Denton Firemen's Relief and Retirement Fund

Actuarial Valuation as of December 31, 2015

December 7, 2016

Rudd and Wisdom, Inc.
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Rudd and Wisdom, Inc.

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December 7, 2016

Board of Trustees
Denton Firemen's Relief
 and Retirement Fund
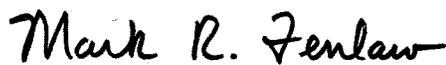P.O. Box 2375
Denton, Texas 76202

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, 2015. This valuation was prepared to determine whether the fund has an adequate contribution arrangement.

In a separate report dated July 13, 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, 2015. Similarly, we will provide a separate report later in December 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, 2016. GASB 68 prescribes the city's accounting for your fund, while this actuarial valuation report reflects the assumed continuation of the current funding policy.

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

Mark R. Fenlaw, F.S.A.

Rebecca B. Morris

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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, 2015 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, 2015. Section II shows the summary of key results of the actuarial valuation as of December 31, 2015 and discusses the significant changes since the prior valuation that we prepared as of December 31, 2013.

This valuation reflects an actuarially assumed total contribution rate of 28.1%, comprised of 12.6% by the firefighters and 15.5% by the city. The total contribution rate of 28.1% exceeds the normal cost rate of 21.91%, leaving 6.19% available to amortize the unfunded actuarial accrued liability (UAAL) of $17,249,607. Assuming that the total payroll increases at the rate of 3% per year in the future, the contributions in excess of the normal cost **will amortize the UAAL in 31.6 years.**

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 15 years to 25 years to be preferable and 40 years to be the maximum acceptable period. Since the total contributions are sufficient to pay the fund's normal cost and to amortize the fund's UAAL within the maximum acceptable period, we are of the opinion that the fund, based on present levels of benefits and 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, 2017 and as of December 31, 2019 by making projections from the December 31, 2015 actuarial valuation. 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 (losses in 2014 and 2015 and gains in 2012 and 2013) that have been only partially recognized as of December 31, 2015. As shown in Exhibit 6, 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

2012-2015 that the fund experienced. The AVA used in this valuation is $72,693,078. The market value of assets (MVA) is $67,976,717. The $4,716,361 difference between the MVA and the AVA is the net of the deferred gains and losses 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 7.

For the purpose of projecting the amortization period through 2019 we used six scenarios of various assumed annual rates of investment return, net of investment-related expenses, over the 2016-2019 projection period. The projected amortization periods will not be the same as the actual amortization periods from completed future actuarial valuations but are the result of projected future actuarial valuation results based on the completed December 31, 2015 actuarial valuation. 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, 2015, 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						
2016	6.75%	12.00%	12.00%	12.00%	11.00%	10.00%
2017	6.75	6.75	12.00	0.00	11.00	3.00
2018	6.75	6.75	6.75	6.75	11.00	3.00
2019	6.75	6.75	6.75	6.75	11.00	3.00
2020 and later	6.75	6.75	6.75	6.75	6.75	6.75
Amortization Period in Years as of December 31:						
2015 (actual)	31.6	31.6	31.6	31.6	31.6	31.6
2017 (projected)	36.3	30.6	28.3	34.0	29.7	34.6
2019 (projected)	51.3	35.0	26.4	52.3	23.6	64.7

The projected future December 31, 2017 valuation in Scenario 1 reveals that instead of decreasing by the expected two years from 31.6 years to 29.6 years, the amortization period is projected to increase to 36.3 years. The increase two years after that is even more dramatic to 51.3 years. These increases are due primarily to the significant deferred losses from 2014 and 2015 that will be recognized as of December 31, 2017 and 2019.

The primary conclusion from Scenario 1, along with Scenarios 2 and 3, is that unless there are some investment gains in 2016 and 2017 from returns greater than 6.75%, the deferred net loss as of December 31, 2015 will significantly increase the amortization period in the next two valuations. This conclusion is not surprising when you consider that if we had fully recognized the $4.7 million deferred net loss in this actuarial valuation by using the MVA instead of the AVA, the amortization period would have been 55.3 years.

One of the characteristics of a well-funded plan like yours is that an amortization period above 30 years is very sensitive to investment gains and losses. For example, Scenario 4 is the same as Scenario 2 except for a projected rate of return of 0% for calendar year 2017. The one adverse year, without any investment gains or losses in the next two years, would result in a projected amortization period of 52.3 years as of December 31, 2019, which is 17.3 years greater than the projected amortization period of 35.0 years in Scenario 2.

We do not know what the investment experience will be for each of the next four calendar years. However, these scenarios show the sensitivity of the UAAL amortization period in the next two biennial actuarial valuations to the current deferred net loss, requiring solid gains with a 12% rate of return in 2016 and 2017 to approximately offset the effect of the $4.7 million deferred net loss (Scenario 3) by December 31, 2019. Scenario 5 shows it would take four consecutive years of 11% returns for the amortization period to get below 25 years as of December 31, 2019. 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. 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 plausible scenarios for the next two valuations assuming no changes in benefits or in funding policy.

The primary conclusion from the scenarios is that since the fund has a deferred net loss in the AVA that will hinder the amortization of the UAAL, the board and the city should start the process of developing and implementing a new funding policy that will lower the amortization period. With the current funding policy, the current amortization period is sensitive to investment losses similar to the ones the fund experienced in 2014 and 2015. We address this subject in more detail in Section III.

