/31/2016 *#	17/18	10.26%+	23.59%	33.85%
12/31/2017 *	18/19	10.26%+	24.79%	35.05%
12/31/2017 *^	19/20	10.26%+	24.95%	35.21%
12/31/2018	19/20	10.26%+	27.82%	38.08%
12/31/2018 ^	**20/21**	**10.26%+**	**28.02%**	**38.28%**

** Revised actuarial assumptions.*
 # Retirement System amended.
+ Adjusted for contributions on items of pay not included in valuation payroll and/or temporary reduction in contribution rate.
@ One-half year ended December 31.
^ 18-month time lag between valuation date and contribution fiscal year.

Active Members and Retired Lives
Historical Comparative Schedule

Valuation Date	Active Members No.	Valuation Payroll $ Millions	Valuation Payroll Average	Valuation Payroll % Incr.	Retired Lives No.[&]	Active per Retired	Annual Benefits $ Millions	Annual Benefits As a % of Pay
6/30/1999	619	28.0	45,277	4.3 %	547	1.1	11.8	42.1 %
6/30/2000	620	29.9	48,187	6.4 %	557	1.1	12.4	41.5 %
6/30/2001 #*	629	31.8	50,513	4.8 %	566	1.1	13.1	41.2 %
6/30/2002 #	622	32.5	52,265	3.5 %	587	1.1	14.1	43.5 %
12/31/2003 #@	608	33.1	54,443	0.5 %	604	1.0	15.2	46.0 %
12/31/2004	583	32.5	55,821	2.5 %	618	0.9	16.1	49.5 %
12/31/2005 *	576	33.4	57,999	3.9 %	617	0.9	16.2	48.5 %
12/31/2006	567	33.9	59,767	3.0 %	604	0.9	16.3	48.1 %
12/31/2007	545	32.9	60,289	0.9 %	614	0.9	16.9	51.4 %
12/31/2008	535	33.0	61,690	2.3 %	606	0.9	17.1	51.8 %
12/31/2009	506	33.5	66,187	7.3 %	614	0.8	18.0	53.7 %
12/31/2010	534	34.7	64,917	(1.9)%	612	0.9	18.1	52.2 %
12/31/2011	536	34.6	64,490	(0.7)%	616	0.9	18.9	54.6 %
12/31/2012	515	34.0	65,961	2.3 %	623	0.8	19.4	57.1 %
12/31/2013	501	33.1	66,089	0.2 %	627	0.8	20.1	60.7 %
12/31/2014	487	32.5	66,740	1.0 %	655	0.7	21.6	66.5 %
12/31/2015 *#	489	33.4	68,398	2.5 %	672	0.7	23.1	69.2 %
12/31/2016 *#	485	34.4	70,860	3.6 %	673	0.7	24.1	70.1 %
12/31/2017 *	488	34.9	71,533	0.9 %	677	0.7	25.6	73.4 %
12/31/2018	**466**	**34.0**	**73,001**	**2.1 %**	**710**	**0.7**	**28.0**	**82.4 %**
20-Year Average				2.5 %				

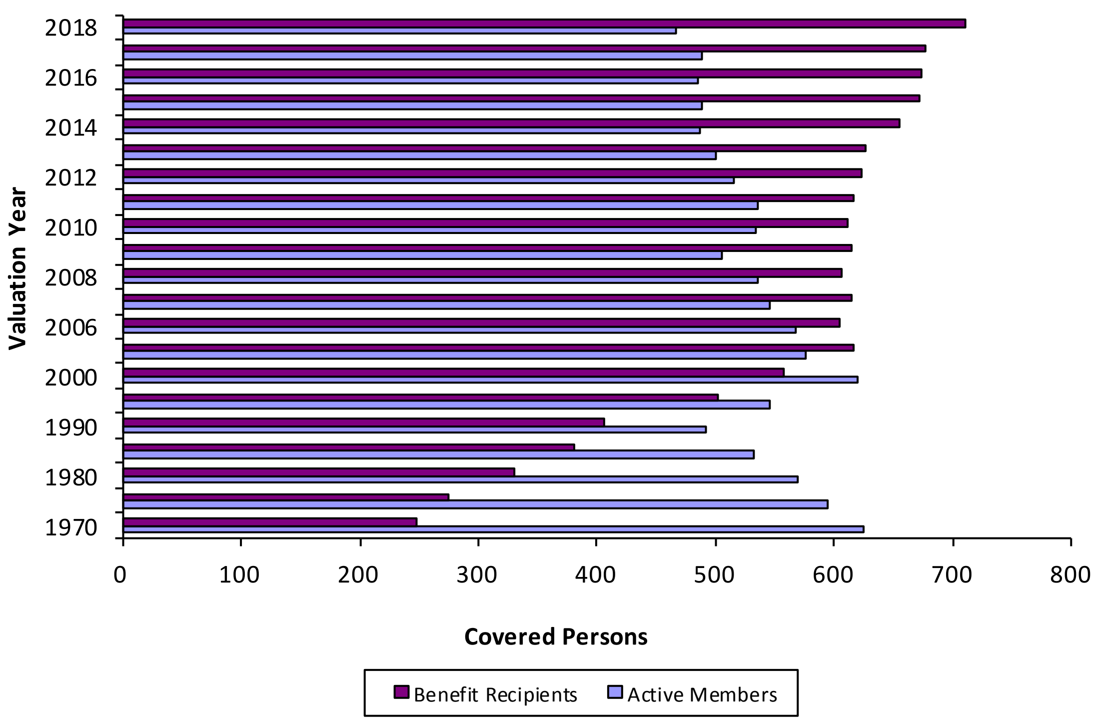
* *Revised actuarial assumptions.*

\# *Retirement System amended.*

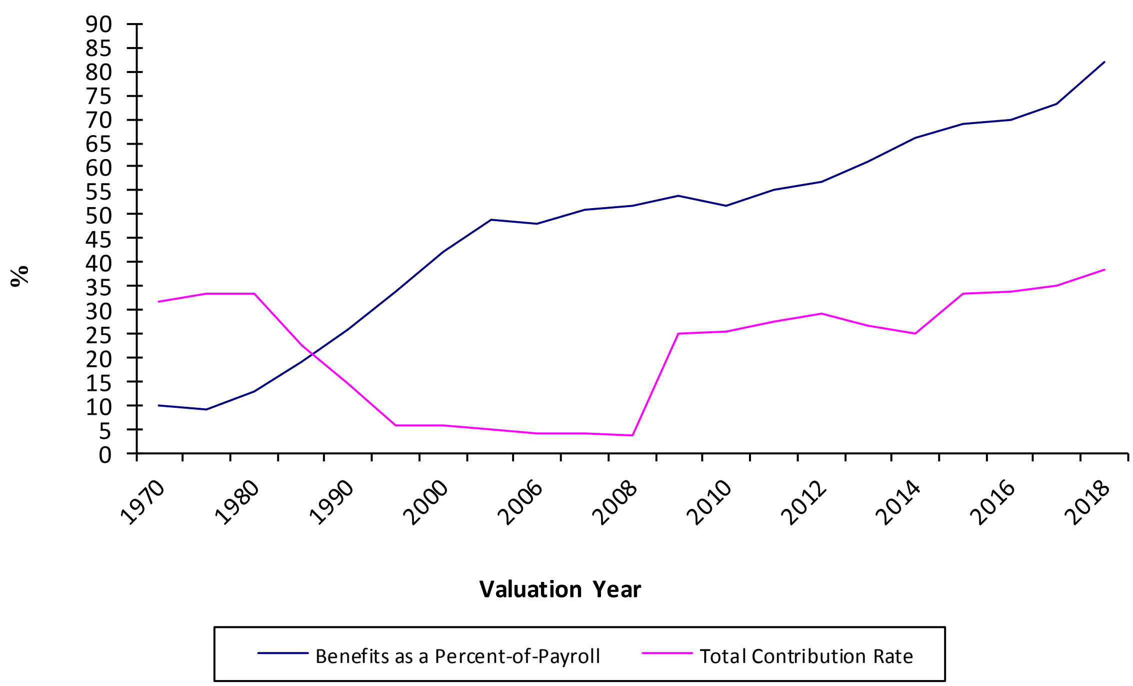
& *Alternate payees under EDROs are counted as separate retired lives.*

