
Denton Firemen's Relief and Retirement Fund

Actuarial Valuation as of December 31, 2019

July 13, 2020



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July 13, 2020

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Denton Firemen's Relief
and Retirement Fund
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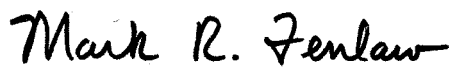
Members of the Board of Trustees:

At the request of the Board of Trustees of the Denton Firemen's Relief and Retirement Fund, we have prepared this report of the results of the actuarial valuation of the fund as of December 31, 2019. This valuation was prepared (1) to determine the city's contribution rate under its current funding policy, which is a modified actuarially determined contribution rate funding policy, (2) to recommend a city contribution rate for the next two years, and (3) to highlight the fund's actuarial condition.

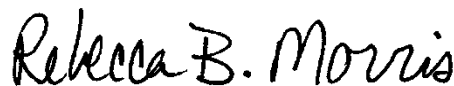
In a separate report dated June 9, we provided the necessary disclosures for the fund's compliance with the Governmental Accounting Standards Board (GASB) Statement No. 67 for the plan year ending December 31, 2019. Similarly, we will provide a separate report later in the year containing the pension expense, net pension liability, and disclosure information for the city's compliance with GASB 68 for the fiscal year ending September 30, 2020. GASB 68 prescribes the city's accounting for your fund, while this actuarial valuation report reflects the assumed continuation of the current funding policy, adopted in December 2017.

We certify that we are members of the American Academy of Actuaries who meet Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained in this report.

Sincerely,



Mark R. Fenlaw, F.S.A.



Rebecca B. Morris, A.S.A.

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Section I

Valuation Summary

An actuarial valuation of the assets and liabilities of the Denton Firemen's Relief and Retirement Fund as of December 31, 2019 has been completed. The valuation was based on the Present Plan (plan effective January 1, 2011) and the provisions of the Texas Local Fire Fighters' Retirement Act (TLFFRA) which were in effect on December 31, 2019. Section II shows the summary of key results of the actuarial valuation as of December 31, 2019 and discusses the significant changes since the prior valuation that we prepared as of December 31, 2017.

Following the December 31, 2017 actuarial valuation, the city's funding policy for the fund was made a part of the new Meet and Confer Agreement effective October 1, 2019. The funding policy is a modified actuarially determined contribution rate (ADCR) which began in December 2017. Under that policy, the city's initial contribution rate was set at 18.5% and is to be re-evaluated following every actuarial valuation. The funding policy has the intent of paying off the unfunded actuarial accrued liability (UAAL) over a closed 25-year period or sooner. The policy language implies that the rate should stay at 18.5% for at least the first five years, even if the ADCR is less than 18.5%, in order to pay down the UAAL. A key requirement of the policy is city approval of any change to the contribution level.

The funding policy begins with the 18.5% city contribution rate, has an ADCR over a closed 25-year period we assume began January 1, 2018, but in no event will the city contribution rate be less than the TMRS for the other city employees. **The ADCR over the 23 years remaining in the closed period of December 31, 2019 is 17.23%** based on this actuarial valuation. The TMRS rate for the year beginning January 1, 2021 is 17.79%. **We recommend continuation of the current 18.5% city contribution rate.**

Assuming the city continues contributing a level 18.5% each year for the long term, we actuarially determined the UAAL amortization period. With the assumed continuous future 18.5% city contribution rate, there would be a total contribution rate each year of 31.1%, comprised of 12.6% by the firefighters and 18.5% by the city. The total contribution rate of 31.1% exceeds the normal cost rate of 22.33%, leaving 8.77% available to amortize the UAAL of \$23,333,103. Assuming that the total payroll increases at the rate of 3% per year in the future, the contributions in excess of the normal cost **would be expected to amortize the UAAL in 18.3 years.**

There are several reasons that support the city planning to keep its contribution rate at 18.5%:

- Continuing to contribute 18.5% each year would accelerate both the amortization of the UAAL and an increase in the funded ratio. This would increase the likelihood that those metrics would become closer to those of the TMRS plan (TMRS has a

15.6-year amortization period and 84.6% funded ratio compared to the above 18.3-year amortization period assuming a level 18.5% contribution rate and an 80.8% funded ratio for the fund, both plans measured as of December 31, 2019.)

- It would hedge against potential future adverse experience, such as the investment experience in 2018 and so far in 2020, or any potential future changes in assumptions.
- It would better position the fund to provide an ad hoc increase in the monthly benefit for retirees at some future date without a rate increase.

The city should also consider contributing more to the retirement plan for its firefighters than to TMRS every year for these reasons:

1. **Low firefighter turnover** – Their lower turnover than other city employees means that a higher percent of firefighters will ultimately qualify for a retirement benefit than other city employees. As a result, their benefits cost more as a percent of pay.
2. **Physical demands of the job** – Because of this, firefighters tend to retire at earlier ages than other city employees. As a result, their benefits cost more as a percent of pay because they are paid over a longer period of retirement.
3. **Post-retirement increases** – Retirees in TMRS have for years been getting annual increases in their monthly benefits based on 70% of the CPI while retired firefighters haven't had an increase since 2008, a modest 2% increase.
4. **Employee contribution rates** – Firefighters contribute 12.6% of their pay to the fund while other city employees contribute only 7% to TMRS.

In order for a retirement plan to have an adequate contribution arrangement, contributions must be made that are sufficient to pay the plan's normal cost and to amortize the plan's UAAL over a reasonable period of time. Based on the current Texas Pension Review Board (PRB) pension funding guidelines, our professional judgment, and the actuarial assumptions and methods used in making this valuation, we consider periods of 10 years to 25 years to be preferable and 30 years to be the maximum acceptable period. Since the total assumed contributions are sufficient to pay the fund's normal cost and to amortize the fund's UAAL in 18.3 years, we are of the opinion that the fund, based on present levels of benefits and assumed contributions **has an adequate contribution arrangement. Section III presents considerations for future benefit improvements.**

Projected Actuarial Valuation Results

In addition to completing this actuarial valuation, we estimated the amortization periods as of December 31, 2021 and as of December 31, 2023 by making projections from the December 31, 2019 actuarial valuation and assuming a fixed city contribution rate of 18.5%

until the UAAL is amortized. These projections examine the effect on the amortization period in the next two actuarial valuations of the actuarial investment gains and losses that the fund experienced in the four years prior to the valuation date (loss in 2018 and gains in 2016, 2017, and 2019) that have been only partially recognized as of December 31, 2019. As shown in Exhibit 8, a smoothing method is used to determine the actuarial value of assets (AVA) for this valuation. This method phases in over a five-year period any investment gains or losses (net actual investment return greater or less than the actuarially assumed investment return) that the fund has had. The AVA used in this current valuation is deferring recognition of various portions of the gains and losses in 2016-2019 that the fund experienced. The AVA used in this valuation is \$98,109,262. The market value of assets (MVA) is \$103,815,795. The \$5.7 million difference between the MVA and the AVA is the net deferred gain over the past four years that will be recognized in the next two actuarial valuations.

The theory behind the AVA method is to allow time for investment gains and losses to partially offset each other and thereby dampen the volatility associated with the progression of the MVA over time. In practice, the timing and amounts of investment gains and losses can result in irregular effects on the AVA in a given year. However, as intended, the pattern of the AVA is smoother over time than the pattern of the MVA, as seen in Exhibit 9.

For the purpose of projecting the amortization period through 2023 we used six scenarios of various assumed annual rates of investment return, net of investment-related expenses, over the 2020-2023 projection period. These projections show the expected effects over the next four years after the valuation date (1) of the recognition of the portions of the investment gains and losses over the past four years that are deferred as of December 31, 2019, and (2) of investment returns over the next four years different from the 6.75% assumption used in this valuation.