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, 2013 actuarial valuation. Exhibit 1 is a distribution of the active firefighters by age and service. The salaries used for projecting future contributions and

benefits in the valuation were based on the actual pay for the 2015 calendar year, adjusted to reflect the net effect of the variable pay increases effective in April 2015 and the expectation that overtime would be lower in 2016 than it was in 2015. The total of these salaries is our assumed annualized covered payroll for the plan year beginning January 1, 2016 and is used in the valuation to determine the UAAL amortization period. The averages of the assumed salaries for the 2016 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 December 2015. Exhibit 2A is a reconciliation of firefighters and pensioners from December 31, 2013 to December 31, 2015. Exhibit 3 shows a breakdown of the dollar amount of the monthly benefits for retirees and surviving spouses. Exhibit 4 shows a historical comparison of the actuarial accrued liability and the actuarial value of assets.

The summary of assets contained in Exhibit 5 is based on the December 31, 2015 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, 2013 and December 31, 2015. Exhibit 5A contains the statement of changes in assets for 2014 and 2015. Exhibit 6 shows the development of the actuarial value of assets. Exhibit 7 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, 2013 and December 31, 2015 is shown in Exhibit 8.

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;

4. RP-2000 Combined Healthy Mortality Tables projected to 2024; and

5. City contribution rate averaging 15.5% over the UAAL amortization period.

The following actuarial assumption changes have been made, and the new assumptions are compared to those used in the December 31, 2013 valuation:

1. The investment return assumption was changed from 7% net of investment-related expenses to 6.75%. We modified the components of the investment return assumption, increasing the assumed net real rate of return from 3.75% to 4.25% and lowering the assumed annual inflation rate from 3.25% to 2.5%. Because of the somewhat lower inflation anticipated in our economy for the long-term future, we think that the 0.75% reduction in the assumed long-term rate of inflation is appropriate. The increase in the assumed net real rate of return is due to the combined effect of (a) the changes in the target asset allocation compared to two years ago (less in fixed income and more in alternatives) and (b) the somewhat higher gross real rate of return assumptions for some of the asset classes compared to two years ago.

2. We changed the general compensation increase from 3.25% per year to 3%, the sum of the revised underlying price inflation assumption of 2.5% plus 0.5% for general compensation increases in excess of inflation, sometimes referred to as productivity, but also as the price of competing for qualified employees. As a result, we also changed the aggregate payroll increase assumption from 3.25% per year to 3%.

3. The assumed average city contribution rate was changed from 17.0% to 15.5% in recognition of (a) the city's policy of contributing the same rate of payroll contributed for the city's other employees under the Texas Municipal Retirement System (TMRS), (b) the expectation for future contribution rates to TMRS to be somewhat lower due to growth in the number of city employees, (c) the long-term effect of TMRS using a closed amortization period (currently 19 years), and (d) the actual city contribution rate in calendar year 2016 (17.41%) and the budgeted rate for calendar year 2017 (17.48%).

The effects of these changes in assumptions on the UAAL amortization period are identified in Section II. A summary of all the assumptions and methods used in the valuation is shown in Exhibits 9 and 10. 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 11 contains definitions of terms used in this actuarial valuation report. Exhibit 12 summarizes the plan provisions of the Present Plan.

Actuarially Determined Contributions by the City

GASB 68 is all about accounting for pensions and did away with the concept of annually required contributions, referred to as the ARC. The GASB made a point of separating their accounting standard for public employee defined benefit plans from the actual funding of those plans. In other words, the city's GASB 68 pension expense will usually be very different from its actual contributions. That is why separate reports are needed each year to provide the required GASB 68 actuarial information.

As a result of GASB getting out of the business of providing a funding standard, the PRB recommended in their report to the Texas Legislature at the end of 2014 that actuarial valuation reports for fixed contribution rate plans should disclose contribution levels required for a variety of appropriate amortization periods. Since the preferred range for the UAAL amortization period is 15 to 25 years in the PRB's pension funding guidelines, we have shown the city contribution rate that would have been required beginning January 1, 2016 for amortization periods of 15, 20, and 25 years based on this December 31, 2015 actuarial valuation. Because of the significant deferred net loss of $4.7 million in the AVA, we have used the MVA to determine the UAAL for these actuarially determined contribution rates.

UAAL Amortization Period	Actuarially Determined Contribution Rate by the City	Firefighter Contribution Rate	Total Contribution Rate
15 Years	22.16%	12.60%	34.76%
20 Years	19.75%	12.60%	32.35%
25 Years	18.33%	12.60%	30.93%

In 2015, the Legislature passed HB 3310. It includes a new sentence which requires an actuarial valuation to include a recommended rate needed to have an amortization period for the UAAL that does not exceed 30 years. The city currently contributes the same rate to the fund as it does to its plan in TMRS for other city employees and has for a number of years. Since our assumed continuation of this funding policy results in an actuarially determined amortization period of 31.6 years, we must recommend a different funding policy that would increase the city's contribution rate. Because of the lag between the beginning date for the rates above (January 1, 2016) and an effective date of January 1, 2018 that would give the city time to decide upon and implement a new funding policy, **we recommend a fixed city contribution rate effective January 1, 2018 of either (a) 18.5% for an amortization period of 25 years or (b) 20.1% for an amortization period of 20 years or (c) 23.1% for an amortization period of 15 years, all amortization periods determined as of December 31, 2015.**

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 is typically outside the scope of an actuarial valuation for funding purposes. However, we provided projected amortization periods for the next two biennial actuarial valuations under six scenarios. 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.