@ *One-half year ended December 31.*

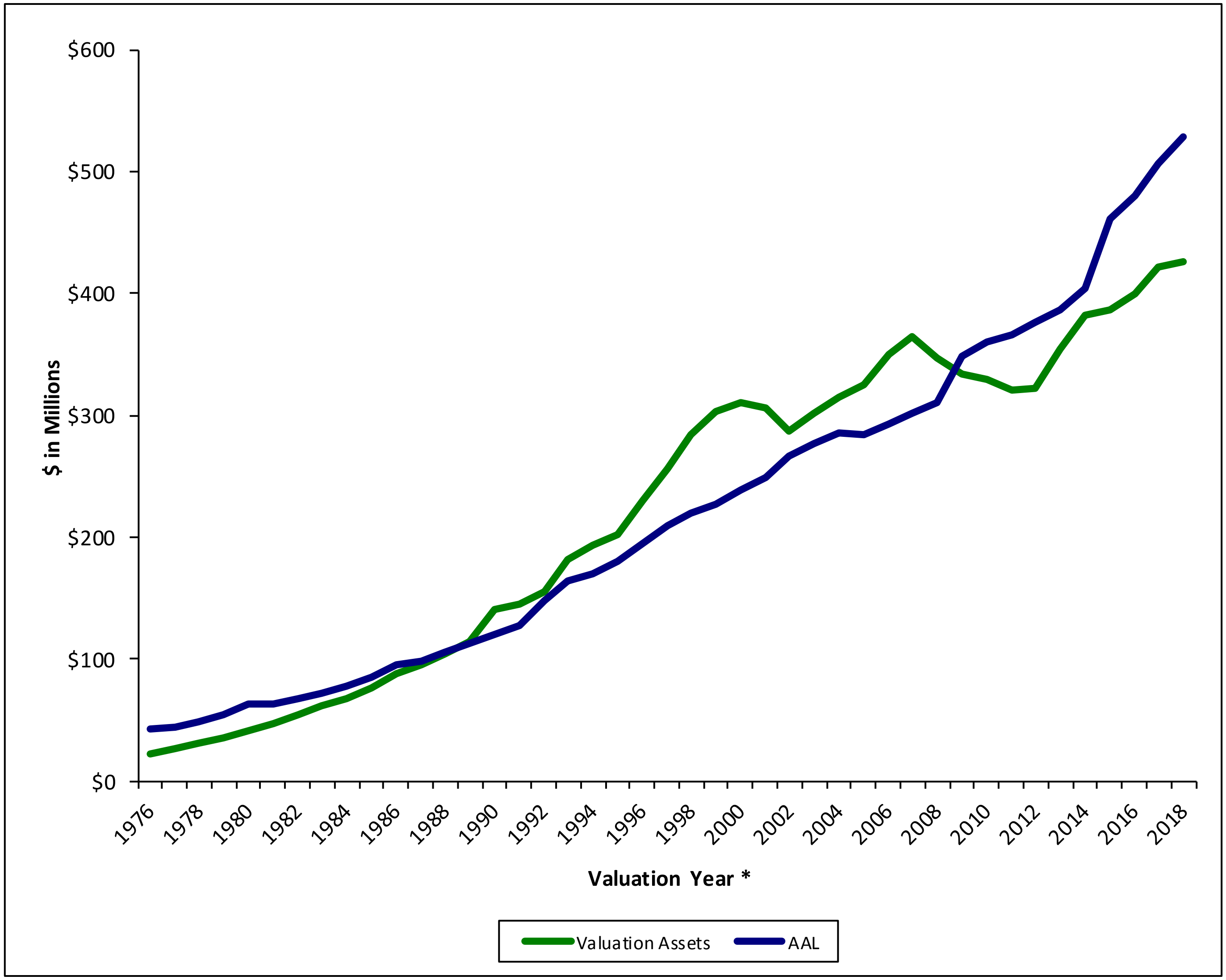
Active Members and Benefit Recipients



Benefits as a % of Pay and Total Contribution Rate



Actuarial Accrued Liabilities & Assets



* *Note: Valuation year is June 30 to June 30, 2003 and December 31 from December 31, 2003.*

Financing of Unfunded Actuarial Accrued Liabilities

Base Year	Current Balance	Projected to Contribution Period	Remaining Financing Period		Amortization Factor	Dollar Payment	% of Payroll Contribution
2015	$ 77,688,125	$ 81,208,917	27	yrs.	16.791291	$ 4,836,371	11.90%
2016	3,771,052	3,946,939	28		17.146377	230,191	0.56%
2017	4,068,759	4,263,507	29		17.488539	243,789	0.60%
2018	16,893,246	17,720,983	30		17.818247	994,541	2.45%
UAAL	**$ 102,421,182**	**$ 107,140,345**	**28**		**16.244716**	**$ 6,304,892**	**15.51%**

SECTION B

VALUATION DATA

Summary of Benefit Provisions Evaluated December 31, 2018

Voluntary Retirement. Police members may retire after attaining age 50 and completing 10 years of service. Firefighter members are eligible for retirement after attaining age 55 with 10 or more years of service. Firefighter members may also retire at the age their service reaches the service credit limit.

Compulsory Retirement. None.

Final Average Salary (FAS). The average of member's highest annual salary rates during the three consecutive calendar years of credited service when such compensation rates are the highest increased by the applicable FAS Adjustment Factor 12.6% for Police members for the period January 1, 2018 to June 30, 2018, and 13.2% for Police members for the period July 1, 2018 to December 31, 2018, 9.8% for Firefighter members for the period January 1, 2018 to June 30, 2018, and 10.3% for Firefighter members for the period July 1, 2018 to December 31, 2018). Highest salary rates that occur in calendar years after the calendar year in which the member reaches their service credit limit will not be included in the FAS.

Benefit Multiplier Description. See page B-2.

