ORANGE FIREMEN'S
RELIEF AND RETIREMENT FUND

ACTUARIAL VALUATION
AS OF JANUARY 1, 2021

FOSTER & FOSTER
ACTUARIES AND CONSULTANTS

April 15, 2021

Board of Trustees
Orange Firemen's
Relief and Retirement Fund

Re: Orange Firemen's Relief and Retirement Fund

Dear Board:

We are pleased to present to the Board this report of the actuarial valuation of the Orange Firemen's Relief and Retirement Fund. The funding valuation was performed to determine whether the assets and contributions are sufficient to provide the prescribed benefits and to develop the appropriate preferred funding costs as outlined by the Texas Pension Review Board, as well as to determine the funding period required to amortize any existing Unfunded Actuarial Accrued Liability. Use of the results for other purposes may not be applicable and may produce significantly different results.

The valuation has been conducted in accordance with generally accepted actuarial principles and practices, including the applicable Actuarial Standards of Practice as issued by the Actuarial Standards Board, and reflects laws and regulations issued to date pursuant to the provisions of the Texas Local Fire Fighters' Retirement Act (TLFFRA) and Vernon's Texas Civil Statutes, as well as applicable federal laws and regulations. In our opinion, the assumptions used in this valuation, as adopted by the Board of Trustees, represent reasonable expectations of anticipated plan experience. Future actuarial measurements may differ significantly from the current measurements presented in this report for a variety of reasons including: changes in applicable laws, changes in plan provisions, changes in assumptions, or plan experience differing from expectations. Due to the limited scope of the valuation, we did not perform an analysis of the potential range of such future measurements.

In conducting the valuation, we have relied on personnel, plan design, financial reports, and asset information supplied by the Fund staff, and the actuarial assumptions and methods described in the Actuarial Assumptions section of this report. While we cannot verify the accuracy of all this information, the supplied information was reviewed for consistency and reasonableness. As a result of this review, we have no reason to doubt the substantial accuracy of the information and believe that it has produced appropriate results. This information, along with any adjustments or modifications, is summarized in various sections of this report.

The undersigned are familiar with the immediate and long-term aspects of pension valuations, and meet the Qualification Standards of the American Academy of Actuaries necessary to render the actuarial opinions contained herein. All of the sections of this report are considered an integral part of the actuarial opinions.

To our knowledge, no associate of Foster & Foster Inc. working on valuations of the program has any direct financial interest or indirect material interest in the City of Orange, nor does anyone at Foster & Foster Inc. act as a member of the Board of Trustees of the Orange Firemen's Relief and Retirement Fund. Thus, there is no relationship existing that might affect our capacity to prepare and certify this actuarial report.

If there are any questions, concerns, or comments about any of the items contained in this report, please contact us at 239-433-5500.

Respectfully submitted,

Foster & Foster Inc.

By: ______________________________
Bradley R. Heinrichs, FSA, EA, MAAA
Enrolled Actuary #20-6901

By: ______________________________
Drew D. Ballard, EA, MAAA
Enrolled Actuary #20-8193

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SUMMARY OF REPORT

The actuarial valuation of the Orange Firemen's Relief and Retirement Fund, performed as of January 1, 2021, has been completed and the results are presented in this Report. The pension costs, compared with those developed in the January 1, 2019 actuarial valuation, are as follows:

Valuation Date	New Contributions 1/1/2021	Old Contributions 1/1/2021	1/1/2019
Current Normal Cost Rate % of Covered Annual Payroll	12.00%	11.94%	12.24%
Funding Measurements			
Actuarial Accrued Liability (AAL)	17,257,431	17,247,808	17,203,479
Actuarial Value of Assets (AVA)	9,765,510	9,765,510	7,961,733
Unfunded Actuarial Accrued Liability (UAAL = AAL - AVA)	7,491,921	7,482,298	9,241,746
Funded Ratio (AVA / AAL)	56.6%	56.6%	46.3%
Amortization Period	20.7 years	42.7 years	Infinite years
Contributions			
Expected City Contribution Rate	18.80%	14.50%	14.50%
Expected Member Contribution Rate	13.80%	12.50%	12.50%
Total Expected Contribution Rate	32.60%	27.00%	27.00%
Funding Costs			
City 20-Year Funding Cost	19.24%	20.45%	28.57%
City 30-Year Funding Cost [1]	15.31%	16.53%	23.19%
City 40-Year Funding Cost	13.57%	14.80%	20.81%

