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# Midland Firemen's Relief and Retirement Fund

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## Actuarial Valuation as of December 31, 2017

January 22, 2019



Rudd and Wisdom, Inc.  
CONSULTING ACTUARIES

# Rudd and Wisdom, Inc.

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January 22, 2019

Board of Trustees  
Midland Firemen's Relief and  
Retirement Fund  
c/o Ms. Shera Crow  
Post Office Box 4296  
Midland, TX 79704

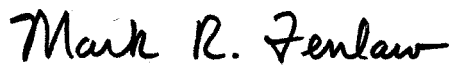
Members of the Board of Trustees:

At your request, we have prepared this report of the results of the actuarial valuation of the fund as of December 31, 2017. This valuation was prepared to determine whether the fund has an adequate contribution arrangement.

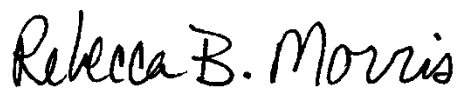
In a separate report later this year, we will provide the necessary disclosures for the fund's compliance with the Governmental Accounting Standards Board (GASB) Statement No. 67 for the plan year ending December 31, 2018. Similarly, we will provide a separate report as soon as possible containing the pension expense, net pension liability, and disclosure information for the city's compliance with GASB 68 for the fiscal year ending September 30, 2018. 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, F.S.A.



Rebecca B. Morris, A.S.A.

MRF/RBM:nlg

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## Section I Valuation Summary

An actuarial valuation of the assets and liabilities of the Midland Firemen's Relief and Retirement Fund as of December 31, 2017 has been completed. The valuation was based on the Present Plan (plan effective December 14, 2011) and the provisions of the Texas Local Fire Fighters' Retirement Act (TLFFRA) which were in effect on December 31, 2017. Section II shows the key results of the actuarial valuation as of December 31, 2017 and discusses the changes since the prior valuation as of December 31, 2015 prepared by your prior actuary.

This valuation reflects an actuarially assumed total contribution rate of 36.4%, comprised of 14.2% by the firefighters and 22.2% by the city. The total contribution rate of 36.4% exceeds the normal cost rate of 25.98%, leaving 10.42% available to amortize the unfunded actuarial accrued liability (UAAL) of \$58,952,399. Assuming that the total payroll increases at the rate of 4% per year in the future, the contributions in excess of the normal cost **will never amortize the UAAL.**

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 Texas State Pension Review Board guidelines for pension funding, 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 40 years to be the current maximum acceptable period. The PRB guidelines will be changing to a maximum of 30 years allowing for phase in through 2025. Since the total contributions are not 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 inadequate contribution arrangement.** Section III presents considerations for restoring an adequate contribution arrangement.

The box on the next page shows the amortization periods over the last several valuations. The primary reasons shown below for the increase in the amortization period from 44.7 years as of December 31, 2015 to "never" as of December 31, 2017 are reviewed in Section II:

- Lower investment return than expected
- Aggregate payroll since the prior valuation lower than expected
- Continuation of high amounts of overtime
- Changes in actuarial assumptions
- Changes in the city pay practices

| Actuarial Valuation Date | Amortization Period |
|--------------------------|---------------------|
| January 1, 2010          | 41.2 years          |
| January 1, 2012          | 86.3 years          |
| January 1, 2014          | 59.1 years          |
| December 31, 2015        | 44.7 years          |
| December 31, 2017        | never               |

### Projected Actuarial Valuation Results

In addition to completing this actuarial valuation, we estimated the amortization periods as of December 31, 2019 and as of December 31, 2021 by making projections from the December 31, 2017 actuarial valuation. These projections examine the effect on the amortization period in the next two biennial 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, 2015, and 2016, and a gain in 2017) that have been only partially recognized as of December 31, 2017. 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 2014-2017 that the fund experienced. The AVA used in this valuation is \$91,856,742. The market value of assets (MVA) is \$89,023,115. The \$2,833,627 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 biennial 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 2021 we used six scenarios of various assumed annual rates of investment return, net of investment-related expenses, over the 2018-2021 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, 2017 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, 2017, (2) of investment returns over the next four years different from the 7.75% assumption used in this valuation, and (3) the city contribution rate beginning January 1,

2018 that would have been required to have an amortization period of 40 years (Scenarios 1-3) or 30 years (Scenarios 4-6).