Benefit Multiplier. The member's benefit multiplier, used to compute full age and service allowance, is defined in the following table:

Benefit Multipliers and Allowance Caps for Member Groups

Covered Group	Date of Hire	Benefit Multiplier	Allowance Cap
Firefighters	Prior to July 1, 1992	2.5%	100%
	-or-		
	Prior to July 1, 1992	2.8%	94.5%
	July 1, 1992 to January 9, 2012	2.8%	90%
	January 10, 2012 or after	2.0%*	90%
Fire Chief	At any time	2.8%	94.5%
Police Command	Prior to July 1, 2001	2.8%	100%
	July 1, 2001 to December 19, 2011	2.8%	80%
	December 20, 2011 or after	2.0%@	80%
Police Chief or Deputy Police Chief	At any time	2.8%	100%
Police Officers and Sergeants	Before March 9, 1995	2.8%	100%
	March 9, 1995-June 30, 2001	2.8%	87.5%
	July 1, 2001 to December 19, 2011	2.8%	80%
	December 20, 2011 or after	2.0%#	80%

* *Firefighter members hired on or after January 10, 2012 will have a 2.0% multiplier for the first five years of employment. Members may then irrevocably elect that multiplier, or, by making higher member contributions, elect a higher multiplier for all future service (2.2%, 2.4%, 2.6%, or 2.8%).*

@ *Police Command members hired on or after December 20, 2011 will have a 2.0% multiplier for the first five years of employment. Members may then irrevocably elect that multiplier, or, by making higher member contributions, elect a higher multiplier for all future service (2.2%, 2.4%, 2.6%, or 2.8%).*

\# *Police Officers and Sergeants members hired on or after December 20, 2011 will have a 2.0% multiplier for the first five years of employment. Members may then irrevocably elect that multiplier, or, by making higher member contributions, elect a higher multiplier for all future service (2.2%, 2.4%, 2.6%, or 2.8%).*

Full Age and Service Allowance. Allowance, payable monthly for life to the retired member, equals the member's benefit multiplier times the member's FAS times years of credited service. In lieu of this single life-level amount form of payment, a retiring member may elect from a variety of optional forms of payment, each of which is the actuarial equivalent (same lump sum value at time of retirement) of the single life-level payment form.

Deferred Allowance. A member with 10 or more years of service who leaves covered employment before retirement is eligible to receive an allowance computed in the same manner as an age and service allowance but based upon the member's employment record to the time of leaving. Such deferred allowance commences the first day of the calendar month next following the later of the date of the member's attainment of age 50 or the date when written application therefore is received by the Board. Benefits may be actuarially reduced in accordance with the Early Retirement provision if applicable.

Early Allowance. A Firefighter member who leaves covered employment after both attaining age 50 and completing 10 years of service is eligible to receive an immediate early allowance (in lieu of a deferred allowance), computed in the same manner as a deferred allowance based upon the member's employment record to the time of early retirement, but actuarially reduced (per schedule in ordinance) to reflect the fact that the age when payments begin is younger than age 55.

Duty Disability Allowance. A member who becomes totally and permanently disabled from duty-connected causes is eligible to receive, subject to offsets, a duty disability allowance computed in the same manner as a full age and service allowance based upon the member's employment record to the time of disability with a minimum allowance before offset of 72% of FAS. The maximum allowance after offsets is 90% of final salary less amounts received from (i) Worker's Compensation, (ii) gainful employment as a law enforcement officer or firefighter, and (iii) Social Security disability income.

Non-Duty Disability Allowance. A member with 1 or more years of credited service and who has not attained the minimum service retirement age, who becomes totally and permanently disabled from other than duty-connected causes is eligible to receive a non-duty disability allowance computed in the same manner as a full age and service allowance, based upon the member's employment record to the time of disability. Minimum benefit for Police Officers is 48% of FAS if credited service is less than 20 years or 60% of FAS if credited service is 20 or more years. Minimum benefit for Police Command Officers is based on the earlier of (i) the date the member would have completed 20 (if credited service is less than 20 years) or 25 years of service (if credited service is 20 or more years) or (ii) the date the member would have reached 50 years of age. Minimum benefit for Firefighters is based on the earlier of (i) the date the member would have completed 20 (if credited service is less than 20 years) or 25 years of service (if credited service is 20 or more years) or (ii) the date the member would have reached 55 years of age. Until a member reaches the Pension System vesting requirement of 10 years of service, the benefit the member is entitled to is 50% for service years 1-5, then an additional 10% of the above formula for every year of service accrued in the System (e.g., 1-5 years of service = 50% of Non-Duty Disability Allowance, 6 years = 60%, …, 10 years = 100%).

Death-in-Service Benefits. Upon the death of a member, surviving dependents are eligible to receive the following benefits, subject to offsets for Worker's Compensation and Social Security.

(a) The widow receives an allowance equal to the Option B-100 allowance (joint and 100% survivor actuarial equivalent benefit) which would have been payable to her had the deceased member retired the day preceding the date of his death and elected Option B-100. The minimum allowance payable to the widow is 20% of the member's FAS. If the death was determined to be duty-related, the minimum allowance payable to the widow is 72% of the member's final average salary (60% for Command or Firefighters hired after June 30, 1992).

(b) Dependent children under age 18 (up to age 23 if they are continuous full-time students) each are eligible to receive an allowance of 15% of the member's FAS. If there are four or more dependent children, each child receives an equal share of 50% of the member's FAS.

(c) If there is neither a widow nor children, each dependent parent is eligible to receive an allowance equal to 15% of FAS.

Compensation. Compensation upon which members contribute includes base pay, longevity pay, educational increment and vacation pay, plus the following additional compensation items:

Firefighters: Overtime pay (assumed to be 4.2% for calendars years before 2010 and actual overtime in 2010 and later), holiday pay, clothing allowance, acting assignment pay, shop pay and shift pay. In addition, up to six (6) days of unused vacation time may be converted to compensation.

Police Officers and Police Command Officers: Overtime pay, comp. payoff, holiday pay, clothing allowance, acting assignment, witness fees and shift pay.

The average of the additional compensation items is used to annually adjust the FAS Adjustment Factor. In addition, compensation will not include any amount that would cause the System to be in violation of IRC Sections 401(a) (17) or 415(d).

Member Contributions. Effective July 1, 2013, member contribution rates shall be payable in accordance with the following table.

System Funding Represented as a Percentage of Valuation Assets to Actuarial Accrued Liabilities	Firefighters	Police Officers & Sergeants	Police Command Officers
Below 100%	10.70%	9.86%	10.89%
100% - 104.999%	9.70%	8.86%	9.89%
105% - 109.999%	8.70%	7.86%	8.89%
110% - 114.999%	7.70%	6.86%	7.89%
115% - 119.999%	6.70%	5.86%	6.89%
120% - 124.999%	6.70%	5.20%	6.06%
125% - 129.999%	6.70%	4.54%	5.23%
130% - 134.999%	6.70%	3.88%	4.40%
135+%	6.70%	3.22%	3.57%

The member contribution rates used for the December 31, 2018 valuation were 10.70%, 9.86%, 10.89%, 10.20%, and 10.20% for Firefighters, Police Officers and Sergeants, Police Command Officers, Police Chief and Deputy Police Chiefs, and Fire Chief respectively.

Members may elect their benefit multiplier/employee contributions based on the following:

- Firefighter members hired on or after January 10, 2012 will have a 2.0% multiplier for the first five years of employment. Members may then irrevocably elect that multiplier, or, by making higher member contributions, elect a higher multiplier for all future service (2.2%, 2.4%, 2.6%, or 2.8%).
- Police Command members hired on or after December 20, 2011 will have a 2.0% multiplier for the first five years of employment. Members may then irrevocably elect that multiplier, or, by making higher member contributions, elect a higher multiplier for all future service (2.2%, 2.4%, 2.6%, or 2.8%).
- Police Officers and Sergeants members hired on or after December 20, 2011 will have a 2.0% multiplier for the first five years of employment. Members may then irrevocably elect that multiplier, or, by making higher member contributions, elect a higher multiplier for all future service (2.2%, 2.4%, 2.6%, or 2.8%).