Mark R. Fenlaw
Fellow, Society of Actuaries
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Rebecca B. Morris
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Section II

Key Results of the Actuarial Valuation

	December 31, 2013[1]	December 31, 2015
1. Actuarial present value of future benefits		
a. Those now receiving benefits or former firefighters entitled to receive benefits	$ 36,485,236	$ 39,149,449
b. Firefighters	79,039,342	89,097,935
c. Total	$ 115,524,578	$ 128,247,384
2. Actuarial present value of future normal cost contributions	$ 35,033,884	$ 38,304,699
3. Actuarial accrued liability (Item 1c – Item 2)	$ 80,490,694	$ 89,942,685
4. Actuarial value of assets	$ 62,089,743	$ 72,693,078
5. Unfunded actuarial accrued liability (UAAL) (Item 3 - Item 4)	$ 18,400,951	$ 17,249,607
6. Contributions (percent of pay)		
a. Firefighters	12.60%	12.60%
b. City of Denton (assumed average)	17.00%	15.50%
c. Total	29.60%	28.10%
7. Normal cost (percent of payroll)	21.18%	21.91%
8. Percent of payroll available to amortize the UAAL (Item 6c - Item 7)	8.42%	6.19%
9. Annualized covered payroll	$ 13,790,301	$ 14,965,362
10. Present annual amount available to amortize the UAAL (Item 8 x Item 9)	$ 1,161,143	$ 926,356
11. Years to amortize the UAAL	24.0 years	31.6 years
12. Funded ratio (Item 4 ÷ Item 3)[2]	77.1%	80.8%

[1] All items are from the December 31, 2013 actuarial valuation and reflect the Present Plan.

[2] 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 82.5% as of December 31, 2013 and 75.6% as of December 31, 2015.

Change in Amortization Period

The amortization period, based on the Present Plan provisions, was determined in the actuarial valuation as of December 31, 2013, to be 24.0 years. Since two years have passed since that valuation date, a 22.0-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 had been made. The amortization period is now 31.6 years based on the same plan provisions. The actual experience occurring between December 31, 2013 and December 31, 2015 differed from the expected experience, and in combination with the changes in assumptions, the resulting amortization period was 31.6 years, which is 9.6 years more than the expected 22.0-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 2014 and 2015 was 0.8%. 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 2014 and 2015 was 7.8% compared to the assumed rate of return for those years of 7%. This caused a **decrease** in the amortization period of 2.0 years.

2. The aggregate payroll increased at an average rate of 4.17% per year, compared to the assumed 3.25% per year rate, which caused the amortization period to **decrease** by 0.5 of a year.

3. The gain from city contributions above the assumed long-term average of 17% in 2014 (18.53%) and 2015 (17.94%) **decreased** the amortization period by 0.6 of a year.

4. The net result of all experience other than the investment experience, the aggregate payroll experience, and the city contribution rate experience had the combined effect of **decreasing** the amortization period by 2.7 years. This was primarily the result of lower-than-expected pay increases in the last two years.

5. The change in the assumed average city contribution rate from 17.0% to 15.5% had the effect of **increasing** the amortization period by 5.3 years.

6. The change in the general compensation increase and aggregate payroll increase assumptions from 3.25% to 3% per year and the decrease in the annual investment return assumption from 7% to 6.75% had the net effect of **increasing** the amortization period by 10.1 years.

Section III

Benefit Improvements

The results of this actuarial valuation as of December 31, 2015, reveal that the fund, based on the Present Plan of benefits, has an adequate contribution arrangement. As disclosed in both Sections I and II, the amortization period of the UAAL is 31.6 years. In order for benefit improvements to be made to the plan, they must be made in accordance with Section 7 of TLFFRA, which requires approval of the board, the board's actuarial firm, and the firefighters. The 31.6-year UAAL amortization period is too high to consider any benefit improvements. In addition, the city's funding policy for the fund should be changed at the appropriate time to be distinct from its funding polity for its TMRS plan for the other city employees. Perhaps then benefit improvements might be possible.

One of the key assumptions in the fund's recent actuarial valuations has been the assumed average city contribution rate. For purposes of the valuation of the fund, an assumed rate is used because of the city's policy beginning in 2010 to use the same TMRS contribution rate for the contribution rate for this fund. The city agreed in 2006 to gradually increase its contribution to the fund and in 2010 started to contribute the same rate to the fund as to TMRS. The rate was 15.41% in 2010 and increased to 18.98% in 2013 before starting to gradually decrease each year. So it has been very beneficial for the fund since 2010 for the city's contribution rate to the fund to be the same as for the city's TMRS plan. The significant increases in the city's contribution rate to the fund from the 10% rate during the years 2000 to 2006 have offset the significant investment losses from the 2008 recession and allowed the lowering of the investment return assumption from 7.75%.

In spite of this beneficial increase in the city's contribution rate to the fund, we do not believe that the city's linking of their contribution rate to the fund to their rate to their TMRS plan makes good sense for the long-term future for two reasons.

- The city's TMRS contribution rate is expected to gradually decrease during the 18 years after 2017 due to anticipated growth in the number of city employees and then to decrease significantly in 2036 because of the TMRS funding policy with a closed amortization period.

