

Employees' Retirement Fund of the City of Fort Worth

Annual Actuarial Valuation
as of December 31, 2019





April 15, 2020

Board of Trustees
Employees' Retirement Fund of the City of Fort Worth
3801 Hulen Street, Suite 101
Fort Worth, TX 76107

Re: Actuarial Valuation for Funding Purposes as of December 31, 2019

Members of the Board:

We certify that the information contained in this report is accurate and fairly presents the actuarial position of the Employees' Retirement Fund of the City of Fort Worth (FWERF) as of December 31, 2019. This report was prepared at the request of the Board and is intended for use by FWERF staff and those designated or approved by the Board. This report may be provided to parties other than FWERF only in its entirety and only with the permission of the Board.

Actuarial Valuation

The primary purposes of the actuarial valuation report are to determine the adequacy of the current City contribution rate, describe the current financial condition of FWERF, analyze changes in the condition of FWERF, and provide various summaries of the data. This report should not be relied on for any purpose other than the purposes described herein.

This report does not reflect the recent and still developing impact of COVID-19, which may significantly impact demographic and economic experience.

Plan Provisions

Our actuarial valuation as of December 31, 2019 reflects the benefit and contribution provisions set forth in Vernon's Texas Revised Civil Statutes, Article 6243i, Article I of Chapter 2.5 of the Code of the City of Fort Worth (City Code), and the Administrative Rules of FWERF. The current plan provisions are outlined in Appendix I of this report.

Actuarial Assumptions and Methods

The assumptions and methods applied in this actuarial valuation were adopted by the Board of Trustees on March 27, 2019 based on the experience investigation that covered the three-year period from January 1, 2016 through December 31, 2018. In accordance with the Administrative Rules of FWERF, all actuarial assumptions and methodologies must be adopted by the Board upon the advice of the Actuary.

We believe the assumptions are internally consistent and are reasonable, based on the actual experience of FWERF. The current actuarial assumptions and methods are outlined in Appendix II of this report.

The results of the actuarial valuation are dependent upon the actuarial assumptions used. Actual results can and almost certainly will differ, as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rates and funding periods. A review of the impact of a different set of assumptions on the funded status of FWERF is outside the scope of this actuarial valuation.

Data

The valuation was based upon information as of December 31, 2019, furnished by FWERF staff, concerning system benefits, financial transactions, plan provisions and active members, terminated members, retirees and beneficiaries. We checked for internal and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the information provided by FWERF staff.

Certification

All of our work conforms with generally accepted actuarial principles and practices, and to the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion, our calculations also comply with the requirements of, where applicable, the Internal Revenue Code and ERISA.

The signing actuaries are independent of the plan sponsor. They are each Enrolled Actuaries, Fellows of the Society of Actuaries, and Members of the American Academy of Actuaries, and meet the Qualification Standards of the American Academy of Actuaries. Finally, each of the undersigned are experienced in performing valuations for large public retirement systems.

Respectfully submitted,
Gabriel, Roeder, Smith & Company



R. Ryan Falls, FSA, EA, MAAA
Senior Consultant



Joseph P. Newton, FSA, EA, MAAA
Senior Consultant



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SECTION A

EXECUTIVE SUMMARY

Executive Summary

	December 31, 2019	December 31, 2018
Membership <ul style="list-style-type: none"> Number of <ul style="list-style-type: none"> - Active members 6,709 - Retirees and beneficiaries 4,679 - Inactive, vested 398 - Inactive, nonvested 769 - Total 12,555 Member Contributory Payroll \$ 514,764,656 City Contributory Payroll \$ 504,398,247 		<ul style="list-style-type: none"> 6,589 4,583 375 660 12,207 \$ 494,152,294 \$ 485,336,445
Effective Contribution Rates <ul style="list-style-type: none"> Members (after phase-in) 11.09% City 24.48% 		<ul style="list-style-type: none"> 11.10% 24.48%
Actuarially Determined City Contribution <ul style="list-style-type: none"> % of City Contributory Payroll 31.68% Amortization Period 29 years 	<ul style="list-style-type: none"> \$ 159,793,365 31.68% 29 years 	<ul style="list-style-type: none"> \$ 152,541,245 31.43% 30 years
Assets <ul style="list-style-type: none"> Market value (MVA) \$ 2,396,727,586 Actuarial value (AVA) \$ 2,400,393,264 Return on market value 15.2% Return on actuarial value 6.4% 		<ul style="list-style-type: none"> \$ 2,147,041,319 \$ 2,324,698,216 -3.6% 5.9%
Actuarial Information on AVA (smoothed) <ul style="list-style-type: none"> Normal cost % (exclude admin) 15.92% Total normal cost \$ 81,950,533 Actuarial accrued liability \$ 4,586,884,563 Unfunded actuarial accrued liability (UAAL) \$ 2,186,491,299 Funded ratio 52.3% 		<ul style="list-style-type: none"> 15.97% \$ 78,916,121 \$ 4,438,326,161 \$ 2,113,627,945 52.4%
Actuarial Information on MVA <ul style="list-style-type: none"> Unfunded actuarial accrued liability (UAAL) \$ 2,190,156,977 Funded ratio 52.3% 		<ul style="list-style-type: none"> \$ 2,291,284,842 48.4%

Executive Summary (continued)

Eliminating the UAAL

Based on the recent modifications made to FWERF, multiple funding periods are calculated as part of the actuarial valuation and used for different purposes:

1. The funding period and ADEC are calculated at the valuation date based on the current statutory contribution rates for members and the City, excluding Risk-Sharing Contributions and Ad Hoc COLAs, to determine if Risk-Sharing Contributions and Ad Hoc COLAs should be paid.

<u>Funding Period based on Actuarial Value of Assets</u>	2019	2018
Incorporating only statutory contribution rates	72 years	75 years
Period Dictated by Funding Policy	29 years	30 years
Employer Contribution Rate Necessary to Meet Funding Policy	31.68%	31.43%

<u>Funding Period based on Market Value of Assets</u>	2019	2018
Incorporating only statutory contribution rates	73 years	Infinite
Period Dictated by Funding Policy	29 years	30 years
Employer Contribution Rate Necessary to Meet Funding Policy	31.72%	33.56%

2. The funding period is also calculated to incorporate the projected Risk-Sharing Contributions and Ad Hoc COLAs which is the most reasonable estimate for the time until the UAAL is eliminated.

<u>Funding Period Incorporating Projected Risk Sharing Contributions and Ad Hoc COLAs</u>	2019	2018
Based on Actuarial Value of Assets	43 years	44 years
Based on Market Value of Assets	43 years	55 years

SECTION B

DISCUSSION

Discussion

Introduction

The results of the December 31, 2019 actuarial valuation of the Employees' Retirement Fund of the City of Fort Worth (FWERF) are presented in this report.

The primary purposes of the actuarial valuation report are to determine the adequacy of the current City contribution rate, describe the current financial condition of FWERF, analyze changes in the condition of FWERF, and provide various summaries of the data. This report should not be relied on for any purpose other than the purposes described herein.

This report does not reflect the recent and still developing impact of COVID-19, which may significantly impact demographic and economic experience. The risks to the plan may include the health of the members, decreases in payroll and contribution revenue, investment losses and plan mortality experience.

All of the tables referenced in the following discussion appear in Section C of this report.

Plan Provisions

There were no changes to the plan provisions during the past year. The current plan provisions are outlined in Appendix I of this report.

Actuarial Assumptions and Methods

The assumptions and methods applied in this actuarial valuation were adopted by the Board of Trustees on March 27, 2019 based on the experience investigation that covered the three-year period from January 1, 2016 through December 31, 2018. In accordance with the Administrative Rules of FWERF, all actuarial assumptions and methodologies must be adopted by the Board upon the advice of the Actuary. We believe the assumptions are internally consistent and are reasonable, based on the actual experience of FWERF.

