

City of Troy Volunteer Firefighters' Incentive Plan

39th Annual Actuarial Valuation

December 31, 2018



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June 28, 2019

Board of Trustees
City of Troy Volunteer Firefighters' Incentive Plan
500 West Big Beaver Road
Troy, Michigan 48084

Dear Trustees:

The results of the December 31, 2018 Annual Actuarial Valuation of the City of Troy Volunteer Firefighters' Incentive Plan are presented in this report.

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

The purposes of the valuation are to measure the System's funding progress and to determine the employer contribution for the fiscal year ending June 30, 2021. This report should not be relied on for any purpose other than the purposes described herein. Determinations of financial results, associated with the benefits described in this report, for purposes other than those identified above may be significantly different.

The contribution amount in this report is determined using the actuarial assumptions and methods disclosed in Section D of this report. This report includes risk metrics on page B-9 but does not include a more robust assessment of the risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment.

This valuation assumed the continuing ability of the plan sponsor to make the contributions necessary to fund this plan. A determination regarding whether or not the plan sponsor is actually able to do so is outside our scope of expertise and was not performed.

The findings in this report are based on data and other information through December 31, 2018. The valuation was based upon information furnished by the City, concerning Plan benefits, financial transactions, plan provisions and active members, terminated members, retirees and beneficiaries. We checked for internal reasonability and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the information provided by the City.

Mr. Thomas Darling
City of Troy
June 28, 2019
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This report was prepared using assumptions adopted by the Board. All actuarial assumptions used in this report are reasonable for the purposes of this valuation. Additional information about the actuarial assumptions is included in the section of this report entitled Valuation Methods and Assumptions.


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 City of Troy Volunteer Firefighters' Incentive Plan as of the valuation date. All calculations have been made in conformity with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board.

Brad Lee Armstrong, Jeffrey T. Tebeau and Kevin T. Noelke 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 actuaries are independent of the plan sponsor.

Gabriel, Roeder, Smith & Company will be pleased to review this valuation and report with the Board of Trustees and to answer any questions pertaining to the valuation.

Respectfully submitted,



Brad Lee Armstrong, ASA, EA, FCA, MAAA



Jeffrey T. Tebeau, FSA, EA, MAAA



Kevin T. Noelke, ASA, MAAA

BLA/JTT/KTN:bd

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SECTION A

EXECUTIVE SUMMARY

Executive Summary

Funding Objective

The funding objective of the Plan is to establish and receive contributions that will remain approximately level from year to year and will not have to be increased for future generations of citizens.

Contribution Amounts

The Plan is supported by City contributions and investment income from Plan assets.

Contributions which satisfy the funding objective are determined by the annual actuarial valuation and are sufficient to:

- (1) Cover the actuarial present value of benefits allocated to the current year by the actuarial cost method described in Section D (the Normal Cost); and
- (2) Finance over a period of future years the actuarial present value of benefits not covered by valuation assets and anticipated future normal costs (Unfunded Actuarial Accrued Liability or UAAL).

The funding policy adopted by the Board is to determine the employer contribution as the employer normal cost plus the amortization of the Unfunded Actuarial Accrued Liability over a 25-year open period. Please see page B-7 regarding the implications of this funding policy.

Computed contributions for the fiscal years ending June 30 are shown below:

	<u>2021</u>	<u>2020</u>
City's Contribution	\$ 1,319,272	\$ 1,260,916

For additional details, please see page B-1 of this report.

Executive Summary

Funded Status

Actuarial Accrued Liability and Funding Value of Assets as of the December 31 valuation dates are shown below:

	<u>2018</u>	<u>2017</u>
Actuarial Accrued Liabilities*	\$ 20,268,453	\$ 19,120,031
Funding Value of Assets	<u>11,046,259</u>	<u>10,363,511</u>
Unfunded Actuarial Accrued Liabilities	9,222,194	8,756,520
Percent Funded (Assets/Liabilities)	54.5%	54.2%
<i>Rate of Return on Market Value of Assets</i>	<i>(5.1)%</i>	<i>11.2%</i>
<i>Rate of Return on Valuation Assets</i>	<i>2.2%</i>	<i>4.0%</i>

For additional details, please see Sections B and C of this report.