[1] *Per Section 802.101(a) of the Texas Government Code, the actuarial valuation must include a recommended contribution rate needed for the system to achieve and maintain an amortization period that does not exceed 30 years.*

Plan experience was favorable overall on the basis of the plan's actuarial assumptions. Sources of actuarial gain included inactive mortality experience, a 2-year average investment return of 16.33% which exceeded the 7.75% assumption, and fewer retirements than expected. These gains were offset in part by losses associated with an average salary increase of 7.87% which exceeded the 5.54% assumption and less turnover than expected.

CHANGES SINCE PRIOR VALUATION

Benefit/Fund Changes

Since the previous valuation, the member and city contribution rates were increased from 12.50% and 14.50% to 12.80% and 15.80%, respectively, effective January 28, 2020. The member and city contribution rates were further increased to 13.80% and 18.80% effective October 1, 2020.

Actuarial Assumption/Method Changes

The valuation reflects an update to use the most recently published mortality improvement scale by the Society of Actuaries (MP-2020).

There were no method changes since the prior valuation.

COMPARATIVE SUMMARY OF PRINCIPAL VALUATION RESULTS

	New Contributions 1/1/2021	Old Contributions 1/1/2021	1/1/2019
A. Participant Data			
Actives	36	36	37
Service Retirees + Alt Payees	31	31	33
Beneficiaries	7	7	6
Disability Retirees	1	1	1
Terminated Vested	1	1	1
Total	76	76	78
Total Annual Payroll	2,842,141	2,842,141	2,562,631
Payroll Under Assumed Ret. Age	2,636,104	2,636,104	2,449,670
Annual Rate of Payments to:			
Service Retirees + Alt Payees	974,429	974,429	1,008,821
Beneficiaries	83,202	83,202	75,848
Disability Retirees	26,690	26,690	26,690
Terminated Vested	0	0	38,400
B. Assets			
Actuarial Value (AVA)	9,765,510	9,765,510	7,961,733
Market Value (MVA)	9,765,510	9,765,510	7,961,733
C. Liabilities			
Present Value of Benefits			
Actives			
Retirement + Termination Benefits	8,401,244	8,378,505	7,123,777
Death Benefits	98,207	98,207	80,772
Disability Benefits	763,637	763,637	659,960
Service Retirees + Alt Payees	10,009,646	10,009,646	10,817,156
Beneficiaries	652,059	652,059	634,603
Disability Retirees	304,592	304,592	310,423
Terminated Vested	70,054	70,054	476,513
Total	20,299,439	20,276,700	20,103,204

	New Contributions 1/1/2021	Old Contributions 1/1/2021	1/1/2019
C. Liabilities - (Continued)			
Present Value of Future Salaries	24,738,738	24,738,738	23,140,847
Normal Cost (Entry Age Normal)			
Retirement + Termination Benefits	261,307	260,002	249,130
Death Benefits	6,591	6,591	5,585
Disability Benefits	36,530	36,530	34,031
Total Normal Cost	304,428	303,123	288,746
Present Value of Future Normal Costs	3,042,008	3,028,892	2,899,725
Actuarial Accrued Liability			
Retirement + Termination Benefits	5,801,374	5,791,751	4,636,344
Death Benefits	32,429	32,429	24,214
Disability Benefits	387,277	387,277	304,226
Inactives	11,036,351	11,036,351	12,238,695
Total Actuarial Accrued Liability (AAL)	17,257,431	17,247,808	17,203,479
Unfunded Actuarial Accrued Liability (UAAL)	7,491,921	7,482,298	9,241,746
Funded Ratio (AVA / AAL)	56.6%	56.6%	46.3%

D. Actuarial Present Value of Accrued Benefits

	New Contributions 1/1/2021	Old Contributions 1/1/2021	1/1/2019
Inactives	11,036,351	11,036,351	12,238,695
Actives	5,560,549	5,560,549	4,615,227
Total Present Value Accrued Benefits (PVAB)	16,596,900	16,596,900	16,853,922
Funded Ratio (MVA / PVAB)	58.8%	58.8%	47.2%