- Key differences in the work characteristics of firefighters vs. the other city employees indicate a need for a higher total contribution rate for the fund than the TMRS plan in order to have roughly comparable benefits.

At some point in the near future, it would be appropriate for the city and the board to begin discussing a distinct funding policy for the fund. In fact, the number one recommendation in the 2014 report from the PRB to the Legislature was that the

retirement system sponsor and the system should establish an adequate funding policy. Ideally there should be a formal written policy such as a city council resolution. It is expected that the TMRS rate will drop gradually over the 18 years after the 2017 rate of 17.48% and then drop more significantly to under 11% beginning in 2036. **In two years when the fund's December 31, 2017 actuarial valuation is being completed, if the contribution rate to the fund is still tied to the TMRS rate, it is possible that the key finding then would be an inadequate contribution arrangement for the fund.**

A reason for the need for a higher total contribution rate to your fund than to the TMRS plan is that firefighters have much lower turnover than other city employees. So a higher percent of newly hired firefighters will ultimately qualify for a retirement benefit than will newly hired other city employees. As a result, the cost of firefighter retirement benefits is higher than the cost of comparable retirement benefits for other city employees. A second reason for a higher total contribution rate is that firefighters tend to retire at earlier ages than other city employees because of the physical demands of the job. This also increases the cost of firefighter retirement benefits compared to the cost for other city employees because of a longer period for benefits to be paid. **Because of these two work characteristic differences, a reasonable funding policy would be for the city to contribute a fixed rate to the fund that is greater than the current TMRS contribution rate. The firefighters already contribute more to the fund (12.6%) than the other city employees contribute to the TMRS plan (7%).**

Exhibit 1

Distribution of Firefighters by Age and Service on December 31, 2015
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	1	5	5	2	0	0	0	0	0	13	$57,846
1	0	0	3	0	0	0	0	0	0	3	61,796
2	2	4	2	0	0	0	0	0	0	8	63,753
3	0	3	5	2	0	0	0	0	0	10	67,847
4	0	4	3	1	0	0	0	0	0	8	69,102
5	0	0	1	1	0	0	0	0	0	2	73,728
6	0	0	1	0	0	0	0	0	0	1	58,631
7	0	0	2	2	1	0	0	0	0	5	81,078
8	0	1	1	3	1	0	0	0	0	6	70,369
9	0	0	4	7	6	1	0	0	0	18	83,421
10	0	0	2	7	2	1	1	0	0	13	86,295
11	0	0	0	3	1	0	0	0	0	4	85,811
12	0	0	1	4	2	0	0	0	0	7	88,525
13	0	0	0	3	0	1	0	0	0	4	94,276
14	0	0	0	0	5	2	0	0	0	7	85,411
15	0	0	0	1	1	0	0	0	0	2	82,556
16	0	0	0	2	10	7	3	0	0	22	91,420
17	0	0	0	0	0	1	0	0	0	1	93,690
18	0	0	0	0	0	3	1	0	0	4	88,312
19	0	0	0	0	1	2	0	0	0	3	85,119
20-24	0	0	0	0	5	16	1	0	0	22	104,286
25-29	0	0	0	0	0	2	4	1	1	8	115,576
30-34	0	0	0	0	0	0	1	1	1	3	115,860
35+	0	0	0	0	0	0	0	1	1	2	123,259
Totals	3	17	30	38	35	36	11	3	3	176	$85,030

Average	$59,782		$71,372		$88,583	$105,711	$106,412
Salary		$63,317		$81,611		$97,879	$120,371	$85,030

Average age   39.6
Average years of service   12.1
Average age at hire   27.5

Exhibit 2

Summary of Pensioner Data

Type of Benefit	Pensioner Data Used in December 31, 2015 Valuation	
	Number of Recipients	Total Monthly Benefit Payments
Service Retirement[1]	68	$253,710
Disability Retirement	0	0
Vested Terminated (Deferred)[2]	2	3,178
Surviving Spouse	12	28,394
Surviving Child	4	2,837
Total	86	$288,119

Type of Benefit	Comparison of Pensioner Count by Type as of The Prior and Current Actuarial Valuations			
	December 31, 2013	New	Ceased	December 31, 2015
Service Retirement[1]	65	+5[3]	-2	68
Disability Retirement	0	0	0	0
Vested Terminated (Deferred)[2]	2	0	0	2
Surviving Spouse	11	+1	0	12
Surviving Child	5	0	-1	4
Total	83	+6	-3	86

[1] Includes two alternate payees entitled to receive benefits according to the terms of a Qualified Domestic Relations Order as of December 31, 2013, and three alternate payees as of December 31, 2015.

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

[3] Includes one new alternate payee.

Exhibit 2A

Firefighter and Pensioner Reconciliation

	Firefighters	Current Payment Status	Vested Terminated Firefighters	Total
1. As of December 31, 2013	169	81 [1]	2	252
2. Change of status				
a. retirement	(4)	4	0	0
b. disability	0	0	0	0
c. death	0	(2)	0	(2)
d. survivor payment begins	0	1	0	1
e. withdrawal	(7)	0	0	(7)
f. vested termination	0	0	0	0
g. completion of payment	0	(1)	0	(1)
h. QDRO alternate payee	0	1	0	1
i. net changes	(11)	3	0	(8)
3. New firefighters	18	0	0	18
4. As of December 31, 2015	176	84 [2]	2	262

[1] Includes two alternate payees entitled to receive benefits according to the terms of a Qualified
    Domestic Relations Order (QDRO).
[2] Includes three alternate payees entitled to receive benefits according to the terms of a QDRO.