	Scenario					
	1	2	3	4	5	6
Assumed Investment Return for Calendar Year						
2020	6.75%	-4.00%	-4.00%	-4.00%	0.00%	0.00%
2021	6.75	10.00	6.75	4.00	0.00	0.00
2022	6.75	6.75	6.75	10.00	6.75	4.00
2023	6.75	6.75	6.75	10.00	6.75	4.00
2024 and later	6.75	6.75	6.75	6.75	6.75	6.75
Amortization Period in Years as of December 31:						
2019 (actual)	18.3	18.3	18.3	18.3	18.3	18.3
2021 (projected)	12.6	16.8	17.5	18.1	17.0	17.0
2023 (projected)	8.6	15.6	17.9	17.6	19.0	21.1

The projected amortization period as of December 31, 2023 in Scenario 1 (no investment gains or losses) reveals that instead of decreasing by the expected four years from 18.3 years to 14.3 years, the amortization period is projected to decrease to 8.6 years. The bigger reduction is due to the \$5.7 million net deferred gain.

One of the characteristics of a relatively well-funded plan like yours is that the amortization period is sensitive to investment gains and losses. For example, Scenario 3 is the same as Scenario 1 except for a projected rate of return of -4% for calendar year 2020. The one adverse year, without any investment gains or losses in the next three years, would result in a projected amortization period of 17.9 years as of December 31, 2023, which is 9.3 years greater than the projected amortization period of 8.6 years in Scenario 1.

Scenarios 2-6 assume two different adverse investment results for 2020 due to the negative effects of the pandemic on global markets and a variety of returns in the three years following. The funding policy with its initial 25-year closed amortization period would seek amortization periods no greater than 21 years as of December 31, 2021 and no greater than 19 years as of December 31, 2023. Only Scenario 6 would result in a need to increase the city contribution rate. The \$5.7 million net deferred gain will be recognized in the next two biennial actuarial valuations and will partially offset adverse investment experience.

We do not know what the investment experience will be for each of the next four calendar years. Variations in experience from the underlying assumptions, other than investment return, will cause the actual amortization periods to be different from the periods shown above, but investment experience will be the biggest influence on future actuarial valuations. In addition, the future investment experience in each of the next four years could be better or worse than the assumed rates shown. These scenarios present a range of scenarios for the next two valuations assuming no changes in contribution rates and benefits.

Participant and Asset Data

We have relied on and based our valuation on the active firefighter data, pensioner data, and asset data provided on behalf of the board of trustees by Gary Calmes, who provides administrative services for the board of trustees. We have not audited the data provided but have reviewed it for reasonableness and consistency relative to the data provided for the December 31, 2017 actuarial valuation. Exhibit 1 is a distribution of the active firefighters by age and service. The assumed 2020 salaries used for projecting future contributions and benefits in the valuation were based on the actual pay for the 2019 calendar year, adjusted by 3.5% to reflect the net effect of the variable pay increases effective in April 2019 and April 2020. The total of these salaries is our assumed annualized covered payroll for the plan year beginning January 1, 2020 and is used to determine the UAAL amortization period with the assumed continuation of the 18.5% city

contribution rate. The averages of the assumed salaries for the 2020 plan year are shown in Exhibit 1.

Exhibit 2 contains summary information on the pensioners. The monthly benefit payments are generally based on the amounts paid in January 2020. Exhibit 3 is a reconciliation of firefighters and pensioners from December 31, 2017 to December 31, 2019. Exhibit 4 shows a breakdown of the dollar amount of the monthly benefits for retirees and surviving spouses. Exhibit 5 shows a historical comparison of the actuarial accrued liability and the actuarial value of assets.

The summary of assets contained in Exhibit 6 is based on the December 31, 2019 market value of assets contained in the information received from the board. This exhibit also shows a comparison with the market values and actuarial values of assets as of December 31, 2017 and December 31, 2019. Exhibit 7 contains the statement of changes in assets for 2019 and 2018. Exhibit 8 shows the development of the actuarial value of assets. Exhibit 9 shows a historical comparison between the market value and actuarial value of assets. A comparison of the market value asset allocation by asset class as of December 31, 2017 and December 31, 2019 is shown in Exhibit 10.

Assumptions

As a part of each actuarial valuation, we review the actuarial assumptions used in the prior actuarial valuation. As a result of our review, we have selected actuarial assumptions we consider to be reasonable and appropriate estimates of future experience for the fund for the long-term future. Their selection complies with the applicable actuarial standards of practice. Significant actuarial assumptions used in the valuation are:

1. 6.75% annual investment return net of investment-related expenses;
2. 3% annual general compensation increase plus promotion, step, and longevity increases which average 1.98% per year over a 30-year career;
3. Retirement rates which result in an average expected age at retirement of 57.0; and
4. PubS-2010 (safety employees) total dataset mortality tables projected for mortality improvement using scale MP-2019.

The following actuarial assumption changes have been made, and the new assumptions are compared to those used in the December 31, 2017 valuation:

1. We changed the administrative expenses from 0.55% to 0.50% of payroll based on the average historical relationship in the last four years, adjusted for a recent increase in pay for the plan administrator. We believe this assumption is more reasonable for the long-term future.

2. The mortality assumption was changed from the RP-2000 Combined Healthy Mortality Tables projected to 2024 with Scale AA to the PubS-2010 (safety employees) total dataset mortality tables for employees and for retirees, projected for mortality improvement generationally using the projection scale MP-2019. The rationale for the change is to use the results of a new, first-ever study of the mortality of public employee pension plan participants by the Society of Actuaries. The new mortality assumption is more appropriate for the fund for the long-term future than the prior assumption.
3. The assumed spouse age of a retiring firefighter was changed from a two-year to four-year age difference. This change was based on a review of the actual ages of the married retired firefighters.

The effect of these changes in assumptions on the UAAL amortization period is identified in Section II. A summary of all the assumptions and methods used in the valuation is shown in Exhibits 11 and 12. In our opinion, the assumptions used, both in the aggregate and individually, are reasonably related to the experience of the fund and to reasonable expectations. The assumptions represent a reasonable estimate of anticipated experience of the fund over the long-term future.

Other Supporting Exhibits

Exhibit 13 contains definitions of terms used in this actuarial valuation report. Exhibit 14 summarizes the plan provisions of the Present Plan.

Funding Policy for the City

After negotiations in 2017 among representatives from the city manager's office, the board of trustees, and the Denton Fire Fighters Association, an agreement was reached to amend the prior Meet and Confer Agreement. Final approval by the city council occurred in December 2017. The same language was included in the new Meet and Confer Agreement effective October 1, 2019. The city's funding policy for the fund is a modified actuarially determined contribution rate (ADCR) policy summarized below.

- The funding policy is intended to fully pay off the UAAL over a closed 25-year amortization period that we assume began January 1, 2018.
- The city began contributing 18.5% of compensation in late December 2017.
- Each subsequent actuarial valuation for the board will include the modified ADCR for the city's review.

- If the actuarial valuation and modified ADCR are determined to be reasonable by the city, the city's contribution rate will be adjusted to the new modified ADCR beginning on the next October 1st.
- However, the contribution rate will not be lower than the initial 18.5% until the amortization period is 20 years or less.
- Two minimum constraints for the modified ADCR are that it will not be less than the city's TMRS rate or the minimum rate under TLFFRA.
- Any change to the contribution level is subject to final approval by the city.

Variability in Future Actuarial Measurement

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 current economic or demographic assumptions;
- Increases or decreases expected as part of the natural operation of the methodology used for these measurements;
- Changes in economic or demographic assumptions; and
- Changes in plan provisions.

Analysis of the potential range of such future measurements resulting from the possible sources of measurement variability was provided in the projected amortization periods for the next two biennial actuarial valuations under six scenarios. These projections were designed to assess the risk of variance of potential future investment rates of return in the four years following the actuarial valuation date from the assumed 6.75% rate and the potential effect on the amortization period. Additional or other sensitivity analysis could be performed in a subsequent report if desired by the board of trustees.

Respectfully submitted,
RUDD AND WISDOM, INC.