**Due to the adoption of fully generational mortality tables and the most recent projection scale, the 2018 figure shown includes an increase of \$107,651 in liabilities over the 2017 assumption.*

SECTION B

VALUATION RESULTS

City's Computed Contribution for the Fiscal Year Ending June 30, 2021

Contribution for:

NORMAL COST

Age and service payments	\$ 535,219
Death-in-service payments	<u>14,514</u>
Total	549,733

UNFUNDED ACCRUED LIABILITIES

Present recipients	0
Active participants and vested former participants*	<u>769,539</u>
Total	769,539

CITY'S TOTAL CONTRIBUTION FYE JUNE 2021 **\$1,319,272**

* *Financed over an open period of 25 years. Includes the effects of the one and a half year lag between the valuation date and the contribution period.*

Development of Unfunded Actuarial Accrued Liabilities as of December 31, 2018

Actuarial Accrued Liabilities for:	
Active Participants*	\$9,309,873
Inactive Participants	
Currently receiving	9,924,890
Not currently receiving, but entitled to	<u>1,033,690</u>
Total Actuarial Accrued Liabilities	20,268,453
Funding Value of Assets	<u>11,046,259</u>
Unfunded Actuarial Accrued Liabilities	\$9,222,194
Percent Funded	54.5%

* Includes participants on Leave of Absence.

Derivation of Actuarial Gain (Loss) Year Ended December 31, 2018

1)	UAAL at start of year	\$ 8,756,520
2)	Normal cost	535,783
3)	Actual employer contributions	1,285,300
4)	Interest accrual	544,814
5)	Expected UAAL before changes	8,551,817
6)	Change from benefit increases	0
7)	Change from revised actuarial assumptions/methods	107,651
8)	Expected UAAL after changes	8,659,468
9)	Actual UAAL at end of year	9,222,194
10)	Gain (Loss): (8) - (9)	(562,726)
11)	Gain (Loss) as percent of actuarial accrued liabilities at start of year - \$19,120,031	(2.9)%

Summary Statement of Plan Resources and Obligations

Present Resources and Expected Future Resources

	<u>December 31, 2018</u>	<u>December 31, 2017</u>
A. Present valuation assets		
1. Net assets from Plan financial statements	\$ 10,189,588	\$ 10,270,550
2. Market value adjustment	<u>856,671</u>	<u>92,961</u>
3. Funding value of assets	11,046,259	10,363,511
 B. Actuarial present value of expected future employer contributions		
1. For Normal Costs	4,674,944	4,519,577
2. For Unfunded Actuarial Accrued Liability	<u>9,222,194</u>	<u>8,756,520</u>
3. Total	13,897,138	13,276,097
 C. Actuarial Present Value of Expected Future Member Contributions	0	0
 D. Total present and expected future resources	<u><u>\$24,943,397</u></u>	<u><u>\$23,639,608</u></u>

Actuarial Present Value of Expected Future Benefit Payments

A. To retirees and beneficiaries	\$ 9,924,890	\$ 9,523,401
B. To vested terminated members	1,033,690	963,942
C. To present active members		
1. Allocated to service rendered prior to valuation date - actuarial accrued liability	9,309,873	8,632,688
2. Allocated to service likely to be rendered after valuation date	<u>4,674,944</u>	<u>4,519,577</u>
3. Total	13,984,817	13,152,265
 D. Total actuarial present value of expected future benefit payments	<u><u>\$24,943,397</u></u>	<u><u>\$23,639,608</u></u>