The additional member contributions for the multiplier elections are as follows:

Multiplier for Future Service	Firefighters	Police Officers & Sergeants / Police Command
2.0%	0.00%	0.00%
2.2%	1.23%	1.21%
2.4%	2.49%	2.46%
2.6%	3.77%	3.61%
2.8%	5.08%	4.80%

If a member terminates employment before any allowance is payable, accumulated contributions (contributions plus regular interest) are refunded.

Employer Contributions. The City contributes the remainder amounts necessary to maintain the Retirement System in sound financial condition in accordance with its funding objectives.

Automatic Post-Retirement Benefit Increases. Post-retirement benefit increases are paid to eligible groups as described in the following table.

	Firefighters	**Fire Chief**	**Police Officers and Sergeants**	**Police Command Officers**	**Police Chief and Deputy Police Chief**
Effective date	Retired on or after July 1, 2007	Retired on or after January 1, 2016	Retired on or after December 17, 2008	Retired on or after February 19, 2010	Retired on or after January 1, 2016
Amount of increase	1.5% of original benefit	1.5% of original benefit	1.0% of original benefit	1.0% of original benefit	1.0% of original benefit
First increase to occur	2 years after retirement	2 years after retirement	5 years after retirement	5 years after retirement	5 years after retirement

The increase is paid on January or July following the end of the delay period. Benefit recipients who are eligible for the automatic post-retirement increase do not participate in the 13th check program.

13th Check. For members not eligible for automatic post-retirement increases, one-half of net investment income over 8% which is attributable to retired life assets is distributed annually (in January) to retired members and beneficiaries who have been on the retirement rolls for five years in the form of a 13th check. Net investment income is based on a market value rate of return averaged over the preceding five plan years. The distribution is in proportion to points. An individual's points are determined by multiplying (i) the number of full years of retirement, to a maximum of 15, by (ii) the number of years, and fractions thereof, of service at retirement. Subsequent to the calculations above, the benefit so calculated for Chief of Police, Deputy Chief, Police Command Officers, Police Officers and Sergeants, Firefighter Service, and beneficiaries having had at least 10 years of service under either bargaining unit shall be increased by 20 percent.

Key Employee Incentive Program (KEIP). Participation is open to any employee of the City of Grand Rapids Police and Fire Retirement System who attains service retirement eligibility and maintains a minimum leave accrual balance of 100 hours. A regular retirement benefit is computed for the member as of his KEIP election date based upon Final Average Compensation (FAC), credited service and benefit multiplier as of this date. Monthly payments equal to 75% of the computed monthly benefit are deposited into the KEIP Reserve Account (KRA) on behalf of this member. Interest is credited monthly to this balance in the KRA at the rate of 3%, compounded annually. Employer and member contributions shall cease as of the member's KEIP election date. The members may remain in the KEIP for up to five years and then must cease participation in the KEIP. The member's monthly benefit at retirement will be the original monthly payment determined at the KEIP election date plus any applicable post-retirement benefit increases.

Eligibility. The Plan is closed to individuals hired from outside of the organization to fill the position of Fire Chief, Police Chief or Deputy Police Chief.

Derivation of Section 1.233(28) Valuation Assets*

Valuation Date December 31:	2016	2017	2018	2019	2020	2021	2022
A. Funding Value Beginning of Year	$386,363,384	$399,808,165	$421,679,693				
B. Market Value End of Year	383,172,938	425,546,035	387,555,682				
C. Market Value Beginning of Year	375,266,542	383,172,938	425,546,035				
D. Non-Investment Net Cash Flow	(17,264,269)	(10,786,805)	(12,669,727)				
E. Investment Return:							
E1. Market Total: B-C-D	25,170,665	53,159,902	(25,320,626)				
E2. Assumed Rate	7.25%	7.25%	7.15%				
E3. Amount for Immediate Recognition	27,385,516	28,595,070	29,697,155				
E4. Amount for Phased-In Recognition	(2,214,851)	24,564,832	(55,017,781)				
F. Phased-In Recognition of Investment Return:							
F1. Current Year: 0.2xE4	(442,970)	4,912,966	(11,003,556)				
F2. First Prior Year	(7,491,037)	(442,970)	4,912,966	$ (11,003,556)			
F3. Second Prior Year	525,463	(7,491,037)	(442,970)	4,912,966	$ (11,003,556)		
F4. Third Prior Year	6,558,842	525,463	(7,491,037)	(442,970)	4,912,966	$ (11,003,556)	
F5. Fourth Prior Year	4,173,236	6,558,841	525,462	(7,491,038)	(442,971)	4,912,968	$ (11,003,557)
F6. Total Recognized Investment Gain (Loss)	3,323,534	4,063,263	(13,499,135)	(14,024,598)	(6,533,561)	(6,090,588)	(11,003,557)
G. Funding Value End of Year: A+D+E3+F6	399,808,165	421,679,693	425,207,986				
H. Difference Between Market & Funding Values	(16,635,227)	3,866,342	(37,652,304)				
I. Recognized Rate of Return	**8.13%**	**8.28%**	**3.90%**				
J. Market Value Rate of Return	6.87%	14.07%	(6.04)%				
K. Ratio of Funding Value to Market Value	104.3%	99.1%	109.7%				

* *The Funding Value of Assets recognizes assumed investment return (line E3) fully each year. Differences between actual and assumed investment return (line E4) are phased-in over a closed five-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. If assumed rates are exactly realized for four consecutive years, funding value will become equal to market value.*

Summary of Asset Information from Audit Report Furnished for Valuation December 31, 2018

Balance Sheet

Reserves for	
Member contributions (MDF)	$ 46,610,797
Employer contributions (EAF)	(45,339,112)
Retired benefit payments (BRF)	319,223,020
Undistributed income (IEF)	67,060,977
Total Reserves	**$387,555,682**

Revenues and Expenditures

	December 31, 2018
1. Balance - Beginning of Year	$425,546,035
2. Revenues:	
a. Employees' contributions	5,313,127
b. Employer contributions	9,421,305
c. Investment income	(23,627,954)
d. Other	0
e. Total revenues	(8,893,522)
3. Expenditures:	
a. Benefit payments	26,022,769
b. Supplemental pension distribution	1,094,706
c. Refund of member contributions	286,684
d. Expenses	1,692,672
e. Total expenditures	29,096,831
4. Balance - End of Period: (1) + (2e) - (3e)	$387,555,682

The derivation of Valuation Assets can be found on page B-8.