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Section II

Key Results of the Actuarial Valuation

	December 31, 2017 ¹	December 31, 2019
1. Actuarial present value of future benefits		
a. Those now receiving benefits or former firefighters entitled to receive benefits	\$ 39,792,196	\$ 44,259,778
b. Firefighters	<u>106,446,377</u>	<u>127,238,142</u>
c. Total	\$ 146,238,573	\$ 171,497,920
2. Actuarial present value of future normal cost contributions	\$ 43,392,645	\$ 50,055,555
3. Actuarial accrued liability (Item 1c – Item 2)	\$ 102,845,928	\$ 121,442,365
4. Actuarial value of assets	\$ 84,410,626	\$ 98,109,262
5. Unfunded actuarial accrued liability (UAAL) (Item 3 - Item 4)	\$ 18,435,302	\$ 23,333,103
6. Contributions (percent of pay)		
a. Firefighters	12.60%	12.60%
b. City of Denton ²	<u>18.50%</u>	<u>18.50%</u>
c. Total	31.10%	31.10%
7. Normal cost (percent of payroll)	21.77%	22.33%
8. Percent of payroll available to amortize the UAAL (Item 6c - Item 7)	9.33%	8.77%
9. Annualized covered payroll	\$ 17,624,493	\$ 20,151,687
10. Present annual amount available to amortize the UAAL (Item 8 x Item 9)	\$ 1,644,365	\$ 1,767,303
11. Actuarially determined period to amortize the UAAL based on Item 6b	14.6 years	18.3 years
12. Funded ratio (Item 4 ÷ Item 3) ³	82.1%	80.8%

¹ All items are from the December 31, 2017 actuarial valuation and reflect the Present Plan.

² For both actuarial valuations, 18.5% is the initial contribution rate in the new funding policy, and was assumed to continue.

³ The funded ratio is not appropriate for assessing either the need for or the amount of future contributions or the adequacy of the assumed contribution rates. Using the market value of assets instead of the actuarial value of assets for Item 12 would have resulted in funded ratios of 83.0% as of December 31, 2017 and 85.5% as of December 31, 2019. **The best indicator of the fund's health is Item 11.**

Change in the Actuarially Determined Amortization Period

The amortization period, based on the Present Plan provisions, was determined in the actuarial valuation as of December 31, 2017, to be 14.6 years. Since two years have passed since that valuation date, a 12.6-year amortization period would be expected if all actuarial assumptions had been exactly met, no changes had occurred (other than those expected) in the firefighter and pensioner data, and no changes in assumptions or methods or funding policy had been made. The amortization period is now 18.3 years based on the same plan provisions. The actual experience occurring between December 31, 2017 and December 31, 2019 differed from the expected experience, and in combination with the changes in assumptions, the resulting amortization period is 18.3 years, which is 5.7 years more than the expected 12.6-year period for the following reasons:

1. The average annual rate of investment return, net of investment-related expenses, on the market value of assets during the two plan years 2018 and 2019 was 8.24%. However, the actuarial value of assets (AVA) used in the valuation and the determination of the amortization period is based on an adjusted market value. The average annual rate of return on the AVA, net of investment-related expenses, for plan years 2018 and 2019 was 5.77% compared to the assumed rate of return for those years of 6.75%. This caused an **increase** in the amortization period of 1.7 years.
2. The aggregate payroll increased at an average rate of 6.9% per year, compared to the assumed 3% per year rate, which caused the amortization period to **decrease** by 1.3 years.
3. The net result of all experience other than the investment experience and the aggregate payroll experience had the combined effect of **increasing** the amortization period by 0.6 of a year. This was primarily the result of greater-than-expected pay increases in the last two years.
4. The result of the change in the mortality assumption resulted in an **increase** in the amortization period of 4.8 years.
5. The reduction in the assumed administrative expenses as a percent of payroll caused the amortization period to **decrease** by 0.1 of a year.

Section III

Benefit Improvements

The funding policy in the Meet and Confer Agreement effective October 1, 2019 in Section 4 of Article 12 says that there will be no benefit enhancements until after September 30, 2023. There are probably a variety of opinions among the board members about what conditions should be met before there are any benefit enhancements. However, one significant consideration is that there has been no ad hoc increase for the retirees since a 2% increase in 2008. In contrast, the retirees in the TMRS plan have received an increase each January for many years based on 70% of the increase in the CPI.

In the future when benefit improvements are to be implemented, the board would need to follow the requirements of Section 7 of TLFFRA, which requires the approval of the firefighters, the board, and the board's actuarial firm before any benefit changes can be implemented. As a part of that process, Section F(2) of the plan document should be amended to make it consistent with the proposed benefit enhancement. The current language was designed in the 1990s and requires that 25% of any benefit enhancements be for the retirees.

If the city decides to continue contributing at the rate of 18.5% or at some other rate that could reasonably be assumed to be stable, then we offer for your consideration a strategy for future benefit improvements. The idea is to coordinate periodic benefit improvements with favorable experience so that the recommended city contribution rate based on the city's funding policy would not be increased and so that the resulting actuarially determined UAAL amortization period would be acceptable to the board and to the city.

Exhibit 1
Distribution of Firefighters by Age and Service on December 31, 2019
with Average Annual Salary

Years of Service	Age									Total	Average Salary
	Under 25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60 or Over		
0	0	1	1	0	0	0	0	0	0	2	\$70,000
1	3	4	4	2	0	0	0	0	0	13	71,539
2	0	5	6	1	0	0	0	0	0	12	75,810
3	1	2	4	4	0	0	0	0	0	11	82,531
4	0	3	6	3	1	0	0	0	0	13	79,506
5	0	0	0	2	0	0	0	0	0	2	89,994
6	0	2	5	1	0	0	0	0	0	8	94,073
7	0	2	1	6	1	0	0	0	0	10	96,406
8	0	0	5	2	1	0	0	0	0	8	93,003
9	0	0	0	2	0	0	0	0	0	2	102,600
10	0	0	0	1	0	0	0	0	0	1	115,138
11	0	0	0	3	1	1	0	0	0	5	104,233
12	0	0	0	2	1	0	0	0	0	3	89,571
13	0	0	2	2	6	5	0	0	0	15	104,976
14	0	0	0	3	6	3	0	0	0	12	104,650
15	0	0	0	0	3	1	0	0	0	4	112,577
16	0	0	0	2	3	2	0	0	0	7	115,413
17	0	0	0	0	3	0	1	0	0	4	108,952
18	0	0	0	0	0	5	2	0	0	7	104,847
19	0	0	0	0	2	0	0	0	0	2	100,519
20-24	0	0	0	0	4	19	16	2	0	41	114,316
25-29	0	0	0	0	0	4	5	0	0	9	137,281
30-34	0	0	0	0	0	0	3	2	1	6	137,070
35+	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>2</u>	<u>2</u>	137,680
Totals	4	19	34	36	32	40	27	4	3	199	\$101,265

Average Salary	\$74,003	\$85,532	\$104,160	\$117,279	\$144,051
	\$79,924	\$94,667	\$115,080	\$121,511	\$101,265

Average age	40.5
Average years of service	13.0
Average age at hire	27.5

Exhibit 2
Summary of Pensioner Data

Type of Benefit	Pensioner Data Used in December 31, 2019 Valuation	
	Number of Recipients	Total Monthly Benefit Payments
Service Retirement ¹	72	\$282,208
Disability Retirement	0	0
Vested Terminated (Deferred) ²	3	5,869
Surviving Spouse	13	36,156
Surviving Child	<u>2</u>	<u>1,298</u>
Total	90	\$325,531

Type of Benefit	Comparison of Pensioner Count by Type as of The Prior and Current Actuarial Valuations			
	December 31, 2017	New	Ceased	December 31, 2019
Service Retirement ¹	70	+7	(5)	72
Disability Retirement	0	0	0	0
Vested Terminated (Deferred)	3	+2	(2)	3
Surviving Spouse	11	+3	(1)	13
Surviving Child	<u>3</u>	<u>0</u>	<u>(1)</u>	<u>2</u>
Total	87	+12	(9)	90

¹ Includes three alternate payees receiving benefits according to the terms of a Qualified Domestic Relations Order.

² Monthly benefit payments are deferred to begin at terminated firefighter's future retirement date.