The results of the actuarial valuation are dependent upon the actuarial assumptions used. Actual results can and almost certainly will differ, as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rates and funding periods. A review of the impact of a different set of assumptions on the funded status of FWERF is outside the scope of this actuarial valuation.

There were no changes to the actuarial assumptions and methods during the past year. The current actuarial assumptions and methods are outlined in Appendix II of this report.

Funding Adequacy

As outlined in the City Code and the Funding Policy adopted by the Board, the funding objective of FWERF is to fund the sum of the normal cost, the assumed administrative expenses, and an amount necessary to



eliminate the UAAL over a closed 30-year period beginning on December 31, 2018 with the goal of eliminating the UAAL and attaining a funded ratio of 100% by December 31, 2048. Contribution rates should be established which, over time, will remain level as a percent of payroll. As a result, the Actuarially Determined Employer Contribution (ADEC) is based on a closed 30-year amortization of the UAAL as a level percentage of payroll. This ADEC will be equal to the City's portion of the total contributions that are necessary to meet this funding objective and this ADEC is appropriate for use by the Board to monitor progress towards these funding goals.

FWERF receives member contributions in accordance with the following schedule based on Member Contributory Payroll. Effective July, 2019, Member Contributory Payroll changed to include earnings from unscheduled overtime.

	Previous Contribution Rate	Statutory Contribution Rates Effective July 2019	Statutory Contribution Rates Effective January 2020	Statutory Contribution Rates Effective January 2021
General Employees	8.25%	9.35%	9.35%	9.35%
Police Officers	8.73%	10.53%	12.53%	13.13%
Firefighters	8.25%	10.05%	12.05%	12.05%

Based on the current composition of the active plan population, the average member rate will be approximately 11.09% of the Member Contributory Payroll once all of the contribution rates are completely phased in.

Based on the current composition of the active plan population, the average City rate is approximately 24.48% of the City Contributory Payroll. The ADEC for 2020 is 31.68% of City Contributory Payroll, or \$159.8 million, which exceeds the expected City contribution by 7.20% of City Contributory Payroll. As a result, the stated funding objective is not being met.

City Contributory Payroll includes unscheduled overtime for Tier 1 members and does not include unscheduled overtime for Tier 2 members. A detailed description of compensation and contributions is included in Appendix I.

The City Code specifically defines an actuarially determined contribution (ADC) as a contribution "based on a closed 30-year funding of unfunded liabilities." In this context, the ADC is the sum of the anticipated member contributions and the City contributions. Since the City and the members contribute on a different payroll basis, it would not be accurate to add the City and member contribution rates together. As a result, the actuarial valuation will focus on the Actuarially Determined Employer Contribution (ADEC) for purposes of reporting required contribution rates so it is clear which payroll basis is being considered. However, the ADEC will simply be determined as the projected ADC less the anticipated member contributions.

The unfunded actuarial accrued liability (UAAL) of FWERF increased from \$2.11 billion as of December 31, 2018 to \$2.19 billion as of December 31, 2019. The UAAL was expected to increase to \$2.18 billion as of December 31, 2019 but the plan incurred a net experience loss of \$5 million which

increased the UAAL to \$2.19 billion. The primary sources of the experience changes were a \$14 million loss on the actuarial valuation of assets, which was offset by a \$9 million gain on liabilities. Table 8 demonstrates the calculation of the expected UAAL and summarizes the sources of actuarial experience for the past year.

Additionally, the funded ratio of FWERF—actuarial value of assets divided by the actuarial accrued liability—decreased from 52.4% to 52.3% as of December 31, 2019. The funded status is one of many metrics used to show trends and develop future expectations about the health of a retirement system. The funded status measure itself is not appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan’s benefit obligations or assessing the need for or the amount of future contributions since it does not reflect normal cost contributions, the timing of amortization payments, or future experience other than expected.

Table 1 provides a summary of the actuarial valuation results and details the calculation of the ADEC. Tables 2 and 3 provide additional detail regarding the Actuarial Present Value of Future Benefits and the Normal Cost, respectively. Finally, Table 4 provides a history of the funded status of FWERF.

Impact of Risk-Sharing Contributions and Ad Hoc COLA Provisions

The current statutory contribution rates for members and the City are expected to eliminate the UAAL in 72 years. As previously stated, the funding objective is to eliminate the UAAL by the year 2048. Since this funding objective is not being met, it is anticipated that the members and City will both be required to make risk-sharing contributions to the plan beginning in 2022. Specifically, the City and member contributions will be increased as required to meet the ADC with 60% of the increases allocated to the City and the remaining 40% allocated to the members. The annual increase in the total contribution rate will be capped at 2% of pay and the aggregate increase will be capped at 4% of pay.

Based on results of this actuarial valuation, it is anticipated that the risk-sharing contributions will commence in 2022 at a combined 2% of pay (the maximum level) and increase in 2023 to a combined 4% of pay (the maximum level) through 2061.

As the funded status of the plan continues to improve, members that elected the Conditional Ad Hoc COLA will begin to receive increases once the funding period reaches 28 years, or less. **Based on results of this actuarial valuation, it is anticipated that the Conditional Ad Hoc COLAs will be paid on an annual basis beginning in 2041.**

Finally, when the impact of the risk-sharing contributions and Conditional Ad Hoc COLAs are incorporated into the projection of the UAAL, the UAAL is projected to be eliminated in 43 years. This period exceeds the 40-year period outlined in Section 802.2015 of the Texas Government Code pertaining to the requirements for a Funding Soundness Restoration Plan. Additionally, the Pension Funding Guidelines issued by the Texas Pension Review Board target a funding period of 10 to 25 years, with 30 years as a maximum. The Board should consider how and when further modifications to the program are needed to bring the funding period within an acceptable range.

System Assets

This report contains several tables that summarize key information with respect to the FWERF assets.

The total market value of assets increased from \$2.15 billion to \$2.40 billion as of December 31, 2019. Table 5 reconciles the changes in the fund during the year. Total contributions increased from \$132 million to \$162 million and total benefit payments (retirement benefits plus refunds) increased from \$223 million to \$227 million.

Table 6 shows the development of the actuarial value of assets (AVA). The AVA is a “smoothed” market value. A smoothed value is used in order to dampen some of the year-to-year fluctuations that would occur if the market value were used instead. The method phases in differences between the actual and expected market returns over five years. Additionally, offsetting unrecognized gains and losses are recognized immediately. The actuarial value is currently 0.2% more than the market value.

The approximate investment return for the fiscal year ending December 31, 2019 was 15.2% when measured on market value and 6.4% when measured on actuarial value. Table 7 shows a history of return rates. The FWERF ten-year average market return, calculated consistent with the actuarial assumptions with respect to expenses, is 7.0%.

Data

The valuation was based upon information as of December 31, 2019, furnished by FWERF staff, concerning system benefits, financial transactions, plan provisions and active members, terminated members, retirees and beneficiaries. We checked for internal and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the information provided by FWERF staff.

The tables in Appendix III show key census statistics for the various groups included in the valuation.