Retirants and Beneficiaries Added to and Removed from Rolls
Historical Comparative Schedule

Year Ended	Added No.	Added Annual Allowances	Removed No.	Removed Annual Allowances	End of Year No.	End of Year Annual Allowances	Average Allowance	Expected Removals No.	Expected Removals Annual Allowances
06/30/98	30	$ 962,274	22	$ 205,069	539	$ 11,171,400	$ 20,726	17	$ 217,296
06/30/99	29	869,949	21	216,909	547	11,824,440	21,617	17	238,128
06/30/00	23	800,357	13	180,089	557	12,444,708	22,342	17	259,872
06/30/01	26	823,258	17	174,742	566	13,093,224	23,133	18	287,004
06/30/02	28	1,120,664	7	83,612	587	14,130,276	24,072	15	211,896
12/31/03 @	18	462,019	12	139,543	604	15,226,164	25,209	8	159,228
12/31/04	31	1,115,388	17	233,940	618	16,107,612	26,064	17	329,892
12/31/05	19	470,331	20	343,227	617	16,234,716	26,312	17	360,588
12/31/06	15	505,745	28	423,977	604	16,316,473	27,014	16	350,304
12/31/07	25	895,832	15	307,797	614	16,904,508	27,532	16	375,192
12/31/08	20	701,771	28	512,075	606	17,094,204	28,208	17	404,400
12/31/09	24	1,101,882	16	219,030	614	17,977,056	29,279	17	426,036
12/31/10	15	431,400	17	292,728	612	18,115,728	29,601	18	426,516
12/31/11	18	936,557	14	178,625	616	18,873,660	30,639	18	491,400
12/31/12	25	944,386	18	370,516	623	19,447,529	31,216	19	536,460
12/31/13	27	1,173,645	23	475,392	627	20,145,782	32,130	19	570,612
12/31/14	53	2,105,091	25	672,686	655	21,578,187	32,944	20	602,520
12/31/15	35	1,898,324	18	357,320	672	23,119,191	34,404	21	637,737
12/31/16	29	1,474,519	28	519,642	673	24,074,068	35,771	20	669,129
12/31/17	39	2,240,843	35	693,450	677	25,621,460	37,846	20	701,819
12/31/18	**52**	**2,676,119**	**19**	**326,312**	**710**	**27,971,269**	**39,396**	**20**	**542,499**
12/31/19								**20**	**573,561**

@ *One-half year ended December 31.*

Retirants and Beneficiaries as of December 31, 2018
Tabulated by Type of Allowance Being Paid

Type of Pensions Being Paid	No.*	Annual Pension**	Annual Liability
AGE AND SERVICE PENSIONS			
Regular pension - benefit terminating at death of retirant	177	$ 7,245,321	$ 79,071,392
Option B-100 - 100% joint & survivor (including pop-ups)	118	5,263,421	70,245,025
Option B-75 - 75% joint & survivor (including pop-ups)	127	6,262,872	79,406,452
Option B-50 - 50% joint & survivor (including pop-ups)	69	3,205,036	38,545,705
Survivor beneficiary of deceased retirant	89	1,850,024	14,665,756
Total age and service pensions	580	$23,826,674	$281,934,330
DISABILITY PENSIONS			
Regular pension - benefit terminating at death of retirant	32	$ 1,237,216	$ 13,028,457
Option B-100 - 100% joint & survivor (including pop-ups)	35	1,256,202	17,346,163
Option B-75 - 75% joint & survivor (including pop-ups)	13	583,897	7,782,136
Option B-50 - 50% joint & survivor (including pop-ups)	12	414,605	4,459,699
Survivor beneficiary of deceased retirant	13	269,411	2,688,759
Total disability pensions	105	$ 3,761,331	$ 45,305,214
DEATH-IN-SERVICE PENSIONS	25	383,264	4,134,608
Total Pensions Being Paid	**710**	**$27,971,269**	**$331,374,152**

* *Includes alternate payees under EDROs and members of the KEIP.*

** *For members of the KEIP, this is the benefit amount being contributed to KEIP accounts. These benefits will revert to 100% of the benefit amount at retirement.*

Allowances Being Paid –December 31, 2018
Tabulated by Attained Ages

Attained Ages	Age & Service *		Disability		Death-in-Service		Totals	
	No.	Monthly Allowances	No.	Monthly Allowances	No.	Monthly Allowances	No.	Monthly Allowances
Under 40	2	$ 24,425	1	$ 27,985	3	$ 54,746	6	$ 107,156
40-44	2	18,651	5	231,315	-	-	7	249,966
45-49	1	11,789	8	375,402	2	79,968	11	467,159
50-54	55	2,870,631	17	735,341	1	31,421	73	3,637,393
55-59	105	5,788,688	17	679,377	-	-	122	6,468,065
60-64	76	3,805,869	20	715,278	2	37,989	98	4,559,136
65-69	35	1,658,782	12	422,118	-	-	47	2,080,900
70-74	94	3,720,786	12	307,300	4	42,978	110	4,071,064
75-79	93	3,055,115	9	196,754	6	47,414	108	3,299,283
80-84	49	1,581,398	4	70,461	3	31,503	56	1,683,362
85-89	42	910,984	-	-	2	45,027	44	956,011
90-94	21	307,761			1	8,004	22	315,765
95-99	5	71,795			1	4,214	6	76,009
100-104								
Totals**	**580**	**$23,826,674**	**105**	**$3,761,331**	**25**	**$383,264**	**710**	**$27,971,269**

* *Includes survivor beneficiaries and members of the KEIP.*
** *Totals may not add due to rounding.*

Inactive Vested Members – December 31, 2018
Eligible for Deferred Pensions
Tabulated by Attained Ages

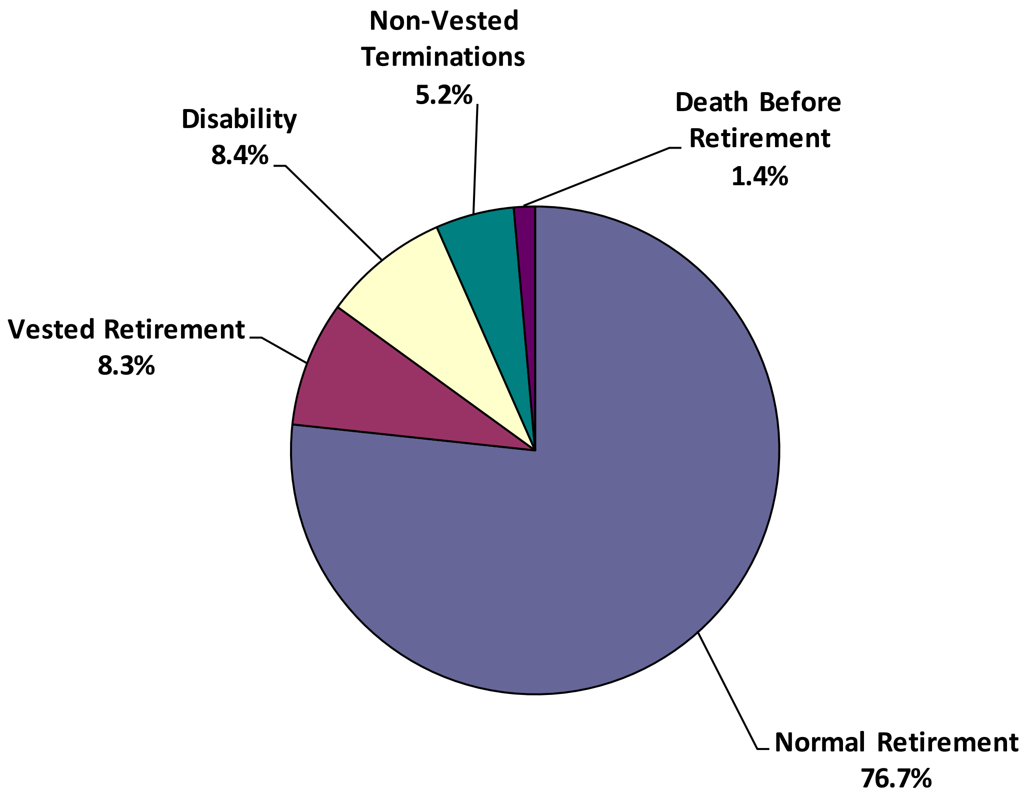
Attained Ages	No.	Estimated Monthly Benefits
Under 30		
30-34		
35-39	1	$ 2,291
40-44	8	21,488
45-49	19	61,412
50-54	3	11,575
55-59	1	6,506
60 +		
Totals	**32**	**$103,272**