Exhibit 3
Firefighter and Pensioner Reconciliation

	Firefighters	Current Payment Status	Vested Terminated Firefighters	Total
1. As of December 31, 2017	189	84 ¹	3	276
2. Change of status				
a. retirement	(5)	7	(2)	0
b. disability	0	0	0	0
c. death	0	(6)	0	(6)
d. survivor payment begins	0	3	0	3
e. withdrawal	(8)	0	0	(8)
f. vested termination	(2)	0	2	0
g. completion of payment	0	(1)	0	(1)
h. QDRO alternate payee	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
i. net changes	(15)	3	0	(12)
3. New firefighters	<u>25</u>	<u>0</u>	<u>0</u>	<u>25</u>
4. As of December 31, 2019	199	87 ¹	3	289

¹ Includes three alternate payees receiving benefits according to the terms of a Qualified Domestic Relations Order (QDRO).

Exhibit 4

Breakdown of Pensioners by Monthly Benefit Amounts as of December 31, 2019

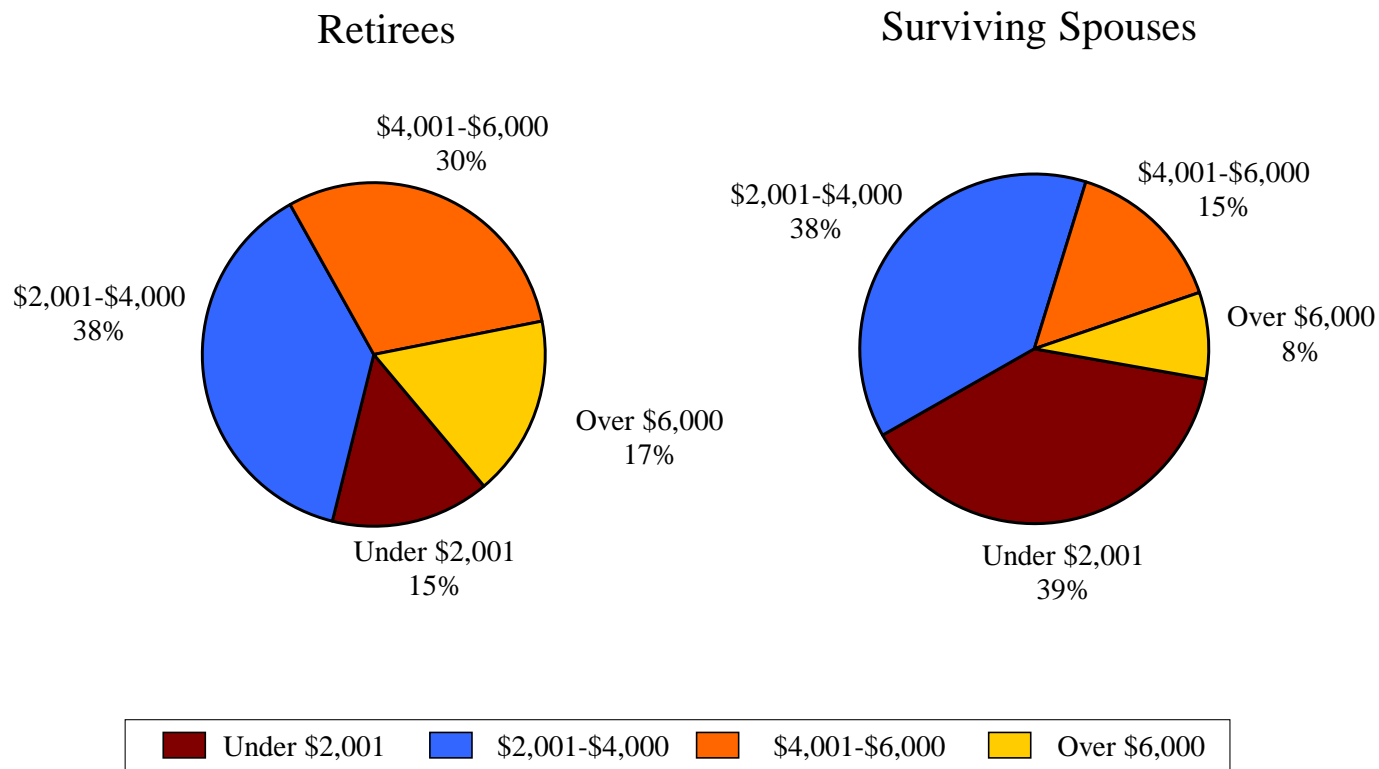


Exhibit 5

Historical Comparison of Actuarial Accrued Liability and Actuarial Value of Assets
(Present Plan Valuations as of December 31)

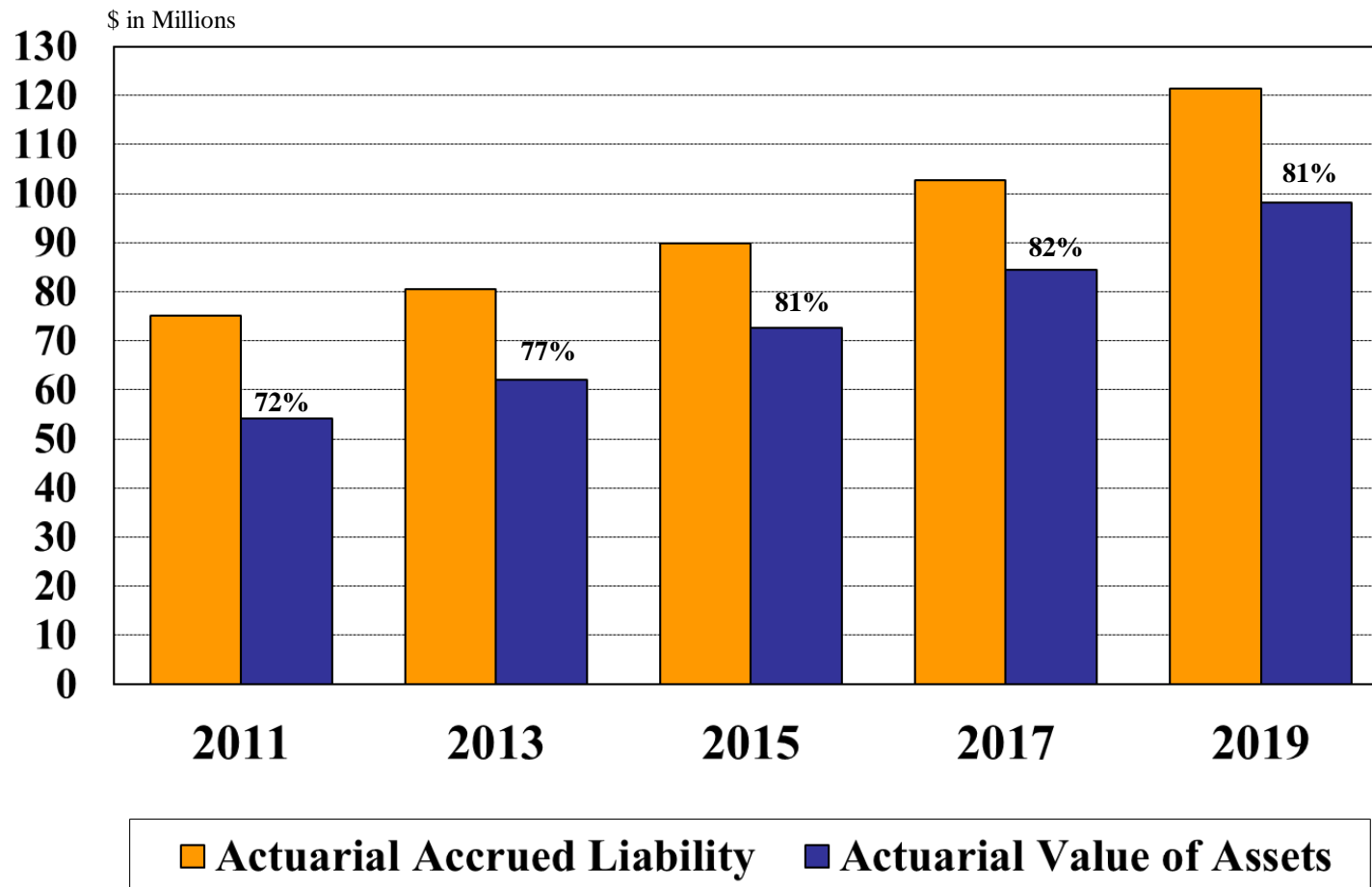


Exhibit 6
Summary of Asset Data

Asset Type	Market Value as of December 31, 2019	Allocation As a Percent of Grand Total
Equities		
U.S. Large Cap	\$39,482,531	38.0%
U.S. Small/Mid Cap	8,193,831	7.9
International	<u>7,615,200</u>	<u>7.3</u>
Total	55,291,562	53.2
Alternatives		
Real Estate	12,988,907	12.5
MLP's/Royal Trusts	<u>5,565,718</u>	<u>5.4</u>
Total	18,554,625	17.9
Fixed Income		
U.S. Treasury & Agency Bonds	12,387,550	11.9
Corporate Bonds	<u>3,793,590</u>	<u>3.7</u>
Total	16,181,140	15.6
Cash Equivalents	<u>13,788,468</u>	<u>13.3</u>
Grand Total	\$103,815,795 ¹	100.0%