GAIN/LOSS ANALYSIS

a. Total (Gain)/Loss

1. Unfunded Actuarial Accrued Liability as of January 1, 2019	$9,241,746
2. Normal Cost applicable for 2019	288,746
3. Normal Cost applicable for 2020	306,360
4. Interest on (1), (2), and (3)	1,558,212
5. Contributions made during 2019	681,412
6. Contributions made during 2020	807,851
7. Interest on (5) and (6)	112,034
8. Expected UAAL as of January 1, 2021: (1)+(2)+(3)+(4)-(5)-(6)-(7)	9,793,767
9. Actual UAAL as of January 1, 2021 (Before Changes)	7,482,298
Total Actuarial (Gain)/Loss	(2,311,469)

b. (Gain)/Loss on Assets

1. Market Value of Assets as of January 1, 2019	7,961,733
2. Contributions Less Benefit Payments	(855,935)
3. Expected Investment Earnings	1,275,284
4. Expected MVA as of January 1, 2021: (1)+(2)+(3)	8,381,082
5. Actual Market Value of Assets as of January 1, 2021	9,765,510
(Gain)/Loss on Assets	(1,384,428)

c. Gain/(Loss) on Liabilities

1. Expected Actuarial Accrued Liability: a(8)+b(4)	18,174,849
2. Actual Actuarial Accrued Liability (Before Changes)	17,247,808
(Gain)/Loss on Liabilities	(927,041)

HISTORY OF GAIN/LOSS

Valuation as of January 1,	Actuarial (Gain)/Loss	(Gain)/Loss on Assets	(Gain)/Loss on Liabilities
2021	(2,311,469)	(1,384,428)	(927,041)
2019	780	463,932	(463,152)
2017	110,796	494,339	(383,543)

COMPARISON OF CONTRIBUTION RATES TO
ACTUARIALLY DETERMINED CONTRIBUTION BENCHMARK

Pursuant to the adopted Funding Policy, an Actuarially Determined Contribution (ADC) benchmark has been created for comparative purposes only and was constructed under the actuarial assumptions and methods identical to those disclosed in this report, except as follows:

Amortization Period – The ADC benchmark is determined in conjunction with each actuarial valuation by determining the fixed-rate contribution rates that would result in a 30-year amortization period as of the valuation date.

Payroll Growth Assumption – The ADC benchmark is calculated using a payroll growth assumption that is the lesser of 3.0% and the average payroll growth of the Orange Fire Department over the last ten (10) years.

Determination of ADC Benchmark Payroll Growth Assumption

Covered Payroll as of:	
1/1/2021	2,842,141
1/1/2011	1,907,382
(a) Average Annual Rate	4.07%
(b) ADC Assumption	3.00%
Lesser of (a) and (b)	**3.00%**

Valuation as of January 1,	*City of Orange Contribution Rate*	*30-Year ADC Benchmark*	*City Contribution Excess/(Shortfall)*
2021	18.80%	14.42%	4.38%

STATEMENT OF FIDUCIARY NET POSITION
DECEMBER 31, 2020

ASSETS	COST VALUE	MARKET VALUE
Cash and Cash Equivalents:		
Short Term Investments	24,258.59	24,258.59
Checking Account	326,461.32	326,461.32
Total Cash and Equivalents	350,719.91	350,719.91
Total Receivable	0.00	0.00
Investments:		
Stocks	524,523.20	1,033,218.53
Mutual Funds:		
Fixed Income	1,752,624.36	1,789,813.77
Equity	4,330,968.69	5,682,256.84
Pooled/Common/Commingled Funds:		
Real Estate	906,489.89	910,258.70
Total Investments	7,514,606.14	9,415,547.84
Total Assets	7,865,326.05	9,766,267.75
LIABILITIES		
Payables:		
Benefit Payments	758.10	758.10
Total Liabilities	758.10	758.10
NET POSITION RESTRICTED FOR PENSIONS	7,864,567.95	9,765,509.65