SECTION C

TABLES

Table 1**Development of Employer Cost**

	<u>December 31, 2019</u>	<u>December 31, 2018</u>
1. Payroll		
a. Member Contributory Payroll	\$ 514,764,656	\$ 494,152,294
b. City Contributory Payroll	504,398,247	\$ 485,336,445
2. Normal Cost Rate (of Member Contributory Payroll)		
a. Total Normal Cost Rate	15.92%	15.97%
b. Effective Member Contribution Rate (Ultimate)	11.09%	11.10%
c. City Normal Cost Rate (Item 2a - Item 2b)	4.83%	4.87%
3. Actuarial Accrued Liability for Active Members		
a. Present value of future benefits for active members	\$ 2,663,122,879	\$ 2,593,438,990
b. Less: present value of future normal costs	<u>(725,862,662)</u>	<u>(709,494,539)</u>
c. Actuarial accrued liability	\$ 1,937,260,217	\$ 1,883,944,451
4. Total Actuarial Accrued Liability for:		
a. Retirees and beneficiaries	\$ 2,577,229,846	\$ 2,492,013,634
b. Inactive members	72,394,500	62,368,076
c. Active members (Item 3c)	<u>1,937,260,217</u>	<u>1,883,944,451</u>
d. Total	\$ 4,586,884,563	\$ 4,438,326,161
5. Actuarial Value of Assets (AVA)	\$ 2,400,393,264	\$ 2,324,698,216
6. Unfunded Actuarial Accrued Liability (UAAL) (Item 4d - Item 5)	\$ 2,186,491,299	\$ 2,113,627,945
7. Actuarially Determined City Contribution Needed to Fund Normal Cost, Admin Expenses and Amortize the UAAL by 2048 Disregarding Risk Sharing Contributions		
a. Total (MOY)	\$ 159,793,365	\$ 152,541,245
b. % of City Contributory Payroll	31.68%	31.43%
8. Funding period based on statutory contribution rates and AVA (years)	72	75
9. Funding period incorporating Risk Sharing Contributions, Conditional Ad Hoc COLAs and AVA (years)	43	44

Table 2

Actuarial Present Value of Future Benefits

	<u>December 31, 2019</u>	<u>December 31, 2018</u>
1. Active Members		
a. Retirement benefits	\$ 2,464,141,870	\$ 2,396,266,206
b. Disability benefits	5,799,279	5,835,216
c. Pre-retirement death benefits	18,988,169	18,970,911
d. Termination	<u>174,193,561</u>	<u>172,366,657</u>
e. Total	\$ 2,663,122,879	\$ 2,593,438,990
2. Inactive Members	\$ 72,394,500	\$ 62,368,076
3. Annuitants	\$ 2,577,229,846	\$ 2,492,013,634
4. Total Actuarial Present Value of Future Benefits	\$ 5,312,747,225	\$ 5,147,820,700

Table 3
Analysis of Normal Cost

	<u>Amount (MOY)</u>	<u>Percentage of Member Contributory Payroll</u>
1. Gross Normal Cost		
a. Retirement benefits	\$ 66,559,070	12.93%
b. Disability benefits	411,812	0.08%
c. Pre-retirement death benefits	978,053	0.19%
d. Termination	<u>14,001,598</u>	<u>2.72%</u>
e. Total	\$ 81,950,533	15.92%
2. Expected Member Contributions	\$ 57,087,400	11.09%
3. Net City Normal Cost	\$ 24,863,133	4.83%
4. Assumed Administrative Expenses	\$ 5,600,000	1.09%

Table 4
Schedule of Funding Progress

Valuation Date	Actuarial Value of Assets (AVA)	Actuarial Accrued Liability (AAL)	Unfunded Actuarial Accrued Liability (UAAL) (3) - (2)	Funded Ratio (2)/(3)	Annual Covered Payroll	UAAL as % of Payroll (4)/(6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
December 31, 2007	\$ 1,821,688,380	\$ 2,059,232,093	\$ 237,543,713	88.5%	\$ 359,308,283	66.1%
December 31, 2008	1,596,392,591	2,192,128,182	595,735,591	72.8%	372,942,445	159.7%
December 31, 2009	1,868,805,569	2,300,542,572	431,737,003	81.2%	368,334,524	117.2%
December 31, 2010	1,894,740,077	2,473,704,487	578,964,410	76.6%	367,639,226	157.5%
December 31, 2011	1,869,656,263	2,617,862,133	748,205,870	71.4%	383,801,802	194.9%
December 31, 2012	1,854,871,487	2,909,019,272	1,054,147,785	63.8%	375,687,978	280.6%
December 31, 2013	1,995,112,935	3,124,079,563	1,128,966,628	63.9%	373,848,113	302.0%
December 31, 2014	2,094,381,418	3,365,534,522	1,271,153,104	62.2%	389,527,874	326.3%
December 31, 2015	2,154,874,311	3,553,200,981	1,398,326,670	60.6%	404,303,585	345.9%
December 31, 2016	2,209,893,867	3,780,554,300	1,570,660,433	58.5%	433,956,825 *	361.9%
December 31, 2017	2,288,265,169	3,956,724,359	1,668,459,190	57.8%	460,564,650 *	362.3%
December 31, 2018	2,324,698,216	4,438,326,161	2,113,627,945	52.4%	485,336,445 *	435.5%
December 31, 2019	2,400,393,264	4,586,884,563	2,186,491,299	52.3%	504,398,247 *	433.5%

* City Contributory Payroll

Table 5**Reconciliation of Plan Net Assets**

	Year Ending	
	December 31, 2019 (1)	December 31, 2018 (2)
1. Market value of assets at beginning of year	\$ 2,147,041,319	\$ 2,323,717,570
2. Revenue for the year		
a. Contributions for the year		
i. City Contributions	\$ 118,623,667	\$ 94,277,090
ii. Member Contributions	43,149,897	37,884,449
iii. Total	<u>\$ 161,773,564</u>	<u>\$ 132,161,539</u>
b. Net investment income	\$ 320,580,906	\$ (81,137,536)
c. Total revenue	\$ 482,354,470	\$ 51,024,003
3. Disbursements for the year		
a. Retirement benefits	\$ 221,241,199	\$ 218,018,676
b. Refunds paid	5,895,427	4,715,456
c. Administrative expenses	5,531,577	4,966,122
d. Total expenditures	<u>232,668,203</u>	<u>227,700,254</u>
4. Increase in net assets (Item 2c - Item 3d)	\$ 249,686,267	\$ (176,676,251)
5. Market value of assets at end of year (Item 1 + Item 4)	\$ 2,396,727,586	\$ 2,147,041,319
6. Estimated dollar weighted market yield	15.2%	-3.6%

Table 6

Development of Actuarial Value of Assets

	Year Ending December 31, 2019					
1. Market value of assets at beginning of year	\$ 2,147,041,319					
2. Net new investments						
a. Contributions	\$ 161,773,564					
b. Disbursements	(232,668,203)					
c. Subtotal	\$ (70,894,639)					
3. Market value of assets at end of year	\$ 2,396,727,586					
4. Net earnings (3-1-2c)	\$ 320,580,906					
5. Assumed investment return rate	7.00%					
6. Expected return	\$ 147,811,580					
7. Excess return (4-6)	\$ 172,769,326					
8. Development of amounts to be recognized as of December 31, 2019:						
	Remaining Deferrals of Excess (Shortfall) of	Offsetting of	Net Deferrals	Years	Recognized for	Remaining after
Year	Investment Income	Gains/(Losses)	Remaining	Remaining	this valuation	this valuation
	(1)	(2)	(3) = (1) + (2)	(4)	(5) = (3) / (4)	(6) = (3) - (5)
2015	\$ 0	\$ 0	\$ 0	1	\$ 0	\$ 0
2016	0	0	0	2	0	0
2017	0	0	0	3	0	0
2018	(177,656,897)	172,769,326	(4,887,571)	4	(1,221,893)	(3,665,678)
2019	172,769,326	(172,769,326)	0	5	0	0
Total	\$ (4,887,571)	\$ 0	\$ (4,887,571)		\$ (1,221,893)	\$ (3,665,678)
9. Preliminary actuarial value of assets (3-8)	\$ 2,400,393,264					
10. 80% of market value	\$ 1,917,382,069					
11. 120% of market value	\$ 2,876,073,103					
12. Actuarial value of assets (9 not less than 10 or greater than 11)	\$ 2,400,393,264					
13. Actuarial value as percentage of market value	100.2%					
14. Estimated actuarial value yield	6.4%					