Comparative Schedule

Valuation Date December 31,	Fiscal Year Ending June 30,	Vested Former Participants				Accrued Liability	Funding Value of Assets	Percent Funded	Unfunded Accrued Liability	Computed City's Contribution
		Current Payments		Deferred Payments						
		No.	Annual \$	No.	Annual \$					
2001 *	2003	62	\$ 225,030	28	\$ 79,743	\$ 8,160,180	\$ 5,109,422	62.6 %	\$ 3,050,758	\$ 512,973
2002 *	2004	61	232,881	28	86,384	9,598,244	5,720,336	59.6	3,877,908	623,348
2003 *	2005	63	246,090	26	79,680	11,786,697	6,083,672	51.6	5,703,025	795,904
2004 *	2006	64	263,767	26	82,834	11,936,051	6,261,188	52.5	5,674,863	774,795
2005 *	2007	67	302,477	27	92,676	12,052,272	6,571,524	54.5	5,480,748	762,121
2006 *	2008	70	346,539	25	79,601	11,931,905	6,006,600	50.3	5,925,305	788,742
2007 *	2009	73	372,705	23	75,828	13,239,695	6,412,626	48.4	6,827,069	885,365
2008 *	2010	74	403,828	24	89,238	13,037,843	6,272,677	48.1	6,765,166	864,167
2009 *	2011	79	477,636	27	110,008	12,625,243	5,325,404	42.2	7,299,839	873,691
2010	2012	77	491,385	27	110,008	12,925,065	5,709,574	44.2	7,215,491	873,354
2011	2013	79	507,267	26	105,942	13,476,184	6,356,765	47.2	7,119,419	868,074
2011	2014	79	507,267	26	105,942	13,476,184	6,356,765	47.2	7,119,419	858,472
2012	2015	80	535,321	25	102,542	13,115,192	5,983,106	45.6	7,132,086	843,872
2013 *#	2016	80	549,601	27	121,398	16,129,421	6,150,170	38.1	9,979,251	1,100,632
2014	2017	82	582,139	26	129,221	16,679,670	8,380,848	50.2	8,298,822	1,113,496
2015 #	2018	82	607,065	26	133,566	16,979,336	8,332,917	49.1	8,646,419	1,112,471
2016	2019	86	690,156	28	151,569	17,993,732	9,015,226	50.1	8,978,506	1,285,259
2017	2020	96	811,339	26	152,740	19,120,031	10,363,511	54.2	8,756,520	1,260,916
2018 #	2021	98	850,312	26	152,740	20,268,453	11,046,259	54.5	9,222,194	1,319,272

* After changes in benefit provisions.

After changes in actuarial assumptions.

Comments

Actuarial Experience: Overall Plan experience was less favorable than assumed during the year ending December 31, 2018 as shown in the gain (loss) schedule on page B-3. The experience loss of approximately \$563,000 is primarily attributable to investment losses and more participants retiring than expected. Although the rate of return was (5.1)% on a Market Value Basis, the return on the Funding Value of Assets was 2.2% due to the asset valuation method, which recognizes investment gains and losses over four years. The experience loss increased the City computed contribution by approximately \$40,000 (before assumption changes).

The funded percent is 54.5% using the Funding Value of Assets. The funded percent is 53.7% using the Market Value of Assets. Absent future gains, this lower funded percent will put upward pressure on future computed employer contributions and downward pressure on the funded ratio.

Comment A: This Plan has a history of benefit increases. The total contribution assumes that the base benefit for new retirees will increase by 1.0% per year in order to mitigate the increase in liabilities and the City's contributions when an increase occurs. This assumption is unchanged from the previous valuation. To the extent that benefits do not increase by 1% per year, the Plan will experience liability gains. The converse is also true: benefit increases in excess of 1% will result in losses.

Comment B: The mortality table was updated to the fully generational RP-2014 Mortality Tables using projection scale MP-2018. The projection scale provides an adequate provision for mortality improvements in the future. This change increased the liabilities by \$107,651 and increased the City's contribution by \$22,841.

Comment C: The following table shows necessary disclosures for Public Act 202 of 2017 under the Uniform Actuarial Assumptions. These results use a 20-year closed amortization period.

PA 202 Assumptions	
Funding Value of Assets (FVA)	\$ 11,046,259
Actuarial Accrued Liability (AAL)	20,268,453
Funded Status	54.50%
City's Contribution	\$ 1,401,640

Other Observations

General Implications of the Funding Policy on Future Expected Plan Contributions and Funded Status

Given the Plan's funding policy, if all actuarial assumptions are met (including the assumption of the Plan earning 6.50% on the actuarial value of assets), it is expected that:

- 1) The employer normal cost is sufficient to cover the cost of benefits accruing each year;
- 2) **The Unfunded Actuarial Accrued Liabilities (UAAL) is not expected to be fully amortized in the definite future;** and
- 3) The funded status of the Plan will increase gradually towards a 100% funded ratio.

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.

Risks to Future Employer Contribution Requirements

There are ongoing risks to future employer contribution requirements to which the Plan 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. Longevity risk – members may live longer or shorter than expected and receive pensions for a period of time other than assumed; and
5. 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.