STATEMENT OF CHANGES IN FIDUCIARY NET POSITION
FOR THE YEAR ENDED DECEMBER 31, 2020
Market Value Basis

ADDITIONS			
Contributions:			
Member		357,533.73	
City		450,316.77	
Total Contributions			807,850.50
Investment Income:			
Net Realized Gain (Loss)	326,452.60		
Unrealized Gain (Loss)	729,173.01		
Net Increase in Fair Value of Investments		1,055,625.61	
Interest & Dividends		180,089.96	
Less Investment Expense[1]		(52,460.48)	
Net Investment Income			1,183,255.09
Total Additions			1,991,105.59
DEDUCTIONS			
Distributions to Members:			
Benefit Payments		1,122,957.70	
Total Distributions			1,122,957.70
Administrative Expense			24,152.80
Total Deductions			1,147,110.50
Net Increase in Net Position			843,995.09
NET POSITION RESTRICTED FOR PENSIONS			
Beginning of the Year			8,921,514.56
End of the Year			9,765,509.65
Actuarial Asset Rate of Return			13.2%
Actuarial Gain/(Loss) due to Investment Return			479,895.32

[1]Investment related expenses include investment advisory, custodial and performance monitoring fees.

STATEMENT OF FIDUCIARY NET POSITION
DECEMBER 31, 2019

ASSETS	COST VALUE	MARKET VALUE
Cash and Cash Equivalents:		
Checking Account	160,663.73	160,663.73
Money Market	106,522.74	106,522.74
Total Cash and Equivalents	267,186.47	267,186.47
Receivables:		
From Broker for Investments Sold	374.00	374.00
Investment Income	3,114.70	3,114.70
Total Receivable	3,488.70	3,488.70
Investments:		
U. S. Bonds and Bills	306,262.84	306,336.72
Corporate Bonds	214,584.91	223,546.14
Stocks	3,082,795.52	4,180,322.06
Mutual Funds:		
Fixed Income	2,218,252.87	2,230,251.71
Equity	1,650,462.66	1,720,257.76
Total Investments	7,472,358.80	8,660,714.39
Total Assets	7,743,033.97	8,931,389.56
LIABILITIES		
Payables:		
Investment Expenses	6,250.00	6,250.00
Administrative Expenses	3,625.00	3,625.00
Total Liabilities	9,875.00	9,875.00
NET POSITION RESTRICTED FOR PENSIONS	7,733,158.97	8,921,514.56

STATEMENT OF CHANGES IN FIDUCIARY NET POSITION
FOR THE YEAR ENDED DECEMBER 31, 2019
Market Value Basis

ADDITIONS			
Contributions:			
Member		315,468.77	
City		365,942.97	
Total Contributions			681,411.74
Investment Income:			
Net Realized Gain (Loss)	281,071.82		
Unrealized Gain (Loss)	1,168,596.14		
Net Increase in Fair Value of Investments		1,449,667.96	
Interest & Dividends		186,952.34	
Less Investment Expense[1]		(88,583.85)	
Net Investment Income			1,548,036.45
Total Additions			2,229,448.19
DEDUCTIONS			
Distributions to Members:			
Benefit Payments		1,146,877.20	
Refunds of Member Contributions		75,362.05	
Total Distributions			1,222,239.25
Administrative Expense			47,426.96
Total Deductions			1,269,666.21
Net Increase in Net Position			959,781.98
NET POSITION RESTRICTED FOR PENSIONS			
Beginning of the Year			7,961,732.58
End of the Year			8,921,514.56
Actuarial Asset Rate of Return			19.5%
Actuarial Gain/(Loss) due to Investment Return			904,532.28

[1]Investment related expenses include investment advisory, custodial and performance monitoring fees.