Table 7

History of Investment Return Rates

Year Ending December 31 of (1)	Market (2)	Actuarial (3)
2007	5.3%	11.5%
2008	-29.1%	-11.4%
2009	21.3%	18.9%
2010	10.8%	2.7%
2011	-0.3%	0.0%
2012	11.0%	1.0%
2013	12.1%	10.0%
2014	4.7%	7.6%
2015	-0.3%	5.4%
2016	8.0%	6.2%
2017	14.6%	7.2%
2018	-3.6%	5.9%
2019	15.2%	6.4%
Average Returns		
Last Five Years:	6.5%	6.2%
Last Ten Years:	7.0%	5.2%

Table 8

Total Experience Gain or Loss

Item (1)	Year Ending December 31, 2019 (2)
A. Calculation of total actuarial gain or loss	
1. Unfunded actuarial accrued liability (UAAL), previous year	\$ 2,113,627,945
2. Normal cost for the year (excluding administrative expenses)	78,916,121
3. Actual administrative expenses	5,531,577
4. Contributions for the year	(161,773,564)
5. Interest at 7.00%	
a. On UAAL	\$ 147,953,956
b. On normal cost and administrative expenses	2,955,669
c. On contributions	(5,662,075)
d. Total	\$ 145,247,550
6. Assumption change (Gains)/Losses	\$ 0
7. Plan changes	0
8. Expected UAAL (Sum of Items 1 through 7)	2,181,549,629
9. Actual UAAL	2,186,491,299
10. Total (gain)/loss for the year (Item 9 - Item 8)	\$ 4,941,670
B. Source of gains and losses	
	% of AAL
11. Asset (Gain)/Loss for the year	0.30% \$ 13,657,876
12. Pay Increases (Less)/Greater than Expected	0.10% 4,571,858
13. Non-Retired Demographic (Gains)/Losses	0.11% (5,198,796)
14. Post-Retirement Mortality (Gains)/Losses	0.26% (11,855,191)
15. Other (Gains)/Losses	0.08% 3,765,923
16. Total (Sum of Items 11 through 15)	0.11% \$ 4,941,670

APPENDICES

Summary of Plan Provisions for Employees' Retirement Fund of the City of Fort Worth

Membership

Membership in the Fund is a condition of employment for all City employees, except:

Elected officers and non-salaried appointed members of administrative boards and commissions,
Part-time, temporary and contract employees, and
Employees paid partly by a county, state, or other governmental agency.

Categories of Members

- Tier I: General Employees hired prior to July 1, 2011
 Police Officers hired prior to January 1, 2013
 Firefighters hired prior to January 10, 2015
- Tier II: General Employees hired on or after July 1, 2011
 Police Officers hired on or after January 1, 2013
 Firefighters hired on or after January 10, 2015

Benefit Service

- Blue: Earned prior to October 1, 2013 for Tier I General Employees and Police Officers
 Earned prior to January 10, 2015 for Tier I Firefighters
- Orange: Earned between October 1, 2013 and July 19, 2019 for Tier I General Employees and Police Officers
 Earned between January 10, 2015 and July 19, 2019 for Tier I Firefighters
 Earned prior to July 20, 2019 for Tier II members
- Gray: Earned on or after July 20, 2019 for all members

Compensation

Regular Earnings include base salary, acting pay, longevity, education incentive, assignment pay, holiday, safety award, shift differential, incentive pay, built-in overtime for firefighters, and any weekly Worker's Compensation benefits. For Tier 1 members, Regular Earnings also includes vacation sellback and wellness pay. Earnings with Overtime are Regular Earnings plus unscheduled overtime.



Summary of Plan Provisions for Employees' Retirement Fund of the City of Fort Worth (continued)

Contributions

General Employees	9.35% of Member Contributory Payroll
Police Officers	10.53% of Member Contributory Payroll; increasing to 12.53% effective January, 2020, and 13.13% effective January, 2021
Firefighters	10.05% of Member Contributory Payroll; increasing to 12.05% effective January, 2020
City	24.24% of City Contributory Payroll for General Employees and Firefighters and 24.96% of City Contributory Payroll for Police Officers

Effective July, 2019, General Employees contribute an additional 0.7% of Member Contributory Payroll until the earliest of the following: 1) the member retires; 2) the member terminates employment; or 3) the member has made additional 0.7% contributions for a period of time that is equal to the amount of credited service the member earned or purchased prior to October 1, 2013.

Member Contributory Payroll is Earnings with Overtime for all members. City Contributory Payroll is Earnings with Overtime for Tier 1 members and Regular Earnings for Tier 2 members.

If the total contribution is less than the ADC for two consecutive years, the City and member contributions will be increased as required to meet the ADC with 60% of the increases allocated to the City and the remaining 40% allocated to the members. The annual increase in the total contribution rate will be capped at 2% of pay and the aggregate increase will be capped at 4% of pay. These increases cannot commence prior to January 1, 2022.

Final Average Compensation (FAC)

Average of highest compensation as noted below:

Blue Service:	Earnings with Overtime earned over three calendar years
Orange Service:	Regular Earnings earned over five calendar years
Gray Service:	Regular Earnings earned over five calendar years

For members who were not vested on October 23, 2007, increases in calendar year earnings used to determine Final Average Compensation for Blue Service benefits are subject to a 12% cap.

Summary of Plan Provisions for Employees' Retirement Fund of the City of Fort Worth (continued)

Normal (Unreduced) Retirement

Eligibility

- Age 65 with 5 years of eligibility service, or
- Age plus years of eligibility service equal at least 80 (minimum age of 55 for Tier II General Employees), or
- For Police Officers, any age with 25 years of eligibility service (Special Retirement).

Benefit Formula

- 3.00% of Blue Service FAC multiplied by years of Blue Benefit Service, plus
- 2.50% of Orange Service FAC multiplied by years of Orange Benefit Service, plus
- 2.50% of Gray Service FAC multiplied by years of Gray Benefit Service.

Early (Reduced) Retirement

Eligibility

- Age 50 with 5 years of eligibility service (minimum age of 55 for Tier II General Employees)

Benefit Formula

- 2.75% of Blue Service FAC multiplied by years of Blue Benefit Service and ERF, plus
- 2.25% of Orange Service FAC multiplied by years of Orange Benefit Service and ERF, plus
- 2.25% of Gray Service FAC multiplied by years of Gray Benefit Service and ERF.

Early Retirement Factor (ERF)

- 5/12% for each month the pension commences before the member's Normal Retirement Date (the date the member would have first become eligible for Normal Retirement had they remained in active service)

In Line of Duty Disability Retirement

Eligibility

- No minimum age or service requirements

Benefit Formula

- Tier I: 2.75% of Blue Service FAC multiplied by years of Blue Benefit Service, plus
2.75% of Orange Service FAC multiplied by years of Orange Benefit Service, plus
2.75% of Gray Service FAC multiplied by years of Gray Benefit Service.
- Tier II: 2.25% of Orange Service FAC multiplied by years of Orange Benefit Service, plus
2.25% of Gray Service FAC multiplied by years of Gray Benefit Service.

Special Provision

- Gray Benefit Service is projected to Normal Retirement Date.



Summary of Plan Provisions for Employees' Retirement Fund of the City of Fort Worth (continued)

Not In Line of Duty Disability Retirement

Eligibility

5 years of eligibility service

Benefit Formula

2.75% of Blue Service FAC multiplied by years of Blue Benefit Service, plus
2.25% of Orange Service FAC multiplied by years of Orange Benefit Service, plus
2.25% of Gray Service FAC multiplied by years of Gray Benefit Service.

Deferred Vested Benefit – Normal and Early Vested Retirement

Eligibility

5 years of eligibility service

Benefit Formula

Same formula applicable to either Early Retirement or Normal Retirement

Commencement Date

Member may elect to commence on either Early Retirement Date or Normal Retirement Date (the dates the member would have first become eligible for Early or Normal Retirement had they remained in active service)

Termination Benefit

A refund of employee contributions with interest is payable in cases where a terminated member does not meet the eligibility requirements for an annuity or chooses to receive a refund of their account balance in lieu of an annuity. Interest accrues at an annual rate based on the two-year Treasury bill rate on the last pay date of the calendar year but stops accruing after termination.