Exhibit 3

Breakdown of Pensioners by Monthly Benefit Amounts as of December 31, 2015

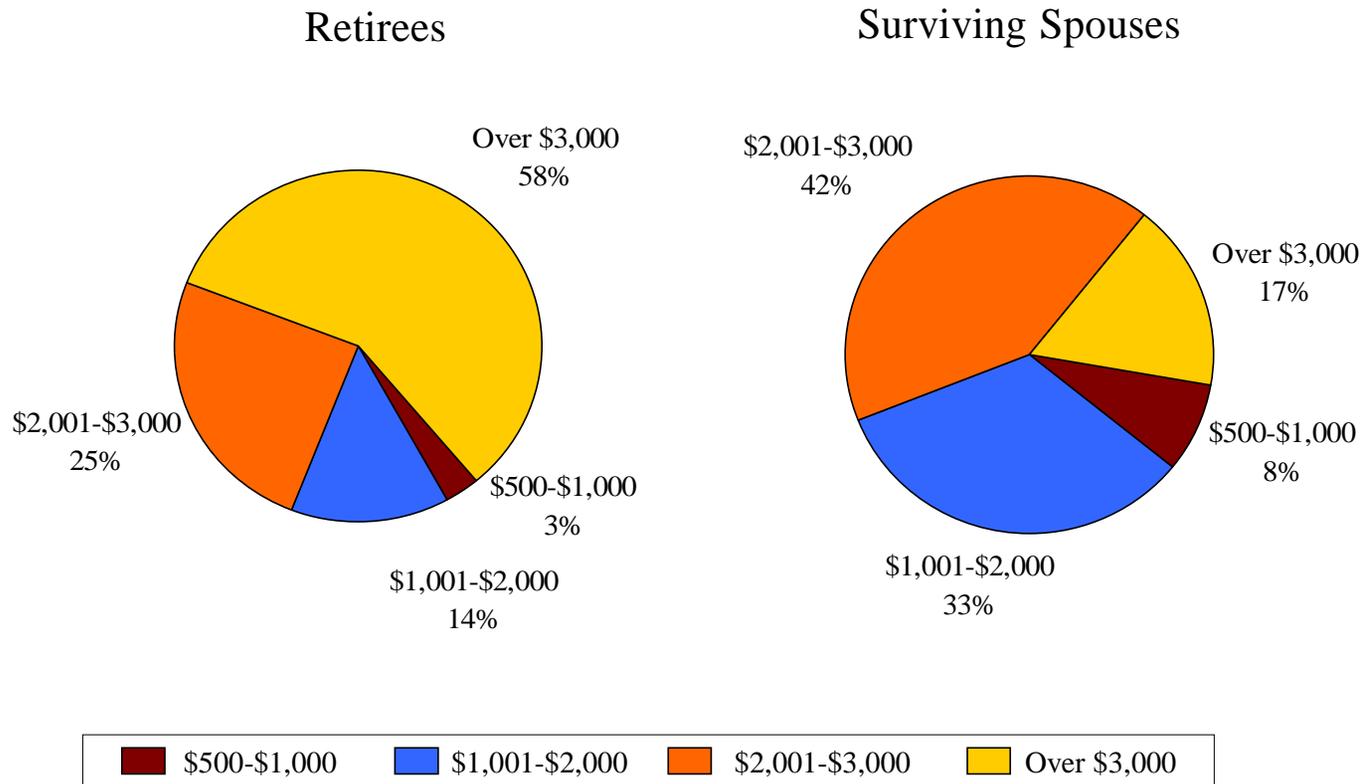### Retirees

Over $3,000
58%

$2,001-$3,000
25%

$500-$1,000
3%

$1,001-$2,000
14%

Surviving Spouses

$2,001-$3,000
42%

Over $3,000
17%

$500-$1,000
8%

$1,001-$2,000
33%

| ■ $500-$1,000 | ■ $1,001-$2,000 | ■ $2,001-$3,000 | □ Over $3,000 |

Exhibit 4

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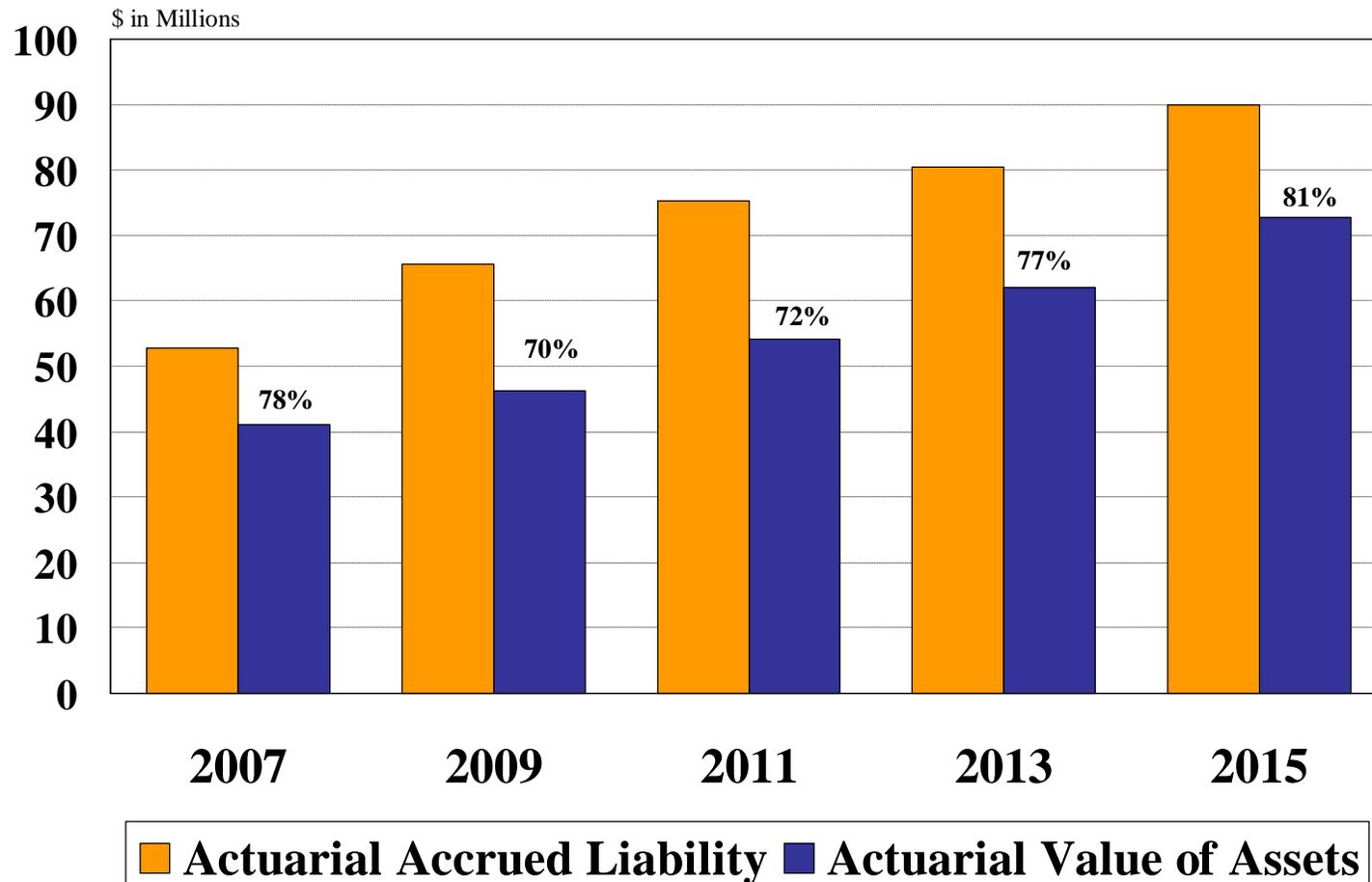**(Present Plan Valuations as of December 31)**

$ in Millions

Legend: ■ Actuarial Accrued Liability ■ Actuarial Value of Assets

- 2007: 78%
- 2009: 70%
- 2011: 72%
- 2013: 77%
- 2015: 81%

Exhibit 5

Summary of Asset Data

Asset Type	Market Value as of December 31, 2015	Allocation As a Percent of Grand Total
Equities		
U.S. Large Cap	$26,117,860	38.42%
U.S. Small/Mid Cap	5,622,331	8.27
International	5,165,252	7.60
Total	36,905,443	54.29
Alternatives		
Real Estate	8,664,808	12.75
Master Limited Partnership	2,913,644	4.28
Total	11,578,452	17.03
Fixed Income		
Certificates of Deposit	6,098,095	8.97
U.S. Notes, Bonds, and Obligations	1,879,208	2.77
Bond Index Funds	2,819,850	4.15
Corporate Bonds and Notes	654,529	0.96
Total	11,451,682	16.85
Cash Equivalents	8,041,140	11.83
Grand Total	$67,976,717[1]	100.00%

[1] The grand total is the audited amount. All of the invested amounts were provided by the plan administer, Mr. Gary Calmes. The cash equivalents amount is the cash equivalents provided by Mr. Calmes net of the receivables and liabilities in the audited financial report.