STATISTICAL DATA

	1/1/2015	1/1/2017	1/1/2019	1/1/2021
Actives				
Number	37	37	37	36
Average Current Age	36.8	34.0	34.8	36.5
Average Age at Employment	25.2	24.4	24.9	24.9
Average Past Service	11.6	9.6	9.9	11.6
Average Annual Salary	$61,949	$65,947	$69,260	$78,948
Service Retirees + Alt Payees				
Number		35	33	31
Average Current Age		65.4	66.3	67.0
Average Annual Benefit		$27,810	$30,570	$31,433
Beneficiaries				
Number		6	6	7
Average Current Age		75.5	75.7	78.1
Average Annual Benefit		$14,383	$12,641	$11,886
Disability Retirees				
Number		1	1	1
Average Current Age		57.4	59.4	61.4
Average Annual Benefit		$26,690	$26,690	$26,690
Terminated Vested				
Number		1	1	1
Average Current Age		47.9	49.9	34.3
Average Annual Benefit [1]		$38,400	$38,400	N/A

[1] Average Annual Benefit for Terminated Vested members reflects the benefit for members entitled to a future annual benefit from the plan.

AGE AND SERVICE DISTRIBUTION

ATTAINED AGE	PAST SERVICE											
	0-1	2-4	5-9	10-19	20	21	22	23	24	25-29	30+	TOTAL
15 - 24	3	0	0	0	0	0	0	0	0	0	0	3
25 - 34	1	3	8	5	0	0	0	0	0	0	0	17
35 - 44	0	2	3	4	0	0	0	0	0	0	0	9
45 - 49	0	0	0	0	1	0	0	1	0	0	0	2
50	0	0	0	0	0	0	0	0	0	1	0	1
51	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	1	0	1
55 - 59	0	0	0	0	0	0	0	0	0	1	0	1
60+	0	0	0	0	0	0	0	0	0	0	2	2
TOTAL	4	5	11	9	1	0	0	1	0	3	2	36

Illustrates members who have attained Normal Retirement eligibility.

VALUATION PARTICIPANT RECONCILIATION

1. Active lives

a. Number in prior valuation 1/1/2019	37
b. Terminations	
i. Vested (partial or full) with deferred benefits	0
ii. Non-vested or full lump sum distribution received	(3)
iii. Non-vested awaiting lump sum distribution	(1)
c. Deaths	
i. Beneficiary receiving benefits	0
ii. No future benefits payable	0
d. Disabled	0
e. Retired	0
f. Continuing participants	33
g. New entrants	3
h. Total active life participants in valuation	36

2. Non-Active lives (including beneficiaries receiving benefits)

	Service Retirees, Alt. Payees Receiving Benefits	Receiving Death Benefits	Receiving Disability Benefits	Vested Deferred	Total
a. Number prior valuation	33	6	1	1	41
Retired	1	0	0	(1)	0
Vested Deferred	0	0	0	1	1
Death, With Survivor	(1)	1	0	0	0
Death, No Survivor	(2)	0	0	0	(2)
Disabled	0	0	0	0	0
Refund of Contributions	0	0	0	0	0
Rehires	0	0	0	0	0
Expired Annuities	0	0	0	0	0
Data Corrections	0	0	0	0	0
Hired/Termed in Same Year	0	0	0	0	0
b. Number current valuation	31	7	1	1	40

ACTUARIAL ASSUMPTIONS AND METHODS

Mortality Rates

Active Lives:
PubS-2010 Mortality Table for Employees.

Retiree and Vested Terminated Lives:
PubS-2010 Mortality Table for Healthy Retirees.

Contingent Survivor Lives:
PubS-2010 Mortality Table for Contingent Survivors.

Disabled Lives:
PubS-2010 Mortality Table for Disabled Retirees.

The mortality assumptions for all participants are sex distinct with mortality improvement projected 5 years beyond the valuation date using scale MP-2020 and a base year of 2010. We feel these assumptions sufficiently accommodate anticipated future mortality improvements.

Previously, the mortality improvement scale used was MP-2018.

Interest Rate

7.75% per year, compounded annually, net of expenses. This is supported by the target asset allocation of the trust and the expected long-term return by asset class.

Contribution Rates

Members – 13.80%
City – 18.80%

Retirement Age

Years Following First NR Eligibility	Rate
0	25.0%
1-2	20.0
3	15.0
4	10.0
5-9	50.0
10+	100.0

The assumed rates of retirement were approved in conjunction with an actuarial experience study dated August 2019.

Disability Rates

Sample rates are displayed below.