¹ The grand total is the audited amount. All of the invested amounts were determined from the coordination of the investment consultant's report and the audited financial report, both of which were provided by the plan administrator, Mr. Gary Calmes. The cash equivalents amount is the cash equivalents net of the receivables and liabilities in the audited financial report.

Comparison of Asset Values as of the Prior and Current Actuarial Valuation Dates		
	<u>December 31, 2017</u>	<u>December 31, 2019</u>
Market Value	\$85,388,283	\$103,815,795
Actuarial Value	\$84,410,626	\$98,109,262
Actuarial Value as a Percent of Market Value	98.9%	94.5%

Exhibit 7

Statement of Changes in Audited Assets
for the Years Ended December 31, 2019 and 2018

	<u>12/31/2019</u>	<u>12/31/2018</u>
Additions		
1. Contributions		
a. Employer	\$ 3,639,740	\$ 3,434,007
b. Employees	<u>2,478,958</u>	<u>2,338,837</u>
c. Total	\$ 6,118,698	\$ 5,772,844
2. Investment Income		
a. Interest and dividends	\$ 3,659,547	\$ 2,751,874
b. Net appreciation in fair value	<u>11,658,482</u>	<u>(2,742,313)</u>
c. Total	\$ 15,318,029	\$ 9,561
3. Other Additions	<u>1,704</u>	<u>0</u>
Total Additions	\$ 21,438,431	\$ 5,782,405
Deductions		
4. Benefit Payments		
a. Monthly benefits	\$ 3,781,902	\$ 3,709,324
b. Lump-sum benefits	<u>425,073</u>	<u>346,532</u>
c. Total	\$ 4,206,975	\$ 4,055,856
5. Expenses		
a. Investment-related	\$ 178,458	\$ 192,709
b. General administrative	<u>71,427</u>	<u>87,899</u>
c. Total	\$ 249,885	\$ 280,608
Total Deductions	\$ 4,456,860	\$ 4,336,464
Net Increase in Assets	\$ 16,981,571	\$ 1,445,941
Market Value of Assets (Fiduciary Net Position)		
Beginning of Year	\$ 86,834,224	\$ 85,388,283
End of Year	\$ 103,815,795	\$ 86,834,224
Rate of Return		
Net of All Expenses	17.17%	(0.31)%
Net of Investment-Related Expenses	17.25%	(0.21)%
Gross	17.48%	0.01%
Investment-Related Expenses	0.23%	0.22%

Exhibit 8

Development of Actuarial Value of Assets

Calculation of Actuarial Investment Gain/(Loss) Based on Market Value for Plan Years Ending December 31				
	2019	2018	2017	2016
1. Market Value of Assets as of Beginning of Year	\$86,834,224	\$85,388,283	\$75,304,750	\$67,976,717
2. Firefighter Contributions	2,478,958	2,338,837	2,142,990	1,997,155
3. City Contributions	3,639,740	3,434,007	2,979,807	2,759,844
4. Benefit Payments and Administrative Expenses ¹	(4,278,402)	(4,143,755)	(3,832,498)	(4,364,181)
5. Expected Investment Return ²	<u>5,923,420</u>	<u>5,818,691</u>	<u>5,126,618</u>	<u>4,601,686</u>
6. Expected Market Value of Assets as of End of Year	94,597,940	92,836,063	81,721,667	72,971,221
7. Actual Market Value of Assets as of End of Year	<u>103,815,795</u>	<u>86,834,224</u>	<u>85,388,283</u>	<u>75,304,750</u>
8. Actuarial Investment Gain/(Loss)	9,217,855	(6,001,839)	3,666,616	2,333,529
9. Market Value Rate of Return Net of Expenses	17.25%	(0.21)%	11.58%	10.17%
10. Rate of Actuarial Investment Gain/(Loss)	10.50%	(6.96)%	4.83%	3.42%

¹ Administrative expenses are included because the investment return assumption was net of investment-related expenses for those years.

² Assuming uniform distribution of contributions and payments during the plan year; actuarially assumed investment return was 6.75%.

Deferred Actuarial Investment Gains/Losses to be Recognized in Future Years			
Plan Year	Investment Gain/(Loss)	Deferral Percentage	Deferred Gain/(Loss) as of 12/31/2019
2019	\$9,217,855	80%	\$ 7,374,284
2018	(6,001,839)	60%	(3,601,103)
2017	3,666,616	40%	1,466,646
2016	2,333,529	20%	466,706
Total			<u>\$ 5,706,533</u>

Actuarial Value of Assets as of December 31, 2019	
11. Market Value of Assets as of December 31, 2019	\$ 103,815,795
12. Deferred Gain/(Loss) to be Recognized in Future	<u>5,706,533</u>
13. Preliminary Value (Item 12 – Item 13)	\$ 98,109,262
14. Corridor for Actuarial Value of Assets	
a. 90% of Market Value as of December 31, 2019 (minimum)	\$ 93,434,216
b. 110% of Market Value as of December 31, 2019 (maximum)	\$ 114,197,375
15. Actuarial Value as of December 31, 2019	\$ 98,109,262
16. Write Up/(Down) of Assets (Item 15 – Item 11)	<u>\$ (5,706,533)</u>

Exhibit 9

Historical Comparison of Market and Actuarial Value of Assets
(Valuation as of December 31)