Summary of Plan Provisions for Employees' Retirement Fund of the City of Fort Worth (continued)

In Line of Duty Death Benefit – Active Member

Eligibility

No minimum age or service requirements

Benefit Formula

- Tier I: 3.00% of Blue Service FAC multiplied by years of Blue Benefit Service, plus
3.00% of Orange Service FAC multiplied by years of Orange Benefit Service, plus
3.00% of Gray Service FAC multiplied by years of Gray Benefit Service.
- Tier II: 2.50% of Orange Service FAC multiplied by years of Orange Benefit Service, plus
2.50% of Gray Service FAC multiplied by years of Gray Benefit Service.

Special Provision

Gray Benefit Service is projected to Normal Retirement Date. If member has reached their Normal Retirement Date, benefit formula for Normal Retirement will apply.

Benefit Options

- i. Spouse receives 75% of accrued pension projected to Normal Retirement Date, but not less than \$250 per month. In addition, each dependent child will receive \$100 per month.
- ii. If the member does not have a surviving spouse or other named survivor, beneficiary dependent children under 18 will equally share the total of 75% of accrued pension projected to Normal Retirement Date, but not less than \$250 per month.
- iii. If the member does not have a surviving spouse or dependent children, their dependent parent(s) will receive the pension that would have been paid to the spouse.
- iv. If the member does not have a surviving spouse, dependent children or dependent parent(s), their beneficiary shall receive a refund of employee contributions with interest.

Summary of Plan Provisions for Employees' Retirement Fund of the City of Fort Worth (continued)

Not In Line of Duty Death Benefit – Active Member

Eligibility

5 years of eligibility service

Benefit Formula

2.75% of Blue Service FAC multiplied by years of Blue Benefit Service, plus
2.25% of Orange Service FAC multiplied by years of Orange Benefit Service, plus
2.25% of Gray Service FAC multiplied by years of Gray Benefit Service.

Special Provision

If member has reached their Normal Retirement Date, benefit formula for Normal Retirement will apply.

Benefit Options

- i. Spouses receive 75% of accrued pension, but not less than \$150 per month. In addition, each dependent child will receive \$100 per month.
- ii. If the member does not have a surviving spouse or other named survivor, beneficiary dependent children under 18 will equally share the total of 75% of accrued pension projected to Normal Retirement Date, but not less than \$150 per month.
- iii. If the member does not have a surviving spouse or dependent children, their dependent parent(s) will receive the pension that would have been paid to the spouse.
- iv. If the member does not have a surviving spouse, dependent children or dependent parent(s), their beneficiary shall receive a refund of employee contributions with interest.

Death Benefit – Terminated Vested Member

If the member's years of age and years of eligibility service total at least 65 as of the date of the member's termination, the member's spouse and/or dependents are entitled to the same benefit as a member who dies while Not In Line of Duty.

If the member's age and years of service do not total at least 65, the surviving spouse and dependents may either:

- i. Take a refund of employee contributions plus interest, or,
- ii. Be eligible for the survivor benefit of 75% at the date the member would have been eligible to draw the benefit of Normal Vested Retirement or Early Vested Retirement.

If the member has no surviving spouse, dependent children or dependent parents, the beneficiary is entitled to a refund of employee contributions plus interest.

Summary of Plan Provisions for Employees' Retirement Fund of the City of Fort Worth (continued)

Death Benefit – Post-Retirement

Tier I

If married at least one year prior to retirement, pension benefits are paid in the form of a 75% joint and survivor annuity unless this form is rejected by the member and spouse. Unmarried members may elect to receive an actuarially reduced pension in the form of a 100%, 75%, 50% or 25% joint and survivor annuity with pop-up. Members that were not married at least one year prior to retirement may, after they have been married for two years, elect to receive an actuarially reduced pension in the form of a 75% joint and survivor annuity with pop-up.

Tier II

Members may elect an actuarially reduced pension in the form of a 100%, 75%, 50% or 25% joint and survivor annuity with pop-up.

Additionally, upon the death of the member, any children under 18 years of age will receive \$100 per month until the attainment of age 18 or marriage. If after pension benefits cease the total amount of benefits paid to member and their survivors is less than the member's aggregate employee contributions with interest, the excess will be paid to member's designated beneficiary or estate.

Sick Leave and Major Medical Leave

In addition to regular benefit service, unused major medical leave for general employees and unused and unpaid Civil Service sick leave for police officers and firefighters is converted to benefit service at the time of retirement. This service cannot be used to reach retirement eligibility.

Only that portion of a member's accumulated sick leave and major medical leave that was earned prior to July 20, 2019 and that remains unused as of the date the person retires shall be taken into account in calculating that member's credited service, provided, however, that such balance shall never be taken into account in calculating the pension of a member receiving a line of duty disability pension.

Overtime Contribution (Cash Balance) Account

Contributions on overtime pay for Tier II General Employees who were employed between July 1, 2011 and September 30, 2013 were put in a "cash balance" account. Interest on this account accrues at an annual rate based on the two-year Treasury bill rate on the last pay date of the calendar year. Upon separating from service, the balance in this account will be paid to the member in the form of a lump sum payment. If at time of separation the member is eligible for retirement, the lump sum payout amount will be doubled.

Partial Lump Sum (Actuarial Equivalent) Option

Member's eligible for Normal Retirement may elect to reduce their retirement benefit between 5% and 25% and receive the actuarial value of that reduction in a one-time lump sum payment.



Summary of Plan Provisions for Employees' Retirement Fund of the City of Fort Worth (continued)

Cost-of-Living Adjustment (COLA)

Tier I members are eligible for an annual increase to their Blue and Orange retirement benefits effective January 1, if they were receiving benefits prior to September 30 of the preceding year. Blue benefits may be increased by either the Guaranteed 2% COLA or the Conditional Ad Hoc COLA. Orange benefits are increased by the Guaranteed 2% COLA.

Tier II members are not eligible for a COLA.

Guaranteed 2% COLA

2% increase of base pension (simple interest)

Conditional Ad Hoc COLA

Varying increase of base pension plus aggregate COLAs (compound interest) depending on the funding period needed to pay off the Unfunded Actuarial Accrued Liability of the Plan

Funding Period	COLA Increase
28.1 or greater	0.0%
24.1 to 28.0	2.0%
18.1 to 24.0	3.0%
18.0 or less	4.0%

COLA increases are determined based on the prior year's valuation results. If the COLA increase causes the preliminary funding period to increase to a level that corresponds with a lower COLA increase, the lower COLA increase applies.

Members are not entitled to a COLA for any credited service earned on or after July 20, 2019.

Members who have not retired or entered the DROP effective January 1, 2021 will have Guaranteed and Condition Ad Hoc COLAs eliminated for all past and future service. These members may be granted a Variable COLA if the current contribution rate exceeds the closed 30-year funding policy for two consecutive years and the Variable COLA is approved by the FWERF Board of Trustees and the Fort Worth City Council.

Summary of Plan Provisions for Employees' Retirement Fund of the City of Fort Worth (continued)

Deferred Retirement Option Program (DROP)

Actives members that are eligible for Normal Retirement may elect to participate in DROP. Upon entering DROP, benefit service and FAC are frozen. Then, an amount equal to the member's monthly pension benefit is credited to a DROP account. Member and City contributions continue during the DROP period. When separating from service, the member will be entitled to receive both the monthly pension benefit and payment of the DROP account balance. Interest is not credited to the DROP account.

The DROP account balance will continue to accrue for a maximum period of 72 months. Upon retirement, the member's pension benefit will be recalculated to include any additional benefit service accrued for unused sick leave and major medical leave. If the member completes at least two years of service after entering DROP, their pension benefit will include any retroactive COLAs accrued during the DROP period.