Comparison of Asset Values as of the Prior and Current Actuarial Valuation Dates		
	December 31, 2013	December 31, 2015
Market Value	$ 66,412,172	$ 67,976,717
Actuarial Value	$ 62,089,743	$ 72,693,078
Actuarial Value as a Percent of Market Value	93.5%	106.9%

Exhibit 5A

Statement of Changes in Audited Assets
for the Years Ended December 31, 2015 and 2014

	12/31/2015	12/31/2014
Additions		
1. Contributions		
a. Employer	$ 2,567,219	$ 2,566,875
b. Employees	1,803,064	1,745,419
c. Total	$ 4,370,283	$ 4,312,294
2. Investment Income		
a. Interest and dividends	$ 1,673,596	$ 1,646,725
b. Net appreciation in fair value	(4,876,182)	2,784,166
c. Total	$(3,202,586)	$ 4,430,891
3. Other Additions	1,412	49
Total Additions	**$ 1,169,109**	**$ 8,743,234**
Deductions		
4. Benefit Payments		
a. Monthly benefits	$ 3,390,483	$ 3,284,110
b. Lump-sum benefits	657,875	751,899
c. Total	$ 4,048,358	$ 4,036,009
5. Expenses		
a. Investment-related	$ 86,014	$ 19,874
b. General administrative	76,538	81,005
c. Total	$ 162,552	$ 100,879
Total Deductions	**$ 4,210,910**	**$ 4,136,888**
Net Increase in Assets	**$(3,041,801)**	**$ 4,606,346**
Market Value of Assets (Plan Net Position)		
Beginning of Year	$71,018,518	$66,412,172
End of Year	$67,976,717	$71,018,518
Rate of Return		
Net of All Expenses	(4.73)%	6.51%
Net of Investment-Related Expenses	(4.62)%	6.63%
Gross	(4.50)%	6.66%
Investment-Related Expenses	0.12%	0.03%