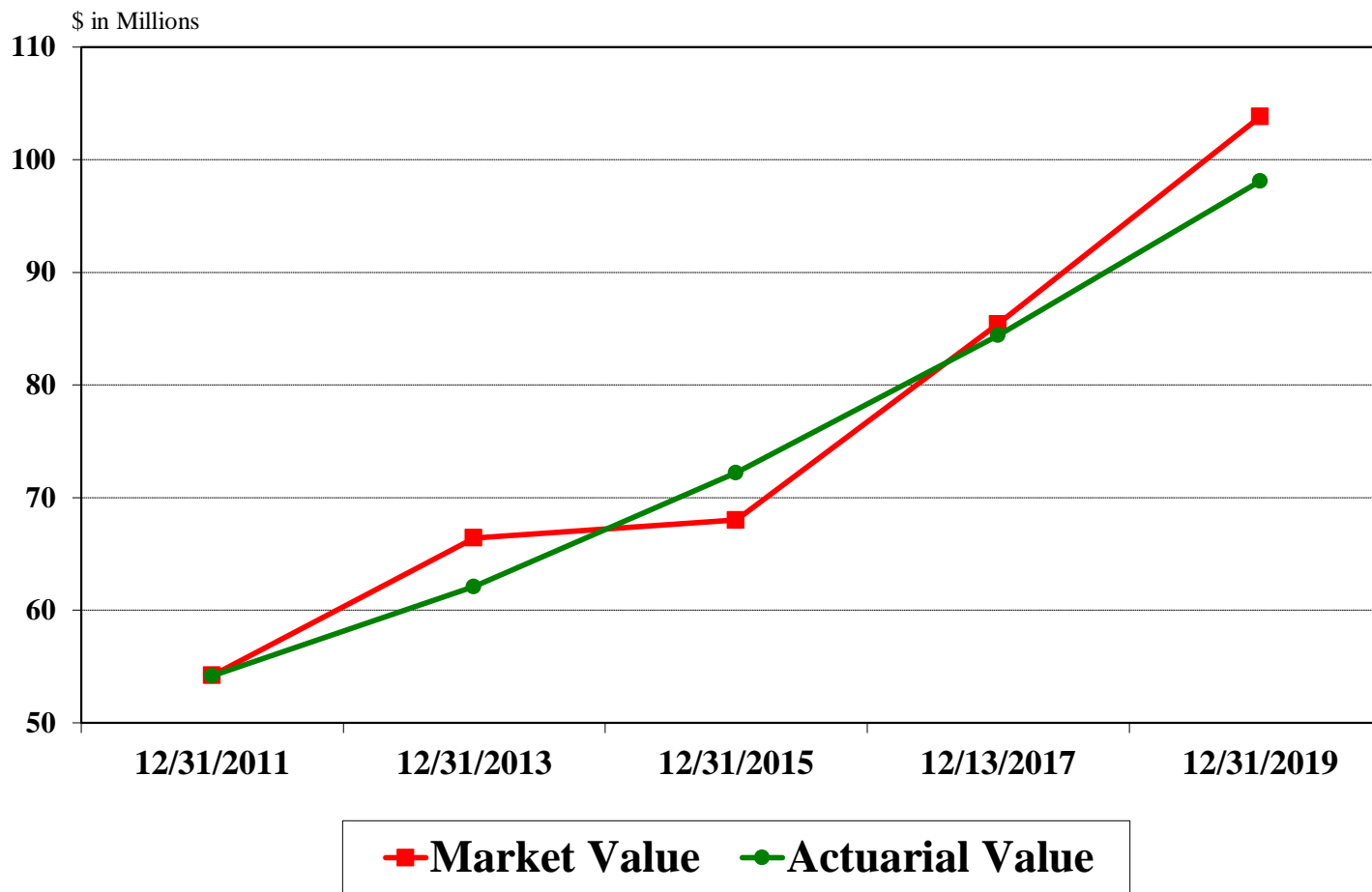
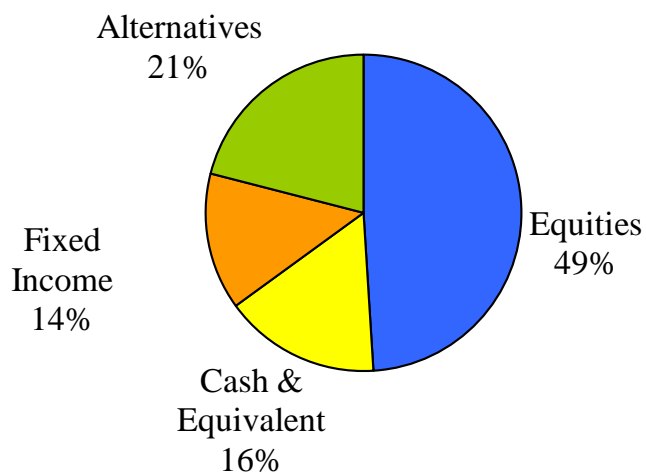


Exhibit 10

Comparison of Market Value Asset Allocation as of the Prior and Current
Actuarial Valuation Dates

December 31, 2017



December 31, 2019

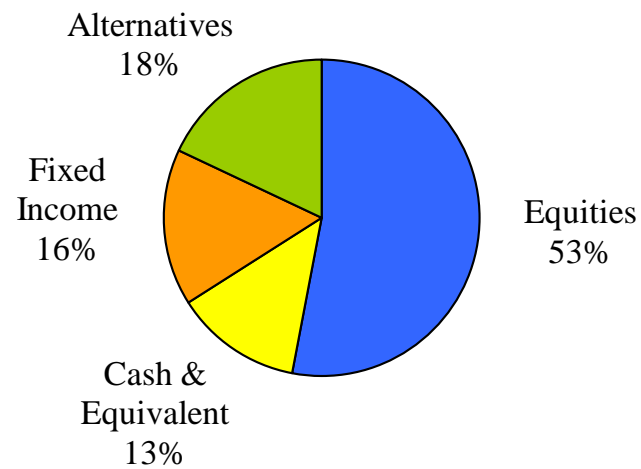


Exhibit 11

Actuarial Methods and Assumptions

A. Actuarial Methods

1. Actuarial Cost Method

The Entry Age Actuarial Cost Method is an actuarial cost method in which the actuarial present value of projected benefits of each active firefighter included in the valuation is allocated as a level percentage of compensation between age at hire and assumed termination. Each active firefighter's normal cost is the current annual contribution in a series of annual contributions which, if made throughout the firefighter's total period of employment, would fund his expected benefits. Each firefighter's normal cost is calculated to be a constant percentage of his expected compensation in each year of employment. The normal cost for the fund is the sum of the normal costs for each active firefighter for the year following the valuation date. The normal cost as a percent of payroll reflects that contributions are made biweekly.

The fund's actuarial accrued liability is the excess of the actuarial present value of projected benefits over the actuarial present value of all future remaining normal cost contributions. The unfunded actuarial accrued liability (UAAL) is the amount by which the actuarial accrued liability exceeds the actuarial value of assets. The UAAL is recalculated each time a valuation is performed. Experience gains and losses, which represent deviations of the UAAL from its expected value based on the prior valuation, are determined at each valuation and are amortized as part of the newly calculated UAAL.

2. Amortization Method

The UAAL is assumed to be amortized with level percentage of payroll contributions (total assumed contribution rate less normal cost contribution rate) based on assumed payroll growth of 3% per year. The actuarial determination of the amortization period reflects that contributions are made biweekly, as does the actuarially determined UAAL amortization contribution rate with the closed amortization period.

3. Actuarial Value of Assets Method

All assets are valued at market value with an adjustment made to uniformly spread actuarial gains or losses (as measured by actual market value investment return vs. expected market value investment return) over a five-year period. The total adjustment amount shall be limited as necessary such that the actuarial value of assets shall not be less than 90% of market value nor greater than 110% of market value. See Exhibit 6.

B. Actuarial Assumptions

As a part of each actuarial valuation, we review the actuarial assumptions used in the prior actuarial valuation. The investment return assumption is reviewed using the building block approach that includes several asset allocations, assumed real rates of return for each asset class, an assumed rate of investment-related expenses, and an assumed rate of inflation, with all assumptions for the long-term future. Our economic assumptions are influenced both by long-term historical experience and by future expectations of investment consultants and economists, but we select the economic assumptions and discuss them with the board before completing the actuarial valuation. See our review of the economic assumptions in Appendix A.

We review the termination and retirement experience since the prior valuation and periodically look back more than two years. We also periodically review the average salaries by years of service to get insights into the promotion, step, and longevity compensation patterns for the purpose of reviewing our compensation increase assumption. For the mortality assumptions, we use an appropriate published mortality table with projections for improvement beyond the valuation date. We are guided in our review and selection of assumptions by the relevant actuarial standards of practice. As a result of our review, we have selected actuarial assumptions we consider to be reasonable and appropriate for the fund for the long-term future.

1. Investment Return

6.75% per year net of investment-related expenses.

2. Inflation

2.5% per year included in compensation increases and investment return assumptions.

3. Mortality Rates

PubS-2010 (public safety) total dataset mortality tables for employees and for retirees (sex distinct), projected for mortality improvement generationally using the projection scale MP-2019.

4. Compensation Increases

General increases of 3% per year (2.5% inflation plus 0.5% productivity) in combination with promotion, step, and longevity increases that average 1.98% per year over a 30-year career. See Exhibit 12.

5. Retirement Rates

Age	Rate per Year for Firefighters Eligible to Retire
50-53	5%
54-58	15
59-61	30
62-64	50
65	100

The average expected retirement age for firefighters under age 50 based on these rates is 57.0.

6. RETRO DROP Election

- a. Percent of firefighters eligible electing RETRO DROP: 100% of service retirements eligible to elect at least a 12-month lump sum.
- b. Months assumed for lump sum: Maximum they are eligible for, up to 48 months.