The following payment options are available for distribution of DROP account balances:

- Defer payment(s) until a later start date with the latest possible benefit commencement date being April 1st of the calendar year following the year in which the member attains age 70 ½
- A lump sum payment
- Periodic payments of a designated amount
- Periodic payments over a designated period of time
- Life expectancy calculation
- Combination of a lump sum and periodic payments
- A defined benefit annuity

Members that retain their DROP account after leaving active service will receive interest credits on their balance consistent with the actual investment returns for the trust.

Summary of Actuarial Assumptions and Methods

The assumptions and methods applied in this actuarial valuation were adopted by the Board of Trustees on March 27, 2019 based on the experience investigation that covered the three-year period from January 1, 2016 through December 31, 2018. In accordance with the Administrative Rules of FWERF, all actuarial assumptions and methodologies must be adopted by the Board upon the advice of the Actuary.

I. Valuation Date

The valuation date is December 31 of each plan year. This is the date as of which the actuarial present value of future benefits and the actuarial value of assets are determined.

II. Actuarial Cost Method

The actuarial valuation is used to determine the adequacy of the current City contribution rate, describe the current financial condition of FWERF, analyze changes in the condition of FWERF, and provide various summaries of the data.

The actuarial valuation uses the Entry Age Normal (EAN) actuarial cost method. Under this method, the first step is to determine the contribution rate (level as a percentage of pay) required to provide the benefits to each member, or the normal cost rate. The normal cost rate consists of two pieces: (i) the member's contribution rate, and (ii) the remaining portion of the normal cost rate which is the employer's normal cost rate. Further, the total normal cost was determined using the "replacement life" application of EAN where the normal cost is based on each member's current benefit structure as though it has always been in place.

The Unfunded Actuarial Accrued Liability (UAAL) is the liability for future benefits which is in excess of (i) the actuarial value of assets, and (ii) the present value of future normal costs. The employer contribution provided in excess of the employer normal cost is applied to amortize the UAAL.

The projected funded status and the ADEC are calculated based on the assumption that: (a) future market earnings, net of investment-related expenses, will equal 7.00% per year, (b) there will be no liability gains/losses or changes in assumptions, (c) active members who leave employment will be replaced by new entrants each year such that the Member Contributory Payroll grows at the same rate as the payroll growth assumption, and (d) contributions will remain the same percentage of payroll as described in Appendix I.

The Entry Age actuarial cost method is an "immediate gain" method (i.e., experience gains and losses are separately identified as part of the UAAL). However, they are amortized over the same period applied to all other components of the UAAL.

Summary of Actuarial Assumptions and Methods (continued)

III. Actuarial Value of Assets

The actuarial value of assets is based on the market value of assets with a five-year phase-in of actual investment returns in excess of (less than) expected investment income. Offsetting unrecognized gains and losses are immediately recognized, with the shortest remaining bases recognized first and the net remaining bases continuing to be recognized on their original timeframe. Expected investment income is determined using the assumed investment return rate and the market value of assets (adjusted for receipts and disbursements during the year). In no event will this amount exceed 120% of market value or be less than 80% of market value.

IV. Actuarial Assumptions

Investment Return: 7.00% per year, net of investment-related expenses (composed of an assumed 2.50% inflation rate and a 4.50% real rate of return)

Mortality Decrements:

Pre-retirement

PubG-2010 Employee Mortality Table for General Employees and PubS-2010 Employee Mortality Table for Police Officers and Firefighters. Generational mortality improvements projected from the year 2010 using the ultimate mortality improvement rates in the MP tables.

Healthy Annuitants

PubG-2010 Healthy Retiree Mortality Table for General Employees and PubS-2010 Healthy Retiree Mortality Table for Police Officers and Firefighters. Generational mortality improvements projected from the year 2010 using the ultimate mortality improvement rates in the MP tables. The mortality for all surviving beneficiaries will be based on the PubG-2010 Healthy Retiree Mortality Table.

Disabled Annuitants

PubG-2010 Disability Mortality Table for General Employees and PubS-2010 Disability Mortality Table for Police Officers and Firefighters. Generational mortality improvements projected from the year 2010 using the ultimate mortality improvement rates in the MP tables.

In Line of Duty Death

The percentage of pre-retirement deaths assumed to be in the line of duty are:

General Employees:	0%
Police Officers:	10%
Firefighters:	10%

Summary of Actuarial Assumptions and Methods (continued)

Service Retirement Decrements:

Members Who Reach 80 Points Before Age 65

The following rates reflect the members expected departure from active service and are applied based on years since first becoming eligible for Normal Retirement:

Year of Eligibility	General Employees	Police Officers	Firefighters
1 st	30%	15%	5%
2 nd	15	10	5
3 rd	20	10	10
4 th	25	20	10
5 th	25	30	25
6 th	35	50	50
7 th	35	50	50
8 th	35	50	50
9 th	35	50	50
10 th	100	100	100

Tier 2 General Employees who reach 80 points (age plus years of eligibility service) prior to age 55 will have their retirement rate increased by 20% in their first year of eligibility.

All members eligible for Normal Retirement prior to January 1, 2021 are assumed to enter DROP and retain their COLA election.

Members Who Do Not Reach 80 Points Before Age 65

The following rates reflect the members expected departure from active service and are applied based on the member's age:

Age	General Employees	Police Officers	Firefighters
65-69	27.5%	100%	100%
70+	100	100	100

Summary of Actuarial Assumptions and Methods (continued)

Service Retirement Decrements (continued):

Early (Reduced) Retirement

Police Officers and Firefighters have zero assumed probability of retiring prior to eligibility for Normal (Unreduced) Retirement. The following age-based rates apply for General Employees:

Age	General Employees
50-56	1.5%
57-58	2.5
59-61	3.5
62	8.0
63-64	2.5

Deferred Retirement Option Program (DROP)

Every member who reaches Normal (Unreduced) Retirement eligibility prior to age 65 is assumed to enter DROP, leave active service in accordance with the assumed retirement rates, and have participated in DROP for the maximum possible period upon departure from active service.

Inactive Vested Participants

Members that terminate with a vested benefit are assumed to choose the most valuable option available to them at the time of termination: withdrawal of contributions or deferred annuity. Dependents of vested members that die prior to reaching Normal Retirement are assumed to elect a withdrawal of contributions.

Disability Retirement Decrements:

Disability Rates

Rates for males and females at selected ages are shown below:

Age	Rate
20	0.005%
25	0.006
30	0.009
35	0.013
40	0.018
45	0.027
50	0.044
55	0.076
60	0.100

Summary of Actuarial Assumptions and Methods (continued)

Disability Retirement Decrements (continued):

In Line of Duty Disability

The percentage of disability retirements assumed to be in the line of duty are:

General Employees:	0%
Police Officers:	40%
Firefighters:	15%

Termination Decrements for Reasons Other Than Death or Retirement:

Withdrawal Rates

The following service-based rates apply:

Years of Service	General Employees	Police Officers	Firefighters
0	22.0%	7.0%	3.0%
1	15.0	2.0	0.5
2	14.0	1.8	0.5
3	11.0	1.6	0.5
4	9.0	1.5	0.5
5		1.4	0.5
6	<i>See age-based termination rates after five years of employment</i>	1.3	0.5
7		1.2	0.5
8		1.1	0.5
9-11		1.0	0.5
12-16		1.0	0.4
17+		0.6	0.4

After the first five years of employment, age-based rates apply as shown below for General Employees:

Age	Rate
25-29	11.5%
30-34	7.5
35-39	6.0
40-44	5.0
45-49	4.5
50-54	3.2
55-59	2.3
60-64	2.0

All rates of termination are zero for members eligible for Normal Retirement.

Summary of Actuarial Assumptions and Methods (continued)

Salary Increases: Increases are assumed to occur at the beginning of the valuation year and vary by employee group. Salary increases include an underlying inflation component of 2.50% and a productivity component of 0.75%.