Age	Rate
25	0.111%
35	0.152%
45	0.335%
55	0.858%

Termination Rates

Service	Rate
<1	12.00%
1	11.00
2	10.00
3	9.00
4	8.00
5	7.50
6	7.00
7	6.50
8	6.00
9	5.50
10	5.00
11	4.00
12	3.00
13	2.00
14	1.00
15-19	0.50
20+	4.00

The assumed rates of termination were approved in conjunction with an actuarial experience study dated August 2019.

Salary Increases

Service	Increase
<1	10.00%
1	9.50
2	9.00
3	8.50
4	8.00
5	7.50
6	5.50
7	5.50
8	5.50
9	5.25
10	5.00
11	4.75
12	4.50
13	4.25
14	4.00
15	3.75
16	3.50
17	3.25
18	3.00
19	2.75
20+	2.50

The assumed rates of salary increase were approved in conjunction with an actuarial experience study dated August 2019.

Payroll Growth	2.50% per year, compounded annually. The payroll growth assumption was approved in conjunction with an actuarial experience study dated August 2019.
Funding Method	Entry Age Normal Actuarial Cost Method
Marital Status	90% of active participants are assumed to be married at the time of retirement. Males are assumed to be three years older than their spouses.
Dependent Children	Each member is assumed to have two children. The first child is assumed to have been born when the member was age 25. The second child is assumed to be two years younger. It is also assumed that benefits will be paid until each child reaches the age of 23.
Payment Form	Members' eligible for the DROP are assumed to elect the DROP 20% of the time and straight service retirement 80% of the time. Other members are assumed to receive straight service retirement.
Actuarial Asset Method	Fair Market Value.

SUMMARY OF BENEFIT PROVISIONS

Credited Service	Period of continuous employment covered by the Fund during which a member pays into, and keeps on deposit in the Fund, the contributions required by the Fund. A fund member also receives service credit for those periods during which the member received a disability benefit from the fund. Credited Service will be calculated in completed years and months.
Compensation	Total pay including regular, longevity and overtime compensation and compensation received during a period of sick leave or vacation/holiday leave, but excluding lump sum distributions for unused sick leave or vacation/holiday leave.
Average Salary	Average Compensation for the highest 60-month average salary.
Member Contributions	13.80% of Compensation.
Service Retirement	
Date	Attainment at age 50 and 20 years of Credited Service.
Benefit	Sum of a. and b., below, where: a. 2.60 percent of the member's Average Salary multiplied by his or her number of years of service not in excess of 20, and b. $91.00 per month for each year of service in excess of 20.
Form of Benefit	Life Annuity with two-thirds (2/3) continued to Surviving Spouse for married members and Life Annuity for unmarried members at retirement.
Disability	A member who qualifies for a disability retirement benefit will receive a monthly retirement income equal to their accrued benefit. Members who retire under a non-service related disability will be subject to a reduction of their accrued benefit unless they have completed 15 or more years of service.
Death Benefits	
Surviving Spouse of Member:	Sum of a.) 34.67% of the member's Average Salary, and b.) $60.67 per month for each year of service in excess of 20. The death benefit will be subject to a reduction for non-service related deaths unless the member had completed 15 or more years of service.

Dependent Children of Member:	Each unmarried child is entitled to 6.93% of the member’s Average Salary. If member’s spouse subsequently dies or if here is no spouse, each eligible child is entitled to 13.86% of the member’s Average Salary, payable until age 18 or until age 25 as long as the child remains a full-time student.

Deferred Retirement Option Program

Eligibility	The later of a.) attainment age 53 and 23 years of Credited Service or b.) the date 36 months prior to retirement date in the member’s DROP benefit calculation.
Participation Period	Not to exceed 36 months.
Payment	Sum of monthly Service Retirement benefit the member would have received if had retired on the DROP election date plus an amount equal to the member contributions to the fund while a DROP participant.

Termination Benefits

Members with <20 years of Credited Service:	Refund of member contributions, without interest.
Members with 20+ years of Credited Service (prior to age 50):	Accrued benefit as described in the Service Retirement section, payable at age 50.

DISCUSSION OF RISK

ASOP No. 51, Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions, states that the actuary should identify risks that, in the actuary's professional judgment, may reasonably be anticipated to significantly affect the plan's future financial condition.