7. Termination Rates

See Exhibit 12.

8. Disability Rates

See Exhibit 12.

9. Reduction in Benefit after 2½ Years of Disability Retirement

45% weighted average reduction in benefit.

10. Percent Married

90% of the firefighters are assumed to be married at retirement, disability, or death while employed, with male firefighters having a spouse four years younger and female firefighters having a spouse four years older. We use actual spouse data once a monthly benefit is being paid.

11. Payment Form for Retirement Benefits Due to Service Retirement, Disability Retirement, or Vested Termination

- Joint and 2/3 to surviving spouse for the 90% assumed to be married
- Life annuity for the 10% assumed to be single

To the extent optional forms of payment are elected and the amounts are determined under an actuarial basis which differs from the basis used in the valuation, actuarial gains or losses will occur. These gains or losses are expected to be very small and will be recognized through the valuation process for those retiring since the prior valuation who made an optional election.

12. Surviving Child's Death Benefit

None are assumed as a result of future deaths.

13. Firefighters' Contribution Rate

12.60% of covered pay.

14. City's Assumed Contribution Rate

For the scenarios with an actuarially determined amortization period for the UAAL, 18.50% of covered payroll for as long as the actuarially determined period.

15. Covered Payroll for First Year Following Valuation Date

Actual (or annualized) pay for 2019 with an adjustment of 3.5% for each firefighter to reflect the average effect of the variable general pay increases effective in April 2019 and April 2020.

16. Administrative Expenses

The expenses paid by fund assets for other than investment-related expenses are assumed to be 0.50% of payroll. The normal cost rate as a percent of payroll is assumed to be 0.50% of payroll higher to reflect these expenses.

Exhibit 12

**Disability and Termination Rates per 1,000 Active Members
Compensation Increases by Years of Service**

Disability Rates		Termination Rates		Compensation Increases	
Attained Age	Rate	Years of Service	Rate	Years of Service	Increase Percent
20	0.14	0	60	1	9.18%
21	0.15	1	54	2	9.18
22	0.16	2	48	3	9.18
23	0.17	3	42	4	9.18
24	0.18	4	37	5	9.18
25	0.19	5	32	6	6.09
26	0.21	6	27	7	6.09
27	0.23	7	24	8	6.09
28	0.25	8	21	9	6.09
29	0.28	9	19	10	6.09
30	0.31	10	17	11	6.09
31	0.35	11	14	12	6.09
32	0.40	12	12	13	6.09
33	0.45	13	11	14	6.09
34	0.49	14	10	15	6.09
35	0.52	15	9	16	3.00
36	0.54	16	9	17	3.00
37	0.57	17	8	18	3.00
38	0.62	18	8	19	3.00
39	0.73	19	8	20	3.00
40	0.92	20 & Over	0	21	3.00
41	1.14			22	3.00
42	1.32			23	3.00
43	1.48			24	3.00
44	1.73			25	3.00
45	2.09			26	3.00
46	2.55			27	3.00
47	2.98			28	3.00
48	3.34			29	3.00
49	3.62			30	3.00
50	3.79			31 & Over	3.00
51	3.92				
52	4.04				
53	4.24				
54	4.56				
55 & Over	0.00				

Exhibit 13 Definitions

1. Actuarial Accrued Liability That portion, as determined by the particular actuarial cost method used, of the Actuarial Present Value of future pension plan benefits as of the Valuation Date that is not provided for by the Actuarial Present Value of future Normal Costs.
2. Actuarial Assumptions Assumptions as to the occurrence of future events affecting pension costs, such as: mortality, termination, disablement and retirement; changes in compensation; rates of investment earnings and asset appreciation; and other relevant items.
3. Actuarially Equivalent Of equal Actuarial Present Value, determined as of a given date with each value based on the same set of Actuarial Assumptions.
4. Actuarial Gain (Loss) A measure of the difference between actual experience and that expected based on the Actuarial Assumptions during the period between two Actuarial Valuation dates, as determined in accordance with the particular actuarial cost method used.
5. Actuarial Present Value The value of an amount or series of amounts payable or receivable at various times, determined as of a given date (the Valuation Date) by the application of the Actuarial Assumptions.
6. 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 pension plan.
7. Actuarial Value of Assets The value of cash, investments and other property belonging to a pension plan, as determined by a method and used by the actuary for the purpose of an Actuarial Valuation.

8. Entry Age Actuarial Cost Method
An actuarial cost method under which the Actuarial Present Value of the Projected Benefits of each individual included in the Actuarial Valuation is allocated as a level percentage of earnings between entry age and assumed termination. The portion of this Actuarial Present Value allocated to a valuation year is called the Normal Cost. The portion of this Actuarial Present Value not provided for at a Valuation Date by the Actuarial Present Value of future Normal Costs is called the Actuarial Accrued Liability. Under this method, Actuarial Gains (Losses), as they occur, reduce (increase) the Unfunded Actuarial Accrued Liability.
9. Plan Year
A 12-month period beginning January 1 and ending December 31.
10. Normal Cost
That portion of the Actuarial Present Value of pension plan benefits that is allocated to a valuation year by the actuarial cost method.
11. Projected Benefits
Those pension plan benefit amounts that are expected to be paid at various future times according to the Actuarial Assumptions, taking into account such items as the effect of advancement in age and past and anticipated future qualified service.
12. Overfunded Actuarial Accrued Liability
The excess, if any, of the Actuarial Value of Assets over the Actuarial Accrued Liability.
13. Unfunded Actuarial Accrued Liability
The excess, if any, of the Actuarial Accrued Liability over the Actuarial Value of Assets.
14. Valuation Date
The date upon which the Normal Cost, Actuarial Accrued Liability and Actuarial Value of Assets are determined. Generally, the Valuation Date will coincide with the end of a Plan Year.
15. Years to Amortize the Unfunded Actuarial Accrued Liability
The period is determined in each Actuarial Valuation as the number of years, beginning with the Valuation Date, to amortize the Unfunded Actuarial Accrued Liability with a level percent of payroll that is the difference between the expected total contribution rate and the Normal Cost contribution rate.

Exhibit 14

Summary of Present Plan

1. Normal Service Retirement Monthly Benefit as a Percent of Highest 36-Month Average Salary for Each Year of Service 2.59%
2. Normal Service Retirement Eligibility (Minimum) Age 50 and 20 Years
3. Retroactive Deferred Retirement Option Plan (RETRO DROP)
 - (a) Earliest RETRO DROP benefit calculation date Age 52 and 22 Years
 - (b) Maximum RETRO DROP benefit accumulation period 48 Months
 - (c) Earliest employment termination date with maximum RETRO DROP accumulation period Age 56 and 26 Years
 - (d) RETRO DROP lump sum includes
 - (i) Monthly benefits that would have been received between RETRO DROP benefit calculation date and end of month of termination of employment,
 - (ii) accumulated contributions made by the firefighter after the RETRO DROP benefit calculation date, and
 - (iii) no interest
4. Initial Disability Retirement Monthly Benefit as a Percentage of Highest 36-Month Average Salary
 - (a) Minimum percentage 51.80%
 - (b) Additional percentage for each year of service in excess of 20 years 2.59%
5. Disability Retirement Monthly Benefit for Firefighters Who Become Totally Disabled while Employed
 - (a) For initial 30-month period, is (i) plus (ii) if not able to perform job in fire department
 - (i) Minimum monthly amount based on 20 years
 - (ii) Additional monthly amount per year of service in excess of 20 years
 - (b) Following initial 30-month period, is the greater of (i) and (ii)
 - (i) Initial benefit reduced by the portion of the initial benefit equal to estimated annual residual earning capacity divided by annual base earnings
 - (ii) Initial benefit multiplied by percentage of disability
 - (c) Upon attaining eligibility for normal retirement, the member's vested retirement benefit becomes payable if the disability benefit has been reduced or terminated

6. Vested Terminated Benefit Eligibility
(Benefit Deferred to Normal Retirement Age) 10 Years

7. Surviving Spouse's Monthly Death Benefit as a Percent of
Highest 36-Month Average Salary for Each Year of Service
for Death while an Active Firefighter
 - (a) Minimum percentage 34.53%
 - (b) Additional percentage for each year of service in excess of 20 years 1.73%

8. Surviving Spouse's Monthly Death Benefit as a Percent of
Highest 36-Month Average Salary for Each Year of Service
for Death while Eligible to Retire as an Active Firefighter 2.59% x 96%

9. Surviving Children's Monthly Benefit as a Percent of Surviving
Spouse's Benefit
 - (a) When the spouse is receiving a benefit, for each child 20%
 - (b) When the spouse is not receiving a benefit or there is no spouse 100%

10. Contributions as a Percent of Payroll by:
 - (a) Firefighters 12.60%
 - (b) City of Denton Funding Policy

11. The normal form of annuity payment at retirement is a Joint and Two-Thirds to
Surviving Spouse, and payment is the first day of each month.