Years of Service	General Employees	Police Officers	Firefighters
0	5.85%	28.25%	18.25%
1	5.65	18.25	15.25
2	5.45	8.25	8.25
3	5.25	8.25	9.75
4	5.05	8.25	9.75
5	4.85	5.75	5.75
6	4.65	4.50	3.25
7	4.45	4.50	3.25
8	4.25	4.50	4.75
9	4.05	4.50	4.75
10	3.85	4.50	3.25
11	3.65	4.50	3.25
12	3.45	4.50	3.25
13	3.25	4.50	4.75
14	3.25	5.75	4.75
15	3.25	5.75	3.25
16	3.25	5.75	3.25
17	3.25	5.75	3.25
18	3.25	4.50	3.25
19+	3.25	3.25	3.25

Valuation Payroll is the expected Regular Earnings for the calendar year following the valuation date. It is generally based on the actual pay for the prior year and increased with one year of expected salary increase.

Overtime Pay: Pay for Blue Service benefits for the upcoming year is based on the Valuation Payroll and increased by the following loads to account for unscheduled overtime pay:

General Employees:	3.50%
Police Officers:	7.00%
Firefighters:	18.00%

Average Earnings Overtime Load: Blue Service benefits are loaded by the following percentages to account for higher than usual overtime worked during the final average earnings period:

General Employees:	0.00%
Police Officers:	2.00%
Firefighters:	6.00%

Summary of Actuarial Assumptions and Methods (continued)

Sick Leave Service Conversions: Retirement and terminated vested benefits are loaded by the following percentages to account for additional service accrued for unused sick and major medical leave:

General Employees:	3.75%
Police Officers:	2.00%
Firefighters:	2.50%

Due to the elimination of future accruals of excess sick leave used toward service and FAC at retirement, these load percentages are phased out for each individual member over a 20-year period based on their service as of December 31, 2018.

Cost-of-Living Adjustments (COLA): Members who have the Guaranteed 2% COLA are assumed to receive a 2% increase of their base pension amount. The open group projection associated with this valuation incorporates the provisions of the Conditional Ad Hoc COLA and the liability associated with future expected Conditional Ad Hoc COLAs.

Administrative Expenses: \$5,600,000 for 2020. This amount is reviewed annually based on input from FWERF staff.

Payroll Growth: Member Contributory Payroll is assumed to grow at 3.00% per year. Future City Contributory Payroll incorporates the expected transition of the City contributing on Earnings with Overtime for Tier 1 members to the City contributing on Regular Earnings for Tier II members. As a result, the City Contributory Payroll is expected to increase by approximately 2.8% over the next 30 years.

Marital Assumptions: 80% of male members and 60% of female members are assumed to be married. Male member is assumed to be four years older than female beneficiary; and female member is assumed to be the same age as male beneficiary.

Decrement Timing: All decrements – mortality, service retirement, disability retirement, and termination of employment for reasons other than death or retirement – are assumed to occur at the middle of the valuation year.

Census Data and Assets

- The valuation was based on members of FWERF as of December 31, 2019 and does not take into account future members.
- All census data was supplied by FWERF and was subject to reasonable consistency checks.
- There were data elements that were modified for some members as part of the valuation in order to make the data complete. However, the number of missing data items was immaterial.
- Asset data was supplied by FWERF.

Summaries of Membership Data

<u>Table Number</u>	<u>Page</u>	
A	36	Summary of Membership Data
B	37	Active Members: Distribution by Age and Service

Table A

Summary of Membership Data

	<u>December 31, 2019</u>	<u>December 31, 2018</u>
	(1)	(2)
1. Active members		
a. Number	6,709	6,589
b. Member Contributory Payroll	\$ 514,764,656	\$ 494,152,294
c. Average salary	\$ 76,727	\$ 74,997
d. Average age	44.2	44.2
e. Average service	10.7	10.7
2. Vested inactive members		
a. Number	398	375
b. Total annual deferred benefits	\$ 7,077,620	\$ 7,117,175
c. Average annual deferred benefit	\$ 17,783	\$ 18,979
3. Nonvested inactive members		
a. Number	769	660
b. Member contributions with interest due	\$ 2,302,048	\$ 1,755,899
c. Average refund due	\$ 2,994	\$ 2,660
4. Service retirees		
a. Number	3,716	3,642
b. Total annual benefits	\$ 178,294,023	\$ 171,642,877
c. Average annual benefit	\$ 47,980	\$ 47,129
5. Disabled retirees		
a. Number	187	197
b. Total annual benefits	\$ 5,177,795	\$ 5,306,748
c. Average annual benefit	\$ 27,689	\$ 26,938
6. Beneficiaries and spouses		
a. Number ¹	776	744
b. Total annual benefits	\$ 19,257,779	\$ 17,723,904
c. Average annual benefit	\$ 25,141	\$ 24,114

¹ As of December 31, 2019, there were nine beneficiaries who were expected to receive a refund of employee contributions with interest of \$141,576 and one beneficiary with an annual deferred benefit of \$9,958.
As of December 31, 2018, there were eight beneficiaries who were expected to receive a refund of employee contributions with interest of \$67,284 and one beneficiary with an annual deferred benefit of \$9,958.

Table B

Active Members: Distribution by Age and Service

Age	Years of Service									Total
	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	
Under 25	145 \$ 41,415	3 \$ 70,490								148 \$ 42,005
25 - 29	454 \$ 59,165	89 \$ 70,179								543 \$ 60,971
30 - 34	460 \$ 60,247	245 \$ 80,243	118 \$ 83,153	1 \$ 95,915						824 \$ 69,516
35 - 39	359 \$ 62,056	252 \$ 78,500	265 \$ 90,611	99 \$ 90,395	4 \$ 77,737					979 \$ 76,948
40 - 44	238 \$ 59,814	156 \$ 74,543	204 \$ 87,100	198 \$ 95,435	94 \$ 95,872	2 \$ 64,559				892 \$ 80,347
45 - 49	228 \$ 61,486	116 \$ 71,288	167 \$ 80,938	190 \$ 93,268	220 \$106,564	58 \$111,949	3 \$ 91,451			982 \$ 85,272
50 - 54	182 \$ 61,177	106 \$ 62,496	118 \$ 70,131	115 \$ 86,056	221 \$100,989	187 \$113,884	36 \$107,277	1 \$ 58,411		966 \$ 86,404
55 - 59	137 \$ 61,446	102 \$ 62,843	116 \$ 64,837	86 \$ 77,427	161 \$ 87,452	111 \$103,349	64 \$106,329	5 \$106,267		782 \$ 79,151
60 - 64	87 \$ 55,404	64 \$ 72,599	85 \$ 61,776	69 \$ 70,317	53 \$ 82,500	36 \$ 91,591	13 \$103,803	5 \$135,742	3 \$136,409	415 \$ 71,510
Over 64	31 \$ 52,744	37 \$ 64,220	35 \$ 63,545	42 \$ 72,604	17 \$ 95,025	7 \$ 88,413	5 \$ 79,989	3 \$106,945	1 \$142,936	178 \$ 69,566
Total	2,321 \$ 59,078	1,170 \$ 73,380	1,108 \$ 79,766	800 \$ 87,648	770 \$ 97,602	401 \$107,996	121 \$104,882	14 \$113,521	4 \$138,041	6,709 \$ 76,727

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;
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 than the assumed rate then the cost of the plan can be expected to increase. Likewise, if longevity is improving then increases in cost can be anticipated.

The statutory contribution rate shown in the Summary of Plan Provisions may be considered as a minimum contribution rate that complies with the plan terms. 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:

		December 31,			
	2019	2018	2017	2016	
Ratio of the market value of assets to City Contributory Payroll	4.8	4.4	5.0	4.8	
Ratio of actuarial accrued liability to City Contributory Payroll	9.1	9.1	8.6	8.7	
Ratio of actives to retirees and beneficiaries	1.4	1.4	1.5	1.5	
Ratio of net cash flow to market value of assets	-3.0%	-4.4%	-3.4%	-3.7%	
Duration of the actuarial accrued liability	11.5	11.7			

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 then 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.