Throughout this report, actuarial results are determined under various assumption scenarios. These results are based on the premise that all future plan experience will align with the plan's actuarial assumptions; however, there is no guarantee that actual plan experience will align with the plan's assumptions.

Below are examples of ways in which plan experience can deviate from assumptions and the potential impact of that deviation. Typically, this results in an actuarial gain or loss representing the current-year financial impact on the plan's unfunded liability of the experience differing from assumptions; this gain or loss impacts the plan's amortization period. When assumptions are selected that adequately reflect plan experience, gains and losses typically offset one another in the long term, resulting in a relatively low impact on the plan's amortization period. When assumptions are too optimistic, losses can accumulate over time and the plan's amortization period could potentially grow to an unmanageable level.

- Investment Return: When the rate of return on the Actuarial Value of Assets falls short of the assumption, this produces a loss representing assumed investment earnings that were not realized. Further, it is unlikely that the plan will experience a scenario that matches the assumed return in each year as capital markets can be volatile from year to year. Therefore, amortization periods can vary in the future.

- Salary Increases: When a plan participant experiences a salary increase that was greater than assumed, this produces a loss representing the cost of an increase in anticipated plan benefits for the participant as compared to the previous year. The total gain or loss associated with salary increases for the plan is the sum of salary gains and losses for all active participants.

- Payroll Growth: The plan's payroll growth assumption, if one is used, causes a predictable annual increase in the plan's amortization payment in order to produce an amortization payment that remains constant as a percentage of payroll if all assumptions are realized. If payroll does not increase according to the plan's payroll growth assumption, the plan's amortization period can increase significantly even if all assumptions other than the payroll growth assumption are realized since anticipated contributions rely upon membership payroll.

- Demographic Assumptions: Actuarial results take into account various potential events that could happen to a plan participant, such as retirement, termination, disability, and death. Each of these potential events is assigned a liability based on the likelihood of the event and the financial consequence of the event for the plan. Accordingly, actuarial liabilities reflect a blend of financial consequences associated with various possible outcomes (such as retirement at one of various possible ages). Once the outcome is known (e.g. the participant retires) the liability is adjusted to reflect the known outcome. This adjustment produces a gain or loss depending on whether the outcome was more or less favorable than other outcomes that could have occurred.

- Amortization Period: Risks associated with the items outlined above will inherently create varying liabilities and assets resulting in volatility in the amortization period. Actuarial losses on assets and liabilities will lead to longer amortization periods, while actuarial gains on assets and liabilities will lead to shorter amortization periods.

- Contribution Risk: This risk results from the potential that the total annual contributions, based on fixed-rates for the City and membership, may deviate from actuarially determined contributions, as illustrated on page 5. The actuarially determined contributions are adjusted in conjunction with each actuarial valuation to take into account the deviation in actual versus expected experience between valuation dates. Fixed-rate contribution structures include the risk that scheduled contributions do not reflect the actual cost of plan benefits, meaning that in order to maintain actuarially sound funding levels, contribution rate increases or benefit reductions may be required.

Impact of Plan Maturity on Risk

For newer pension plans, most of the participants and associated liabilities are related to active members who have not yet reached retirement age. As pension plans continue in operation and active members reach retirement ages, liabilities begin to shift from being primarily related to active members to being shared among active and retired members. Plan maturity is a measure of the extent to which this shift has occurred. It is important to understand that plan maturity can have an impact on the risk characteristics and risk tolerance of the plan. For example, plans with a large amount of liability attributable to retirees have a shorter time horizon to recover from losses (such as investment experience losses due to lower than expected investment returns) than plans where the majority of the liability is attributable to active members. For this reason, highly mature plans with a substantial liability due to retirees and inactive members have less tolerance for risk. Similarly, mature plans paying substantial retirement benefits resulting in a small positive or negative net cash flow can be more sensitive to near term investment volatility, particularly if the size of the fund is shrinking, which can result in less assets being available for investment in the market.