Active Members Included in Valuations
Historical Comparative Schedule

Year Ended	Active Members	Annual Payroll $ Millions	Group Averages: Annual Pay $	Annual Pay % Change	Age Years	Service Years
09/30/80	569	$ 12.1	$21,243	4.1 %	41.2	16.2
09/30/85	533	15.5	29,056	6.3 %	41.3	16.3
06/30/90	492	17.2	34,908	4.5 %	42.6	17.7
06/30/95	546	22.5	41,205	2.7 %	38.7	13.2
06/30/99	619	28.0	45,277	4.3 %	36.7	10.5
06/30/00	620	29.9	48,187	6.4 %	36.8	10.7
06/30/01	629	31.8	50,513	4.8 %	37.0	10.8
06/30/02	622	32.5	52,265	3.5 %	37.2	10.9
06/30/03	619	33.5	54,190	3.7 %	37.5	11.1
12/31/03 @	608	33.1	54,443	0.5 %	37.8	11.5
12/31/04	583	32.5	55,821	2.5 %	38.3	11.8
12/31/05	576	33.4	57,999	3.9 %	39.0	12.5
12/31/06	567	33.9	59,767	3.0 %	39.7	13.2
12/31/07	545	32.9	60,289	0.9 %	40.4	13.9
12/31/08	535	33.0	61,690	2.3 %	41.0	14.5
12/31/09	506	33.5	66,187	7.3 %	41.8	15.3
12/31/10	534	34.7	64,917	(1.9)%	41.9	15.4
12/31/11	536	34.6	64,490	(0.7)%	42.1	15.2
12/31/12	515	34.0	65,961	2.3 %	42.9	16.1
12/31/13	501	33.1	66,089	0.2 %	43.3	16.5
12/31/14	487	32.5	66,740	1.0 %	43.0	16.7
12/31/15	489	33.4	68,398	2.5 %	42.2	16.0
12/31/16	485	34.4	70,860	3.6 %	42.3	15.9
12/31/17	488	34.9	71,533	0.9 %	41.5	15.0
12/31/18	**466**	**34.0**	**73,001**	**2.1 %**	**40.8**	**14.3**
20-Year Average				2.5 %		

@ *One-half year ended December 31.*

Expected Ultimate Disposition of Current Active Members As of December 31, 2018



Additions to and Removals from Active Membership
Actual and Expected Numbers

Year Ended	Added During Year	Terminations During Year: Normal Retirement A	Normal Retirement E	Disability Retirement A	Disability Retirement E	Death-in-Service A	Death-in-Service E	Withdrawal Vested A	Withdrawal Other A	Withdrawal Total A	Withdrawal Total E	End of Year
06/30/00	30	13	13.5	2	1.7	0	0.9	2	12	14	7.8	620
06/30/01	36	12	11.8	4	1.8	1	0.5	2	8	10	7.7	629
06/30/02	19	17	11.0	4	2.5	0	0.5	0	5	5	6.5	622
06/30/03	21	13	9.0	4	3.1	0	0.4	2	5	7	7.2	619
12/31/03 @	0	5	4.5	1	1.6	2	0.2	1	2	3	3.6	608
12/31/04	9	17	8.9	3 *	3.2	0	0.4	2	12	14	6.9	583
12/31/05	11	5	6.3	2	3.3	0	0.4	6	5	11	6.3	576
12/31/06	6	6	6.3	2	3.9	0	0.4	3	4	7	6.6	567
12/31/07	5	6	7.3	9	4.1	1	0.4	2	9	11	6.2	545
12/31/08	11	4	7.4	5	4.1	0	0.4	7	5	12	5.7	535
12/31/09	5	16	8.5	2	4.2	0	0.5	2	14	16	5.4	506
12/31/10	35	1	9.3	3	4.2	0	0.5	2	1	3	4.7	534
12/31/11	18	12	13.1	1	4.1	0	0.5	3	0	3	7.8	536
12/31/12	0	12	14.3	1	4.1	1	0.5	4	3	7	7.6	515
12/31/13	10	13	15.8	4	4.1	0	0.5	6	1	7	6.8	501
12/31/14	24	25	17.8	5	3.9	0	0.6	4	4	8	6.6	487
12/31/15	37	23	17.8	5	3.9	0	0.6	5	2	7	6.6	489
12/31/16	21	17	17.3	0	3.8	1	0.5	4	3	7	7.4	485
12/31/17	38	30	20.6	2	3.5	0	0.5	2	1	3	7.2	488
12/31/18	**25**	**39**	**21.3**	**2**	**3.3**	**0**	**0.5**	**2**	**4**	**6**	**7.8**	**466**
5-Year Totals	**145**	**134**	**94.8**	**14**	**18.4**	**1**	**2.7**	**17**	**14**	**31**	**35.6**	
10-Year Totals	**213**	**188**	**155.8**	**25**	**39.1**	**2**	**5.2**	**34**	**33**	**67**	**67.9**	

A *= Actual*
E *= Expected*

@ *One-half year ended December 31.*
* *Originally death-in-service, later changed to disability.*

Active Police Members – December 31, 2018
By Attained Age and Years of Service

Attained 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	13							13	$ 707,175
25-29	46	2						48	3,079,753
30-34	16	8	1					25	1,717,799
35-39	10	4	10	5				29	2,103,027
40-44	1	2	9	29	14			55	4,276,533
45-49			1	12	51	8		72	5,753,355
50-54				6	24	5		35	2,801,907
55-59						2	1	3	267,435
60 and Over									
Totals	**86**	**16**	**21**	**52**	**89**	**15**	**1**	**280**	**$ 20,706,984**

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

Average Age	Average Service	Average Pay	Number
39.9 years	14.3 years	$73,954	280

Active Fire Members – December 31, 2018
By Attained Age and Years of Service

Attained 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									$ -
25-29	17	4						21	1,226,794
30-34	15	10						25	1,562,739
35-39	14	13	2	3				32	2,081,380
40-44	3	6	4	9				22	1,592,701
45-49		2		12	17	1		32	2,463,461
50-54			1	4	20	18	2	45	3,642,321
55-59				1	1	5		7	592,912
60 and Over						2		2	149,182
Totals	**49**	**35**	**7**	**29**	**38**	**26**	**2**	**186**	**$ 13,311,490**

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

Average Age	Average Service	Average Pay	Number
42.2 years	14.2 years	$71,567	186

SECTION C

SUMMARY OF VALUATION METHODS AND ASSUMPTIONS

Valuation Methods

Normal cost and the allocation of benefit values between service rendered before and after the valuation date was determined using the individual entry-age actuarial 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 portion 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 arising in a given year are amortized over a closed 30-year period. Detail can be found on page A-17.

Valuation Asset Method. Valuation Assets were determined using a method which phases-in each year's differences between actual and assumed investment return over a closed five-year period.

Actuarial Assumptions Used for the Valuation Adopted by the Board of Trustees

The actuary calculates contribution requirements and actuarial present values of the System by applying assumptions to the benefit provisions and census data information furnished, using the valuation methods described on the previous page.

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 System,
(ii) Patterns of pay increases to members,
(iii) Rates of mortality among members, retirants and beneficiaries,
(iv) Rates of withdrawal of active members,
(v) Rates of disability among members, and
(vi) The age patterns of actual retirement.