Duration of Actuarial Liability

The duration of the actuarial accrued liability may be used to approximate the sensitivity to a 1% change in the assumed rate of return. For example, duration of 10 indicates that the liability would increase approximately 10% if the assumed rate of return were lowered 1%. This information is presented beginning at December 31, 2018 which is consistent with the implementation of the Individual Entry Age Normal actuarial cost method.

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.

Glossary

Actuarial Accrued Liability (AAL): That portion, as determined by a particular Actuarial Cost Method, of the Actuarial Present Value of Future Plan Benefits which is not provided for by future Normal Costs. It is equal to the Actuarial Present Value of Future Plan Benefits minus the actuarial present value of future Normal Costs.

Actuarial Assumptions: Assumptions as to future experience under the Fund. These include assumptions about the occurrence of future events affecting costs or liabilities, such as:

- mortality, withdrawal, disablement, and retirement;
- future increases in salary;
- future rates of investment earnings and future investment and administrative expenses;
- characteristics of members not specified in the data, such as marital status;
- characteristics of future members;
- future elections made by members; and
- other relevant items.

Actuarial Cost Method or Funding Method: A procedure for allocating the Actuarial Present Value of Future Benefits to various time periods; a method used to determine the Normal Cost and the Actuarial Accrued Liability. These items are used to determine the ADC.

Actuarial Gain or Actuarial 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. Through the actuarial assumptions, rates of decrements, rates of salary increases, and rates of fund earnings have been forecasted. To the extent that actual experience differs from that assumed, Actuarial Accrued Liabilities emerge which may be the same as forecasted, or may be larger or smaller than projected. Actuarial gains are due to favorable experience, e.g., the Fund's assets earn more than projected, salaries do not increase as fast as assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, actuarial losses are the result of unfavorable experience, i.e., actual results that produce actuarial liabilities which are larger than projected. Actuarial gains will shorten the time required for funding of the actuarial balance sheet deficiency while actuarial losses will lengthen the funding period.

Actuarially Equivalent: Of equal actuarial present value, determined as of a given date and based on a given set of Actuarial Assumptions.

Glossary (continued)

Actuarial Present Value (APV): The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of Actuarial Assumptions. For purposes of this standard, each such amount or series of amounts is:

- a. adjusted for the probable financial effect of certain intervening events (such as changes in compensation levels, marital status, etc.),
- b. multiplied by the probability of the occurrence of an event (such as survival, death, disability, termination of employment, etc.) on which the payment is conditioned, and
- c. discounted according to an assumed rate (or rates) of return to reflect the time value of money.

Actuarial Present Value of Future Plan Benefits: The Actuarial Present Value of those benefit amounts which are expected to be paid at various future times under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age and past and anticipated future compensation and service credits. The Actuarial Present Value of Future Plan Benefits includes the liabilities for active members, retired members, beneficiaries receiving benefits, and inactive, nonretired members either entitled to a refund or a future retirement benefit. Expressed another way, it is the value that would have to be invested on the valuation date so that the amount invested plus investment earnings would be provide sufficient assets to pay all projected benefits and expenses when due.

Actuarial Valuation: The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a plan. An Actuarial valuation for a governmental retirement system typically also includes calculations of items needed for compliance with GASB.

Actuarial Value of Assets or Valuation Assets: The value of the Fund's assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets, but commonly actuaries use a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the ADC.

Actuarially Determined: Values which have been determined utilizing the principles of actuarial science. An actuarially determined value is derived by application of the appropriate actuarial assumptions to specified values determined by provisions of the law.

Amortization Method: A method for determining the Amortization Payment. The most common methods used are level dollar and level percentage of payroll. Under the Level Dollar method, the Amortization Payment is one of a stream of payments, all equal, whose Actuarial Present Value is equal to the UAAL. Under the Level Percentage of Pay method, the Amortization payment is one of a stream of increasing payments, whose Actuarial Present Value is equal to the UAAL. Under the Level Percentage of Pay method, the stream of payments increases at the assumed rate at which total covered payroll of all active members will increase.

Glossary (continued)

Amortization Payment: That portion of the pension plan contribution or ADC which is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.

Actuarially Determined Contribution (ADC) or Annual Required Contribution (ARC): A calculated contribution for a defined benefit pension plan for the reporting period, most often determined based on the funding policy of the plan. Typically the calculated contribution has a normal cost payment and an amortization payment.

Actuarially Determined Employer Contribution (ADEC): The portion of the ADC that is attributable to the employer.

Closed Amortization Period: A specific number of years that is counted down by one each year and therefore declines to zero with the passage of time. For example if the amortization period is initially set at 30 years, it is 29 years at the end of one year, 28 years at the end of two years, etc. See Funding Period and Open Amortization Period.

Decrements: Those causes/events due to which a member's status (active-inactive-retiree-beneficiary) changes, that is: death, retirement, disability, or termination.

Defined Benefit Plan: An employer-sponsored retirement benefit that provides workers, upon attainment of designated age and service thresholds, with a monthly benefit based on the employee's salary and length of service. The value of a benefit from a defined benefit plan is generally not affected by the return on the assets that are invested to fund the benefit.

Defined Contribution Plan: A retirement plan, such as a 401(k) plan, a 403(b) plan, or a 457 plan, in which the contributions to the plan are assigned to an account for each member, and the plan's earnings are allocated to each account, and each member's benefits are a direct function of the account balance.

Employer Normal Cost: The portion of the Normal Cost to be paid by the employers. This is equal to the Normal Cost less expected member contributions.

Experience Study: A periodic review and analysis of the actual experience of the Fund which may lead to a revision of one or more actuarial assumptions. Actual rates of decrement and salary increases are compared to the actuarially assumed values and modified as deemed appropriate by the Actuary.

Funded Ratio: The ratio of the actuarial value of assets (AVA) to the actuarial accrued liability (AAL). Plans sometimes calculate a market funded ratio, using the market value of assets (MVA), rather than the AVA.

Glossary (continued)

Funding Period or Amortization Period: The term “Funding Period” is used in two ways. In the first sense, it is the period used in calculating the Amortization Payment as a component of the ADC. This funding period is chosen by the Board of Trustees. In the second sense, it is a calculated item: the number of years in the future that will theoretically be required to amortize (i.e., pay off or eliminate) the Unfunded Actuarial Accrued Liability, based on the statutory employer contribution rate, and assuming no future actuarial gains or losses.

GASB: The Governmental Accounting Standards Board is an organization that exists in order to promulgate accounting standards for governmental entities.

Normal Cost: That portion of the Actuarial Present Value of pension plan benefits and expenses which is allocated to a valuation year by the Actuarial Cost Method. Any payment in respect of an Unfunded Actuarial Accrued Liability is not part of Normal Cost (see Amortization Payment). For pension plan benefits which are provided in part by employee contributions, Normal Cost refers to the total of employee contributions and employer Normal Cost unless otherwise specifically stated. Under the entry age normal cost method, the Normal Cost is intended to be the level cost (when expressed as a percentage of pay) needed to fund the benefits of a member from hire until ultimate termination, death, disability or retirement.

Open Amortization Period: An open amortization period is one which is used to determine the Amortization Payment but which does not change over time. In other words, if the initial period is set as 30 years, the same 30-year period is used in determining the Amortization Period each year. In theory, if an Open Amortization Period is used to amortize the Unfunded Actuarial Accrued Liability, the UAAL will never completely disappear, but will become smaller each year, either as a dollar amount or in relation to covered payroll.

Unfunded Actuarial Accrued Liability: The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets. This value may be negative in which case it may be expressed as a negative Unfunded Actuarial Accrued Liability, also called the Funding Surplus.

Valuation Date or Actuarial Valuation Date: The date as of which the value of assets is determined and as of which the Actuarial Present Value of Future Plan Benefits is determined. The expected benefits to be paid in the future are discounted to this date.