Exhibit 6

Development of Actuarial Value of Assets

Calculation of Actuarial Investment Gain/(Loss) Based on Market Value for Plan Years Ending December 31				
	2015	2014	2013	2012
1. Market Value of Assets as of Beginning of Year	$71,018,518	$66,412,172	$57,714,227	$54,200,861
2. Firefighter Contributions	1,803,064	1,745,419	1,718,094	1,645,996
3. City Contributions	2,567,219	2,566,875	2,598,419	2,332,743
4. Benefit Payments and Administrative Expenses[1]	(4,124,896)	(4,117,014)	(4,680,412)	(4,396,664)
5. Expected Investment Return[2]	4,979,885	4,655,687	4,027,475	3,779,680
6. Expected Market Value of Assets as of End of Year	76,243,790	71,263,139	61,377,803	57,562,616
7. Actual Market Value of Assets as of End of Year	67,976,717	71,018,518	66,412,172	57,714,227
8. Actuarial Investment Gain/(Loss)	(8,267,073)	(244,621)	5,034,369	151,611
9. Market Value Rate of Return Net of Expenses	(4.62)%	6.63%	15.75%	7.28%
10. Rate of Actuarial Investment Gain/(Loss)	(11.62)%	(0.37)%	8.75%	0.28%

[1] Administrative expenses are included for 2014 and 2015 because the investment return assumption was net of investment-related expenses for those years. In 2012 and 2013, the investment return was net of all expenses.

[2] Assuming uniform distribution of contributions and payments during the plan year; actuarially assumed investment return was 7.00% in all years.

Deferred Actuarial Investment Gains/Losses to be Recognized in Future Years			
Plan Year	Investment Gain/(Loss)	Deferral Percentage	Deferred Gain/(Loss) as of 12/31/2015
2015	$(8,267,073)	80%	$ (6,613,658)
2014	(244,621)	60%	(146,773)
2013	5,034,369	40%	2,013,748
2012	151,611	20%	30,322
Total			$ (4,716,361)

Actuarial Value of Assets as of December 31, 2015	
11. Market Value of Assets as of December 31, 2015	$ 67,976,717
12. Deferred Gain/(Loss) to be Recognized in Future	(4,716,361)
13. Preliminary Value (Item 12 – Item 13)	$ 72,693,078
14. Corridor for Actuarial Value of Assets	
a. 90% of Market Value as of December 31, 2015 (minimum)	$ 61,179,045
b. 110% of Market Value as of December 31, 2015 (maximum)	$ 74,774,389
15. Actuarial Value as of December 31, 2015	$ 72,693,078
16. Write Up/(Down) of Assets (Item 15 – Item 11)	$ 4,716,361