In 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 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).

The assumptions are established by the Board after consulting with the actuary. New assumptions were adopted for the December 31, 2015 valuation pursuant to the Experience Study dated December 7, 2015. All assumptions are based on future expectations, not market measures.

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.

Service at Beginning of Year	Salary Increase Assumptions For an Individual Member		
	Merit & Seniority	Base (Economic)	Increase Next Year
1	17.00%	3.25%	20.25%
2	7.00	3.25	10.25
3	6.00	3.25	9.25
4	5.00	3.25	8.25
5	4.00	3.25	7.25
6 and over	1.00	3.25	4.25

These rates were first used for the December 31, 2016 valuation.

If the number of active members remains constant, then the total active member payroll will increase 3.25% annually, the base portion of the individual salary increase assumptions. This increasing payroll was recognized in amortizing unfunded actuarial accrued liabilities. Note that the 3.25% wage inflation assumption consists of 2.50% for price inflation and 0.75% for real wage growth.

The rate of investment return was 7.15% a year compounded yearly (net after expenses). 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 assumption was first used for the December 31, 2017 valuation.

The assumed real return for funding purposes is the rate of return in excess of average salary increases.

The mortality table was the RP-2014 Healthy Annuity Mortality Table projected to 2019 using the MP-2014 Mortality Improvement Scale. Related values are shown below:

Sample	Value at Retirement of $1 Monthly for Life		Future Life Expectancy (Years)	
Ages	Men	Women	Men	Women
50	$148.41	$152.79	33.25	35.95
55	141.60	146.69	28.92	31.44
60	133.30	138.87	24.73	27.02
65	123.05	129.07	20.70	22.74
70	110.64	117.14	16.85	18.67
75	96.10	103.11	13.26	14.86
80	79.84	87.27	10.01	11.41

This assumption is used to measure the probabilities of members dying before retirement and the probabilities of each benefit payment being made after retirement. For disabled lives the RP-2014 Disabled Retirees projected to 2019 using the MP-2014 mortality improvement scale was used. For death in service the RP-2014 Mortality Tables for Employees projected to 2019 using the MP-2014 Mortality Improvement Scale was used. We assume that one-half of pre-retirement deaths are duty related and that one-half are not. The margin for future mortality improvement is the projection to 2019. This assumption was first used for the December 31, 2015 valuation.

The rates of retirement used to measure the probability of eligible members retiring during the next year were as follows:

Retirement Ages	Percent	Retirement Ages	Percent
50	25%	60	50%
51	25%	61	60%
52	25%	62	70%
53	25%	63	80%
54	25%	64	90%
55	25%	65	100%
56	25%	66	100%
57	25%	67	100%
58	25%	68	100%
59	25%	69	100%
		70	100%

A Police member is eligible for retirement after both attaining age 50 and completing 10 or more years of service. Fire members are eligible after attaining age 55 with 10 or more years of service or at the age their service reaches the service credit limit. A 100% decrement pattern is applied to Firefighters once achieving 34 years of service regardless of age.

Rates of separation from active membership were as follows:

(Rates do not apply to members eligible to retire and do not include separation on account of death or disability.) This assumption measures the probabilities of members remaining in employment. These rates were first used for the December 31, 2010 valuation.

Sample Ages	% of Active Members Separating Within Next Year: Police	% of Active Members Separating Within Next Year: Fire
25	4.60%	2.76%
30	3.80	2.28
35	2.60	1.56
40	1.80	1.08
45	1.40	0.84
50	1.20	0.72
55	1.20	0.72
60	1.20	0.72

The rates of disability were as follows:

Sample Ages	% of Active Members Becoming Disabled Within Next Year: Police	% of Active Members Becoming Disabled Within Next Year: Fire
20	0.12%	0.12%
25	0.12	0.12
30	0.12	0.12
35	0.27	0.27
40	0.59	0.59
45	1.05	1.05
50	1.68	1.68
55	2.51	2.51

		Duty Related	Non-Duty Related
Cause of Disability:	Male	75%	25%
	Female	75%	25%

These rates were first used for the December 31, 2015 valuation.

Summary of Assumptions Used
December 31, 2018
Miscellaneous and Technical Assumptions

***Marriage Assumption**.* 90% of males and 90% of females are assumed to be married for purposes of death-in-service benefits.

***Pay Increase Timing**.* Beginning of (Fiscal) year. 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 mid-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 the experience study, without adjustment for multiple decrement table effects.

Liability Adjustments. Retirement present values were increased by 13.2% and 10.3% for police and fire, respectively, to account for the FAS Adjustment Factor.

13th Check. A 7.15% load was placed on affected liabilities for members eligible to participate in the 13th Check program.

Service Purchase. An $11.0 million liability was applied for the liability for service purchases.

***Normal Form of Benefit**.* The assumed normal form of benefit is the straight life form.

***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.

***New Benefit Multiplier**.* Benefits for new hires will be modeled using the 2.8% benefit multiplier for all future years of service until such time that they elect another benefit multiplier.

SECTION D

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 members of the Retirement System acquire a unit of service credit they are, in effect, handed an "IOU" which reads: "The 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."

This Retirement System meets this constitutional requirement by having the following ***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 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).

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

Benefit payments to any group of members and their beneficiaries cannot exceed the sum of:

Contributions received on behalf of the group from members and the City

. . . plus . . .

Investment earnings on plan assets

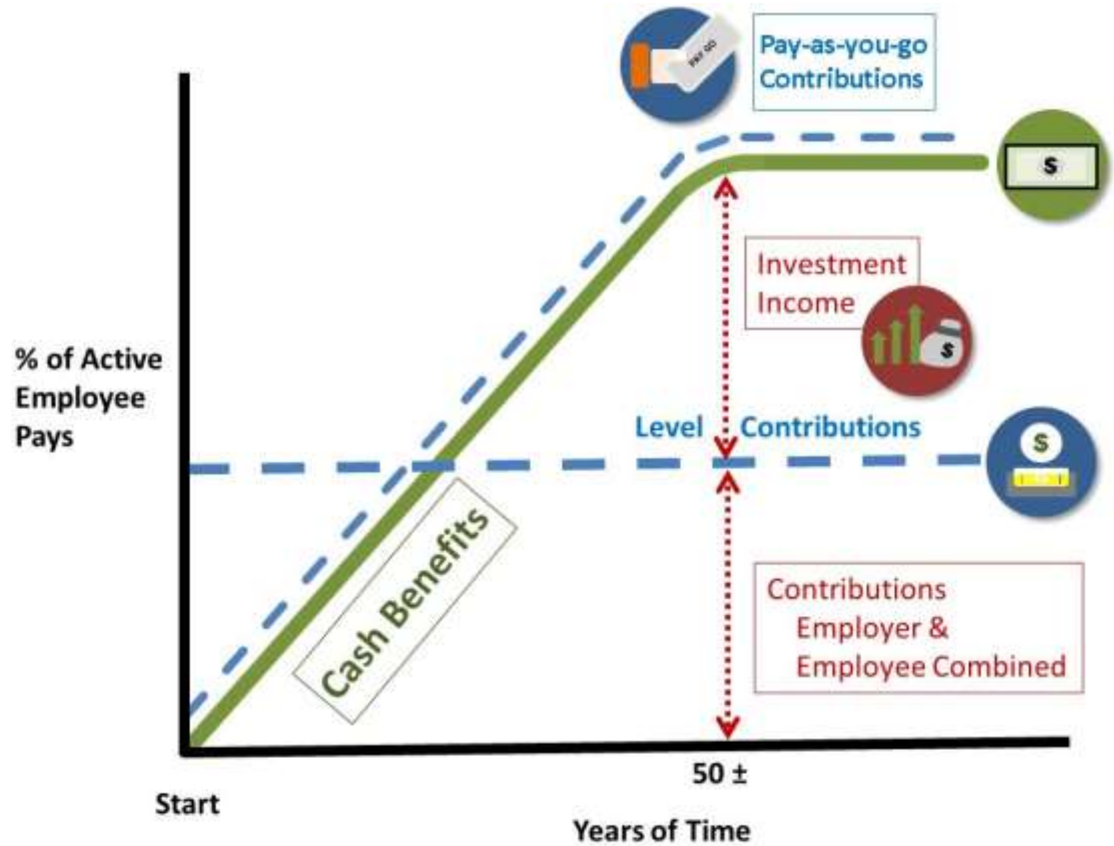
. . . minus . . .