To assist with determining the maturity of the plan and assessing risk, we have provided some relevant metrics in the section titled “Plan Maturity Measures and Other Risk Metrics”. Highlights of this information are discussed below:

- The Support Ratio, determined as the ratio of active to inactive members, has decreased from 100.0% to 90.0% over the last four valuations.
- The Accrued Liability Ratio, determined as the ratio of the Inactive Accrued Liability, which is the liability associated with members who are no longer employed but are due a benefit from the plan, to the Total Accrued Liability, has increased from 61.6% to 64.0% over the last four valuations.
- The Funded Ratio, determined as the ratio of the Actuarial Value of Assets to the Total Accrued Liability, has stayed approximately the same over the last four valuations. The current Funded Ratio is 56.6%.
- The Net Cash Flow Ratio, determined as the ratio of the Net Cash Flow (contributions minus benefit payments and administrative expenses) to the Market Value of Assets, is -3.5%. This indicates that contributions are not currently covering the plan’s benefit payments and administrative expenses.

It is important to note that the we have identified the risks above as the most significant risks based on the characteristics of the plan and the nature of the actuarial valuation, however, it is not an exhaustive list of protentional risks that could be considered. Advanced modelling, as well as the identification of additional risks, can be helpful and can be provided upon request of the Board.

PLAN MATURITY MEASURES AND OTHER RISK METRICS

	1/1/2015	1/1/2017	1/1/2019	1/1/2021
Support Ratio				
Total Actives	37	37	37	36
Total Inactives	37	43	41	40
Actives / Inactives	100.0%	86.0%	90.2%	90.0%
Accrued Liability (AL) Ratio				
Inactive Accrued Liability	10,076,621	11,518,099	12,238,695	11,036,351
Total Accrued Liability	16,345,289	16,353,849	17,203,479	17,257,431
Inactive AL / Total AL	61.6%	70.4%	71.1%	64.0%
Funded Ratio				
Actuarial Value of Assets (AVA)	9,383,309	8,154,674	7,961,733	9,765,510
Total Accrued Liability	16,345,289	16,353,849	17,203,479	17,257,431
AVA / Total Accrued Liability	57.4%	49.9%	46.3%	56.6%
Net Cash Flow Ratio				
Net Cash Flow [1]		(551,652)	(540,554)	(339,260)
Market Value of Assets (MVA)		8,154,674	7,961,733	9,765,510
Ratio		-6.8%	-6.8%	-3.5%

[1] Determined as total contributions minus benefit payments and administrative expenses for the 12 months preceding the valuation date.

VALUATION NOTES

Covered Payroll is the projected annual rate of pay for the year beginning on the valuation date of all covered Members.

Payroll under Assumed Retirement Age is the projected annual rate of pay for the year beginning on the valuation date of all active participants who are not subject to a 100% probability of retirement on the valuation date.

Present Value of Benefits is the single sum value on the valuation date of all future benefits to be paid to current Members, Retirees, Beneficiaries, Disability Retirees and Vested Terminations.

Entry Age Normal Cost Method - Under this method, the normal cost is the sum of the individual normal costs for all active participants. For an active participant, the normal cost is the participant's normal cost accrual rate, multiplied by the participant's current compensation. The funding span utilized in determination of the normal cost rate for each benefit is to the last age at which that benefit is payable.

(a) The normal cost accrual rate equals:
    (i) the present value of future benefits for the participant, determined as of the participant's entry age, divided by
    (ii) the present value of the compensation expected to be paid to the participant for each year of the participant's anticipated future service, determined as of the participant's entry age.

(b) In calculating the present value of future compensation, the salary scale is applied both retrospectively and prospectively to estimate compensation in years prior to and subsequent to the valuation year based on the compensation used for the valuation.

(c) The accrued liability is the sum of the individual accrued liabilities for all participants and beneficiaries. A participant's accrued liability equals the present value, at the participant's attained age, of future benefits less the present value at the participant's attained age of the individual normal costs payable in the future. A beneficiary's accrued liability equals the present value, at the beneficiary's attained age, of future benefits. The unfunded accrued liability equals the total accrued liability less the actuarial value of assets.

(d) Under this method, the entry age used for each active participant is the participant's age at the time he or she would have commenced participation if the plan had always been in existence under current terms, or the age as of which he or she first earns service credits for purposes of benefit accrual under the current terms of the plan.