12. A Social Security Leveling Option optional form of payment is available to firefighters
eligible for a service retirement benefit and to surviving spouses of firefighters who die
while employed where the surviving spouse is between ages 45-60. A Joint and 100%
to Surviving Spouse Optional form of payment and a Joint and 50% to Surviving
Spouse are also available to firefighters eligible for a service retirement benefit.

13. Salary used to determine the Highest 36-Month Average Salary includes all elements
of pay except for (a) lump sum distributions upon termination for unused sick leave or
vacation and (b) overtime pay earned after June 13, 2007 for special deployments in
excess of \$2,000 per biweekly pay period. The average is based on the highest
consecutive 78 biweekly pay periods during active participation in the fund.

14. Refund of firefighters' accumulated contributions without interest will be made to
firefighters who terminate employment and either are not eligible for any other benefit
from the fund or request a refund from the fund.

15. A lump sum death benefit will be payable upon the death of a participating member of
the fund in an amount equal to the current annual salary of the participating member.

Appendix A

Review of the Actuarial Economic Assumptions
for the December 31, 2019 Actuarial Valuation

Section 1. Asset Allocation and Investment Return Assumption Development

Asset Class	Gross Annual Real Rate of Investment Return (ROR) ¹	12/31/2017 ²	12/31/2019 ³	Current Target ³	More Fixed Income	More Equities
Equities						
Domestic						
Large Cap	6.5	35%	37%	40%	35%	46%
Small/Mid Cap	7.0	7	8	10	8	12
International	7.0	7	7	10	7	12
Fixed Income	1.5	14	16	10	20	10
MPLs, Royalty Trusts	7.0	7	6	8	5	0
Real Estate	5.0	14	12	15	15	10
Cash	0.0	<u>16</u>	<u>14</u>	<u>7</u>	<u>10</u>	<u>10</u>
Total		100%	100%	100%	100%	100%
<u>Weighted Average Gross Real ROR Assumption</u>			4.72%	5.46%	4.72%	5.32%
<u>Weighted Average Net Real ROR Assumption⁴</u>			4.22	4.96	4.22	4.82
Possible Theoretical Annual Investment Return Assumption:						
<u>Net Real ROR Plus Assumed Annual Rate of Inflation</u>						
Assumed 2.50% Inflation			6.72%	7.46%	6.72%	7.32%

¹ A gross **real** rate of return is an assumed total annual rate of investment return, before expenses, that is in excess of the assumed annual inflation rate. These are long-term assumptions made by Rudd and Wisdom, Inc.

² This allocation is from the investment consultant's 12/31/2017 report.

³ This allocation is from the investment consultant's 12/31/2019 report.

⁴ A weighted average Net Real ROR is an annual rate equal to the weighted average Gross Real ROR reduced by investment-related expenses of an assumed annual rate of 0.5%. See Section 3.

Appendix A (continued)

Section 2. Price Inflation in the USA
Average Annual Rates of Increase in the CPI-U

<u>Years</u> <u>(Dec. to Dec.)</u>	<u>Number</u> <u>of Years</u>	<u>Average</u> <u>Annual Increase</u>
1954 – 2019	65	3.54%
1959 – 2019	60	3.68
1964 – 2019	55	3.91
1969 – 2019	50	3.91
1974 – 2019	45	3.62
1979 – 2019	40	3.07
1984 – 2019	35	2.58
1989 – 2019	30	2.40
1994 – 2019	25	2.18
1999 – 2019	20	2.14

Most inflation forecasts are for 10 years or less. For example, the average 10-year forecast in the June 2020 Livingston Survey published by the Federal Reserve Bank of Philadelphia was 2.0%. Similarly, the 2020 Wall Street Consensus Survey for the next decade included an average inflation forecast of 2.1%. However, 10 years is much too short a forecast period for a public employee defined benefit pension plan. In the 2020 annual report of the OASDI Trust Funds (Social Security), the ultimate inflation assumptions for their 75-year projections are 3.0%, 2.4%, and 1.8% for the low-cost, intermediate, and high-cost assumptions, respectively. Looking at the average annual increase in the CPI-U over historical periods of 30 to 65 years above and considering the Social Security forecasts, we believe that reasonable assumed rates of inflation for the long-term future would range from 2.25% to 3.25%. Shorter term considerations make the bottom half of that range more desirable.

Section 3. Retirement Plan's Expenses

Plan Year	<u>Market Value of Assets</u>	<u>Expenses</u>		<u>Expenses as a % of Assets</u>	
	<u>Beginning of Year</u>	<u>Admin.</u>	<u>Direct</u> <u>Investmt</u>	<u>Admin.</u> <u>(3) ÷ (2)</u>	<u>DI</u> <u>(4) ÷ (2)</u>
(1)	(2)	(3)	(4)	(5)	(6)
2019	\$86,834,224	\$71,427	\$178,458	0.08%	0.21%
2018	85,388,283	87,899	192,709	0.10	0.23
2017	75,304,750	63,669	73,900	0.08	0.10
2016	67,976,717	94,175	80,181	0.14	0.12

Less than 12% of assets were in ETFs or mutual funds at the end of 2019, and all had relatively low expense ratios. Those indirect expenses did not exceed 0.03% of total assets in 2019. The investment-related expenses have been atypically low for a fund this size but increased some beginning in 2018. For the long-term future, we assume a higher, but still modest rate of investment-related expenses of 0.50%.

Appendix A (continued)

Section 4. Administrative Expenses as a Percent of Payroll

Plan Year Ending 12/31	Administrative Expenses Paid by the Fund	Covered Payroll	% of Payroll (2) ÷ (3)
(1)	(2)	(3)	(4)
2019	\$71,427	\$19,674,270	0.36%
2018	87,899	18,562,198	0.47
2017	63,669	17,007,857	0.37
2016	94,175	15,850,437	0.59
2015	76,538	14,310,032	0.53
2014	81,005	13,852,532	0.58
2016-2019	\$317,170	\$71,094,762	0.45%

The general administrative expenses are not reflected in the investment return assumption but are reflected as a percent of payroll that is added to the normal cost contribution rate. For the December 31, 2019 actuarial valuation, we recommend 0.50%, based on the average developed above for the last four plan years increased to reflect an increase starting in 2020 of the monthly amount to the plan administrator. (The covered payroll was determined as the firefighter contributions for the plan year divided by the firefighter contribution rate during the plan year.)

Section 5. Comparison of Actuarial Economic Assumptions

Actuarial Assumption ^(A)	12/31/2017 Actuarial Economic Assumptions	12/31/2019 Actuarial Economic Assumptions
Inflation (Price)	2.50%	2.50%
Net real rate of return ^(B)	<u>4.25</u>	<u>4.25</u>
Total investment return ^(B)	6.75%	6.75%
Firefighter pay increase ^(C)	4.98%	4.98%
Aggregate payroll increase	3.00%	3.00%
Administrative expenses ^(D)	0.55%	0.50%

(A) All assumptions are annual rates.

(B) Net of investment-related expenses.

(C) 3% annual general pay increase combined with promotion, step, and longevity pay increases that average 1.98% over a 30-year career in both the 12/31/2017 assumptions and the 12/31/2019 assumptions.

(D) Administrative expenses are reflected as a percent of payroll that is added to the normal cost contribution rate.