Expenses incurred in operating the program.

There are retirement programs designed to defer the bulk of contributions far into the future. Lured by artificially low present contributions, the inevitable consequence is a relentlessly increasing contribution rate -- to a level greatly in excess of the level percent of payroll rate. ***This method of financing is prohibited in Michigan by the state constitution***.

A by-product of the level percent-of-payroll contribution objective is the accumulation of invested assets. 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.

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 program.



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

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, turn-over 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.

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.

Glossary

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

Unfunded Actuarial Accrued Liability. The difference between the actuarial accrued liability and Valuation Assets. Sometimes referred to as “unfunded accrued liability.”

Valuation Assets. The value of current plan assets recognized for valuation purposes. Generally based on a phase-in of differences between actual and assumed market rates of return.

SECTION E

ACTUARIAL AND REQUIRED SUPPLEMENTAL INFORMATION FOR COMPLIANCE WITH APPLICABLE GOVERNMENTAL ACCOUNTING STANDARDS BOARD STATEMENTS

This information is presented in draft form for review by the System's auditor. Please let us know if there are any items that the auditor changes so that we may maintain consistency with the System's financial statements.

Schedule of Funding Progress
For Compliance with Applicable GASB Statements

Actuarial Valuation Date	Actuarial Value of Assets (a)	Entry Age Actuarial Accrued Liability (b)	Unfunded Accrued Liability (UAL) (b)-(a)	Funded Ratio (a)/(b)	Annual Covered Payroll (c)	UAL as a Percentage of Covered Payroll [(b)-(a)]/(c)
6/30/1999	$302,315,206	$226,814,077	$(75,501,129)	133%	$28,026,397	0%
6/30/2000	310,502,184	238,351,701	(72,150,483)	130%	29,875,819	0%
6/30/2001 #*	305,328,814	249,233,407	(56,095,407)	123%	31,772,454	0%
6/30/2002 #	287,125,896	265,750,488	(21,375,408)	108%	32,508,791	0%
12/31/2003 #@	301,845,219	276,065,502	(25,779,717)	109%	33,101,130	0%
12/31/2004	315,021,806	285,041,937	(29,979,869)	111%	32,543,780	0%
12/31/2005 *	325,044,112	284,262,073	(40,782,039)	114%	33,407,682	0%
12/31/2006	350,154,501	292,906,422	(57,248,079)	120%	33,887,922	0%
12/31/2007	365,116,538	300,989,725	(64,126,813)	121%	32,857,305	0%
12/31/2008 #	346,472,441	310,236,119	(36,236,322)	112%	33,004,358	0%
12/31/2009 #	334,247,051	348,250,068	14,003,017	96%	33,490,487	42%
12/31/2010 *	328,609,947	360,573,351	31,963,404	91%	34,665,767	92%
12/31/2011	321,207,218	365,300,394	44,093,176	88%	34,566,692	128%
12/31/2012	321,323,888	375,797,800	54,473,912	86%	33,970,131	160%
12/31/2013	354,769,666	385,860,392	31,090,726	92%	33,110,530	94%
12/31/2014	381,482,221	403,969,869	22,487,648	94%	32,502,473	69%
12/31/2015 *#	386,363,384	461,091,743	74,728,359	84%	33,446,517	223%
12/31/2016 *	399,808,165	479,362,227	79,554,062	83%	34,367,003	231%
12/31/2017 *	421,679,693	506,255,138	84,575,445	83%	34,907,940	242%
12/31/2018	**425,207,986**	**527,629,168**	**102,421,182**	**81%**	**34,018,474**	**301%**

* *Revised actuarial assumptions.*

Retirement System amended.

@ *One-half year ended December 31.*

Schedule of Employer Contributions
For Compliance with Applicable GASB Statements

Year Ended	Annual Required Contribution *
6/30/1992	$1,981,125
6/30/1993	544,188
6/30/1994	0
6/30/1995	0
6/30/1996	0
6/30/1997	0
6/30/1998	0
6/30/1999	0
6/30/2000	0
6/30/2001	0
6/30/2002	0
12/31/2003 @	525,966
12/31/2004	727,754
12/31/2005	192,259
12/31/2006	0
12/31/2007	0
12/31/2008	0
12/31/2009	0
12/31/2010	3,709,786
12/31/2011	7,851,051
12/31/2012	8,194,227
12/31/2013	7,531,566
12/31/2014	6,331,848
12/31/2015	5,630,297
12/31/2016	7,166,351
12/31/2017	8,911,489
12/31/2018	**9,421,305**

@ *One-half year ended December 31.*

* *Since it was reported to the actuary that the City's practice is to contribute the percent-of-payroll employer contribution rate shown in the actuarial valuation report, the annual required contributions shown in the Schedule of Employer Contributions are the actual contributions made by the City in the fiscal year.*

Required Supplementary Information
For Compliance with Applicable GASB Statements

The information presented in the required supplementary schedules was determined as part of the actuarial valuations at the dates indicated. Additional information as of the latest valuation date follows:

Valuation date:	December 31, 2018
Actuarial cost method:	Individual entry age
Amortization method:	Level percent closed
Remaining amortization period:	Multiple periods
Asset valuation method:	5-year smoothed market
Actuarial assumptions:	
Investment rate of return	7.15%, net after expenses
Projected salary increases	20.25% - 3.25%
including wage inflation at	3.25%
Cost-of-living adjustments:	Ad hoc "13th check" tied to plan investments for benefit recipients who do not have an automatic benefit increase. 1.5% simple escalator for Firefighters retired on or after July 1, 2007 with commencement delayed 2 years after retirement. 1.5% simple escalator for Fire Chief retired on or after January 1, 2016 with commencement delayed 2 years after retirement. 1.0% simple escalator for Police Command Officer retired on or after February 19, 2010 with commencement delayed 5 years after retirement. 1.0% simple escalator for Police Officers and Sergeants retired on or after December 17, 2008 with commencement delayed 5 years after retirement. 1.0% simple escalator for Police Chief and Deputy Police Chief retired on or after January 1, 2016 with commencement delayed 5 years after retirement.

Membership of the plan consisted of the following at December 31, 2018, the date of the latest actuarial valuation:

Retirees and beneficiaries receiving benefit	710*
Terminated plan members entitled to but not yet receiving benefits	32
Active plan members	466
Total	1,208

* *Includes alternate payees under Michigan Eligible Domestic Relations Order and members of the KEIP.*