The computed contribution shown on page A-1 may be considered as a minimum contribution rate that complies with the Board's funding policy. The timely receipt of the actuarially determined contributions is critical to support the financial health of the plan. Users of this report should be aware that contributions made at the actuarially determined rate do not necessarily guarantee benefit security.

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	2016	2015	2014
Ratio of actives to retirees and beneficiaries	1.55	1.60	1.80	1.62	1.73
Ratio of retiree actuarial accrued liability to total liability	49%	50%	44%	40%	38%
Ratio of net cash flow to market value of assets	4%	12%	6%	-4%	33%

RATIO OF ACTIVE 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 RETIREE ACTUARIAL ACCRUED LIABILITY TO TOTAL LIABILITY

The ratio of retiree liability to the total actuarial accrued liability gives an indication of the maturity of the plan. As the ratio increases, cash flow needs increase, and the liquidity needs of the portfolio change. A ratio on the order of 50% indicates a maturing system.

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.

SECTION C

VALUATION DATA

Summary of Plan Provisions Valued (December 31, 2018)

Normal Payment Conditions

Eligibility - Attainment of age 55 with 10 or more years of incentive service or 30 years of service regardless of age, or attainment of age 50 with 25 or more years of service.

Annual Amount -

Retiring	Fixed Annual Amount per Year of Incentive Service at Retirement
1/1/2005 - 12/31/2005	\$518.00
1/1/2006 - 12/31/2006	\$539.00
1/1/2007 - 12/31/2007	\$560.00
1/1/2008 - 12/31/2008	\$582.00
1/1/2009 - 6/30/2014	\$605.00
7/1/2014 - 6/30/2015	\$642.00
7/1/2015 - 6/30/2016	\$681.00
7/1/2016 - 6/30/2017	\$724.00
7/1/2017 - and after*	\$769.00

*For purposes of the valuation, the benefit level is assumed to increase by 1% each year beginning July 1, 2018.

Vesting

Eligibility - 10 years of incentive service. Payments commence at age 60.

Annual Amount - See above.

Payments in Event of Participant's Death

Eligibility - Death of an active participant after 10 years of incentive service.

Annual Amount – Surviving spouse receives the amount computed as above but reduced to reflect a 100% joint and survivor election.

Summary of Plan Provisions Valued (December 31, 2018)

Post-Retirement Payment Increases

<u>Year</u>	<u>Ad-Hoc Increase</u>
1986	10.0% increase in each current payment
1987	10.0% increase in each current payment
1988	7.5% increase in each current payment
1989	7.5% increase in each current payment
1989	Prorated increase based on difference between actual incentive service and the 25-year maximum which was provided for Ordinance No. 62
1990-1994	\$10 per month increase in each current payment
1995	\$ 5 per month increase in each current payment
1996	\$15 per month increase in each current payment
1997-2009	\$10 per month increase in each current payment
2010-2018	None

Active Participants - December 31, 2018 by Near Age and Years of Service

Near Age	Years of Accrued Service							Totals No.
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	
20-24	7							7
25-29	12	8	1					21
30-34	12	6	6					24
35-39	16	5	2	4				27
40-44	7	9	5	8	4			33
45-49	4	3	5	1	3	3		19
50-54	1	3	4	3	1			12
55-59	1	1	3		2			7
65		1						1
66		1						1
Totals	60	37	26	16	10	3	0	152

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

Group Averages:

Age: 38.9 years.

Service: 8.5 years.

Leave of Absence Participants - December 31, 2018 by Near Age and Years of Service

Near Age	Years of Accrued Service							Totals No.
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	
25-29	1	1						2
30-34		1						1
35-39				1				1
40-44	1							1
45-49		1						1
Totals	2	3	0	1	0	0	0	6

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

Group Averages:

Age: 35.5 years.
Service: 8.6 years.