Exhibit 7

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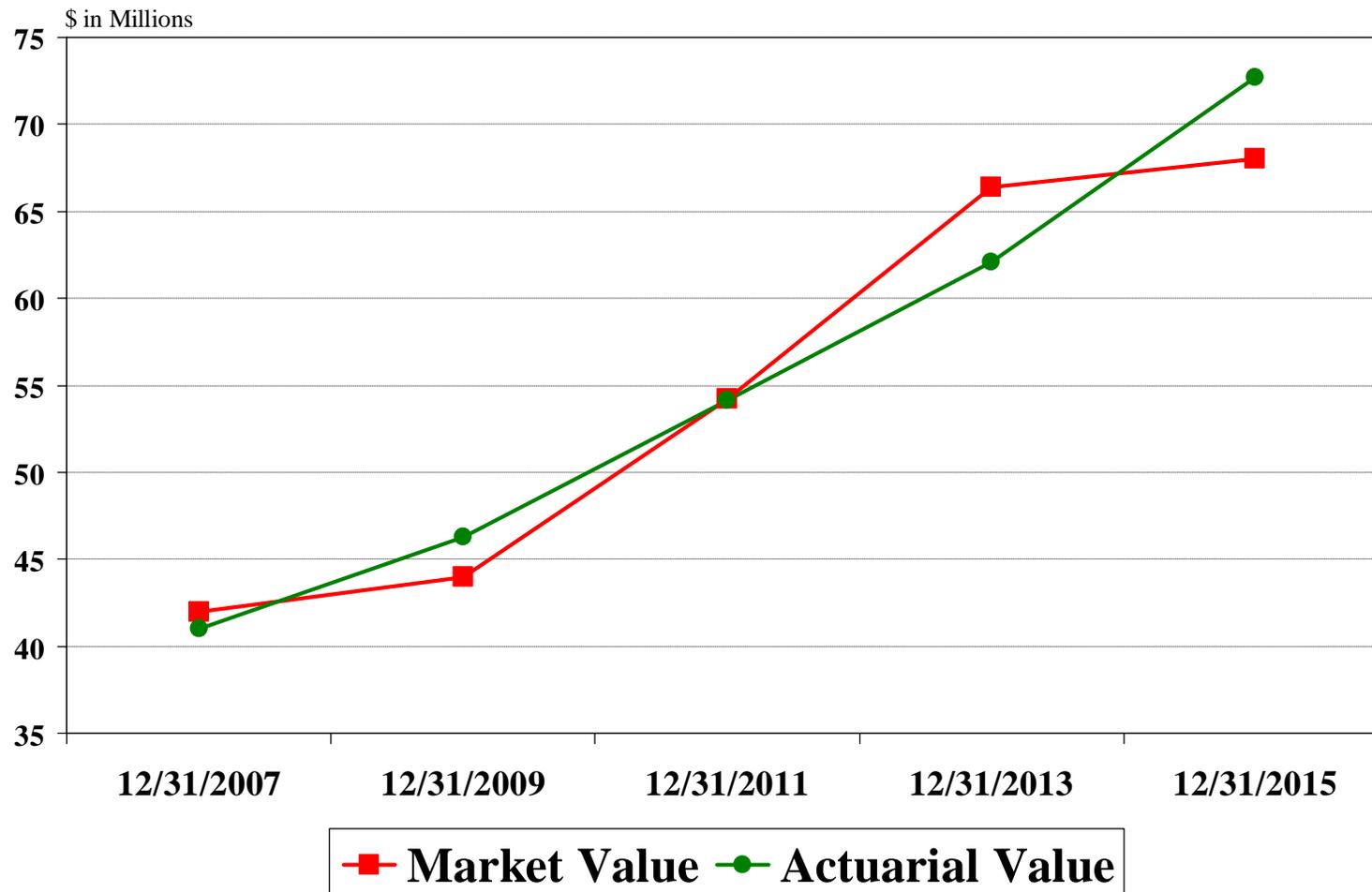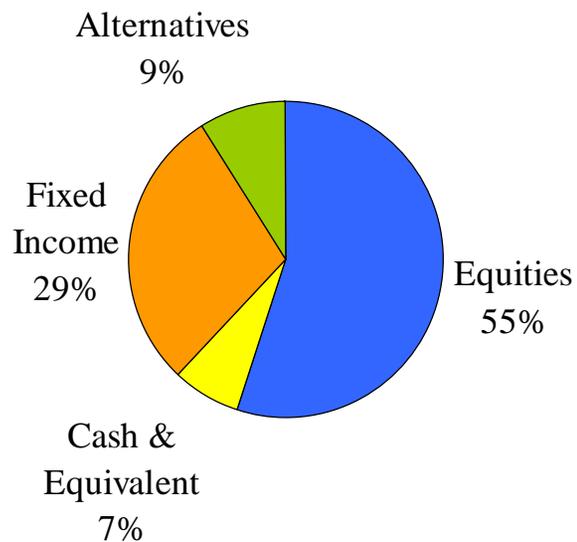(Valuation as of December 31)**

Exhibit 8

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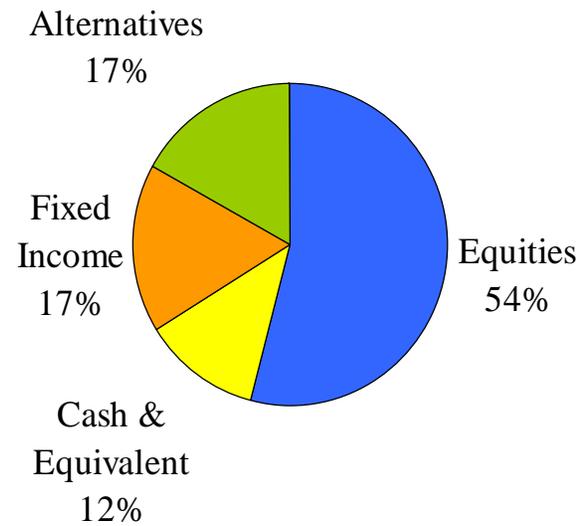Actuarial Valuation Dates**

December 31, 2013

December 31, 2015

Exhibit 9

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.

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.

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

RP-2000 Combined Healthy Mortality Table projected to 2024 for males and for females (sex distinct) for all three types of mortality: pre-retirement, post-retirement, and post-disability.

4. Compensation Increases

General increases of 3% per year (2.5% inflation plus 0.5% productivity) in addition promotion, step, and longevity increases that average 1.98% per year over a 30-year career. See Exhibit 10.

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. Withdrawal Rates

   See Exhibit 10.

8. Disability Rates

   See Exhibit 10.

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 two years younger and female firefighters having a spouse two 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 Average Contribution Rate

15.50% of covered payroll.

15. Covered Payroll for First Year Following Valuation Date

Actual (or annualized) pay for 2015 with an adjustment of 1.5% for each firefighter to reflect the net effect of (a) the variable pay increases effective in April 2016 and (b) the expectation that overtime would be lower in 2016 than it was in 2015.

16. General Administrative Expenses

The expenses paid by fund assets for other than investment-related expenses are assumed to be 0.55% of payroll. The normal cost rate as a percent of payroll is assumed to be 0.55% of payroll higher to reflect these expenses.

Exhibit 10

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

Disability Rates		Withdrawal 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 11

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 12

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) Assumed average for City of Denton   15.50%

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.