Inactive Participants - by Near Ages December 31, 2018

Near Ages	Current Payments		Deferred Payments	
	No.	Annual Payments	No.	Annual Payments
35-39			5	\$ 42,666
40-44			3	22,280
45-49				
50-54	9	\$ 164,924	3	12,945
55-59	17	188,604	14	72,822
60-64	18	183,194	1	2,026
65-69	13	117,228		
70-74	7	40,569		
75-79	8	45,349		
80-84	17	75,424		
85-89	5	19,696		
90-94	4	15,324		
Totals	98	\$850,312	26	\$152,740

Development of Funding Value of Assets

Year Ended December 31,	2017	2018	2019	2020	2021
A. Funding Value Beginning of Year	\$ 9,015,226	\$ 10,363,511			
B. Market Value End of Year	10,270,550	10,189,588			
C. Market Value Beginning of Year	8,318,842	10,270,550			
D. Non-Investment Net Cash Flow (ER cont.) - (Ret. Ben.+Refunds)	964,810	449,536			
E. Investment Income					
E1. Market Total: B - C - D	986,898	(530,498)			
E2. Assumed Rate	6.50%	6.50%			
E3. Amount for Immediate Recognition: (D/2 + A)*E2	617,346	688,238			
E4. Amount for Phased-In Recognition: E1 - E3	369,552	(1,218,736)			
F. Phased-In Recognition of Investment Income					
F1. Current Year: 0.25 x E4	92,388	(304,684)			
F2. First Prior Year	(127,397)	92,388	\$ (304,684)		
F3. Second Prior Year	(115,332)	(127,397)	92,388	\$ (304,684)	
F4. Third Prior Year	(83,530)	(115,333)	(127,395)	92,388	\$ (304,684)
F5. Total Recognized Investment Gain (Loss)	(233,871)	(455,026)	(339,691)	(212,296)	(304,684)
G. Funding Value: A + D + E3 + F5	10,363,511	11,046,259			
H. Difference Between Market & Funding Values	(92,961)	(856,671)			
I. Recognized Rate of Return	4.0%	2.2%			
J. Market Rate of Return	11.2%	-5.1%			

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.

Summary of Current Asset Information Furnished for Valuation

Balance Sheet

Cash and Short-Term	\$ 1,589,904
U.S. Government/Agency Bonds	2,800,309
Common Stocks	3,406,552
ETF - Equity	2,394,491
Accounts Payable	<u>(1,668)</u>
Total Market Value of Plan Assets	\$ 10,189,588

Revenues and Expenditures for Calendar Year 2018

Plan Assets at Beginning of Year	\$ 10,270,550
Plus Employer Contributions	1,285,300
Plus Investment Income	(476,914)
Less Monthly Retirement Benefits and Lump Sum Payments	835,764
Less Investment Expenses	43,229
Less Administrative Expenses	<u>10,355</u>
Plan Assets at End of Year	\$ 10,189,588

SECTION D

VALUATION METHODS 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 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 member's benefit at the time of retirement; and
- (ii) each annual normal cost is a level-dollar amount.

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) dollar contributions over an open period of 25 years. This UAAL payment reflects payments expected to be made between the valuation date and the date contributions determined by this report are scheduled to be made.

Funding Value of Assets. The valuation assets used for funding purposes is derived as follows: prior year valuation assets are increased by contributions and expected investment income and reduced by refunds, benefit payments and expenses. To this amount is added 25% of the difference between expected and actual investment income for each of the previous four years.

Actuarial Assumptions Used for the Valuations

The contribution requirements and benefit values of the Plan are calculated by applying actuarial assumptions to the benefit provisions and people information furnished, using the actuarial cost method described on the previous page.

The actuarial assumptions are adopted by the Board after consulting with the actuary. In general, non-economic actuarial assumptions were based on the experience of the plan as well as the City of Troy Employees Retirement System. The mortality tables also reflect national trends. The reasonableness of the economic assumptions was based on capital market expectations provided by various investment consultants and other sources such as the Social Security Trustees report.

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 Plan
- (ii) rates of mortality among members, retirees and beneficiaries
- (iii) rates of withdrawal of active members (without entitlement to a retirement benefit)
- (iv) rates of disability among members
- (v) the age patterns of actual retirement

In a valuation, the monetary effect of each assumption is calculated 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 Plan will not coincide exactly with assumed experience. 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 to the computed contribution. 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 (net of administrative expenses) used in making the valuation was 6.50% per annum, compounded annually. This rate was first used for the December 31, 1999 valuation. Although not explicitly used in the valuation, the economic assumptions are consistent with a price inflation assumption of 2.60% per year.

Mortality Table. The post retirement mortality table used is the fully generational RP-2014 Healthy Annuitant Mortality Tables. The post-disabled mortality tables were set to the RP-2014 Disabled Retiree Mortality Tables. The assumption used to measure the probabilities of members dying before retirement is the RP-2014 Employee Mortality Tables. The tables described above were adjusted backwards to 2006 with the MP-2014 scale. A base year of 2006 with future mortality improvement using scale MP-2018 was used. This valuation contains an additional margin for future improvements in mortality after the measurement date in the projection scale. Sample values follow:

Healthy Retirees				
Sample Ages in 2018	Value of \$1 Monthly for Life		Future Life Expectancy (Years)	
	Men	Women	Men	Women
55	150.68	156.30	29.39	31.82
60	140.50	146.78	24.87	27.10
65	128.40	135.26	20.60	22.61
70	114.05	121.16	16.58	18.31
75	97.36	104.53	12.84	14.29
80	79.12	86.11	9.51	10.69

This table was first used for the December 31, 2018 valuation.

Note: Published mortality tables have been extended to high and low ages using a cubic spline method.

Valuation Assumptions

Probabilities of retirement for members eligible for immediate incentive payments were:

Percent of Eligible Active Participants Separating within Next Year			
Age Based		Service Based	
Ages	Percent	Service	Percent
48	20%	30	20%
49	20%	31	20%
50	20%	32	20%
51	20%	33	20%
52	20%	34	20%
53	20%	35	20%
54	20%	36	20%
55	20%	37	20%
56	20%	38	20%
57	20%	39	20%
58	20%	40	100%
59	15%		
60	15%		
61	15%		
62	25%		
63	100%		

Rates of separation from active employment (before eligible for retirement) used were:

Sample Ages	Years of Service	% of Active Participants Separating within Next Year
ALL	1	15.00 %
	2	10.00
	3	8.00
	4	7.00
	5	6.00
25	5 & Over	5.00
30		4.50
35		3.55
40		1.45
45		0.75
50		0.75

Valuation Assumptions

Pensions in an Inflationary Environment

**Value of \$1,000/Month Retirement Benefit
to an Individual Who Retires at Age 55
in an Environment of 2.60% Inflation**

<u>Age</u>	<u>Value</u>
55	\$1,000
56	975
57	950
58	926
59	903
60	880
65	774
70	680
75	598
80	526

The life expectancy of a 55 year old male retiree is age 84. The life expectancy for a 55 year old female retiree is age 87. Half of the people will outlive their life expectancy. The effects of even moderate amounts of inflation can be significant for those who live to an advanced age.

Miscellaneous and Technical Assumptions December 31, 2018

Marriage Assumption. 100% of males and 100% of females are assumed to be married for purposes of death-in-service benefits.

Pay Increase Timing. Not applicable.

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 without adjustment for multiple decrement table effects.

Decrement Operation. Disability and mortality decrements do not operate during the first 5 years of service. Disability and withdrawal do not operate during retirement eligibility.

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

Optional Forms of Payment. 6.50% interest, 100% unisex blend of the RP-2000 Mortality Table, projected to the year 2017 using Projection Scale BB, set back 0 years for men and 0 years for women. No margin for future mortality improvements is included in these tables.

Incidence of Contributions. Contributions are assumed to be received continuously throughout the year based upon the computed dollar amounts shown in this report. New entrant normal cost contributions are applied to the funding of new entrant benefits.

Leave of Absence Members. All members indicated as on leave of absence as of the valuation date are assumed to return to full employment one year after the valuation date.

Ad-Hoc Increases to Base Benefit. After 7/1/2017, the base benefit amount is assumed to increase by 1.00% per year with no increase after retirement.

Census Data. The City supplied data for plan participants as of December 31, 2018. We did not audit this data, but we applied a number of validation tests to the data. No adjustments were made to the data that was provided by the City.

SECTION E

ADDITIONAL DISCLOSURE INFORMATION

GASB Statements No. 67 and No. 68 are the accounting standards which replaced GASB Statements No. 25 and No. 27. GASB Statement No. 67 is first effective for fiscal year 2014 and GASB Statement No. 68 is first effective for fiscal year 2015. A separate GASB Statements No. 67 and No. 68 report has been issued outside of this report. This section contains historical GASB Statement No. 25 reporting information for prior fiscal years and illustrative information for fiscal year 2015 and after.

Actuarial Accrued Liability

The Actuarial Accrued Liability is a measure intended to help users assess (i) a pension fund's funded status on a going-concern basis, and (ii) progress being made toward accumulating the assets needed to pay benefits as due. Allocation of the actuarial present value of projected benefits between past and future service was based on service using the individual entry-age actuarial cost method. Assumptions were the same as used to determine the Plan's level dollar annual required contribution between entry-age and assumed exit age. Entry-age was established by subtracting credited service from current age on the valuation date.

The preceding actuarial cost method complies with the financial reporting standards established by the Governmental Accounting Standards Board.

The entry age Actuarial Accrued Liability was determined as part of an actuarial valuation of the Plan as of December 31, 2018. Significant actuarial assumptions used in determining the Actuarial Accrued Liability include (a) a rate of return on the investment of present and future assets of 6.50% per year compounded annually, and (b) the assumption that benefits will not increase after retirement.

Actuarial Accrued Liability	
Active members*	\$ 9,309,873
Retired members and beneficiaries currently receiving benefits	9,924,890
Vested terminated members not yet receiving benefits	<u>1,033,690</u>
Total Actuarial Accrued Liability	20,268,453
Actuarial Value of Assets (market value was \$10,189,588)	<u>11,046,259</u>
Unfunded Actuarial Accrued Liability	\$ 9,222,194

* Including members on leave of absence.

During the year ended December 31, 2018, the Plan experienced a net change of \$1,148,422 in the Actuarial Accrued Liability, of which \$107,420 was due to assumption changes. There were no changes in benefit provisions.

Supplementary Information Schedule of Funding Progress (\$ amounts in thousands)

Actuarial Valuation Date December 31,	Actuarial Value of Assets# (a)	Actuarial Accrued Liability (AAL) (b)	Unfunded AAL (b)-(a)	Funded Ratio (a)/(b)
2004 *	\$6,261	\$ 11,936	\$ 5,675	52.5 %
2005 *	6,572	12,052	5,481	54.5
2006 *	6,007	11,932	5,925	50.3
2007 *	6,413	13,240	6,827	48.4
2008 *	6,273	13,038	6,765	48.1
2009 *	5,325	12,625	7,300	42.2
2010	5,710	12,925	7,215	44.2
2011	6,357	13,476	7,119	47.2
2012	5,983	13,115	7,132	45.6
2013 *&	6,150	16,129	9,979	38.1
2014	8,381	16,680	8,299	50.2
2015 &	8,333	16,979	8,646	49.1
2016	9,015	17,994	8,979	50.1
2017	10,364	19,120	8,757	54.2
2018 &	11,046	20,268	9,222	54.5

Prior to 1996, Book Value was used.

* After changes in benefit provisions.

& After changes in actuarial assumptions.

Analysis of the dollar amounts of actuarial value of assets, Actuarial Accrued Liability, or Actuarial Accrued Liability in isolation can be misleading. Expressing the actuarial value of assets as a percentage of the Actuarial Accrued Liability provides one indication of the plan's funded status on a going-concern basis. Analysis of this percentage over time indicates whether the plan is becoming financially stronger or weaker. Generally, the greater this percentage, the stronger the plan. The Unfunded Actuarial Accrued Liability and annual covered payroll are both affected by inflation.

Supplementary Information Schedule of Employer Contributions

Fiscal Year Ending June 30,	Actuarial Valuation Date December 31,	Annual Required Contribution (in thousands)	Percent Contributed
2005	2003	\$796	100 %
2006	2004	775	105
2007	2005	762	104
2008	2006	789	101
2009	2007	885	100
2010	2008	864	100
2011	2009	874	100
2012	2010	873	100
2013	2011	868	100
2014	2011	858	365
2015	2012	844	126
2016	2013	1,101	100
2017	2014	1,113	100
2018	2015	1,112	154
2019	2016	1,285	100

Notes to Supplementary Information Summary of Actuarial Methods and Assumptions

Valuation Date	12/31/2018
Actuarial Cost Method	Individual Entry-Age
Amortization Method	Level dollar, open
Remaining Amortization Period	25 years
Asset Valuation Method	4-year smoothed market
Actuarial Assumptions:	
Investment Rate of Return	6.50%
Projected Salary Increases	N/A