|  | Scenario |        |        |        |        |        |
|--|----------|--------|--------|--------|--------|--------|
|  | 1        | 2      | 3      | 4      | 5      | 6      |
| Assumed Investment Return<br>for Calendar Year     |          |        |        |        |        |        |
| 2018   | 7.75%    | 0.00%  | 0.00%  | 7.75%  | 0.00%  | 0.00%  |
| 2019   | 7.75     | 7.75   | 15.00  | 7.75   | 7.75   | 13.00  |
| 2020   | 7.75     | 7.75   | 15.00  | 7.75   | 7.75   | 13.00  |
| 2021   | 7.75     | 7.75   | 15.00  | 7.75   | 7.75   | 13.00  |
| 2022 and later                                     | 7.75     | 7.75   | 7.75   | 7.75   | 7.75   | 7.75   |
| City Contribution Rate                             | 29.13%   | 29.13% | 29.13% | 31.86% | 31.86% | 31.86% |
| Amortization Period in Years<br>as of December 31: |          |        |        |        |        |        |
| 2017 (actual)                                      | 40.0     | 40.0   | 40.0   | 30.0   | 30.0   | 30.0   |
| 2019 (projected)                                   | 44.4     | 50.2   | 47.8   | 31.7   | 34.8   | 33.9   |
| 2021 (projected)                                   | 42.3     | 54.7   | 39.0   | 29.6   | 35.8   | 29.8   |

The projected future valuations in Scenarios 1 and 4, based on returns of 7.75% each year, reveal that instead of decreasing by two years, the amortization period as of December 31, 2019 is projected to increase. These increases are due primarily to the deferred losses that will be recognized as of December 31, 2019. However, we know that the fund's return in 2018 was adverse. So we have estimated a 0% return in 2018 for Scenarios 2, 3, 5, and 6. The primary conclusion from those four scenarios is that unless there are some significant investment gains in 2019, 2020, and 2021 from returns greater than 7.75%, the deferred net loss as of December 31, 2017 along with the adverse results of 2018 will increase the amortization period in the next two biennial valuations even if the fund had had an adequate contribution arrangement as of December 31, 2017.

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 investment gains in each of the next three years to overcome the effect of the deferred losses and reduce the amortization period below either 40 or 30 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. In addition, the future investment experience in each of the four years could be better or worse than the assumed rates shown. These scenarios present a range of optimistic scenarios for the next two valuations assuming significant increases in the city contribution rate and no changes in benefits.

The primary conclusion from the scenarios is that since the fund has both an inadequate contribution arrangement and a deferred net loss in the AVA that will hinder the amortization of the UAAL, the board needs to consider benefit reductions in addition to increases in contribution rates. 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 Ms. Shera Crow, the administrator of the fund. We have not audited the data provided but have reviewed it for reasonableness and consistency relative to the data provided for the December 31, 2015 actuarial valuation. Exhibit 1A is a distribution of the active firefighters by age and service. The compensation used for projecting future contributions and benefits for each active firefighter in the valuation was the actual pay for calendar year 2017 increased by 5%. This increase was to reflect the average effect of the variable general pay increases effective October 1, 2017. The total of these assumed compensation amounts is our assumed annualized covered payroll for the plan year beginning January 1, 2018 and is used in the valuation to determine the UAAL amortization period. The averages of the assumed compensation amounts for the 2018 plan year are shown in Exhibit 1A.

Exhibit 1B shows a historical comparison of the assumed payroll for the year following each of five actuarial valuation dates. It includes the average annual increase between the assumed payrolls. Exhibit 2 contains summary information on the pensioners. The monthly benefit payments are generally based on the amounts paid December 31, 2017. Exhibit 3 is a reconciliation of firefighters and pensioners from December 31, 2015 to December 31, 2017. 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 allocation of the December 31, 2017 market value of assets in the December 31, 2017 report from the board chairman. This exhibit also shows a comparison with the market values and actuarial values of assets as of December 31, 2015 and December 31, 2017. Exhibit 7 contains the statement of changes in assets for 2017 and 2016. 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 market value asset allocation by major asset class as of December 31, 2017 is in a pie chart 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 this valuation are:

1. 7.75% annual investment return net of investment-related expenses;
2. 3.5% general annual compensation increase plus an average of 2.57% per year for pay increases due to promotions and longevity over a 25-year career;
3. 4% aggregate payroll growth (for the purpose of amortizing the UAAL), reflecting future department growth and a competitive pay environment;
4. Retirement rates which result in an average expected age at retirement of 53.2; and
5. RP-2000 Combined Healthy Mortality Tables projected by scale AA to 2024.

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.

The following actuarial assumption changes have been made, and the new assumptions are compared to those used in the December 31, 2015 valuation by the prior actuary:

1. We changed the aggregate payroll increase assumption used for determining the UAAL amortization period from 4.5% to 4%. We believe this assumption should usually be the same as the general compensation increase assumption. However, we have assumed that the number of active firefighters would increase over the next five years, making the average annual growth in payroll over the next 30 years 4%, which is 0.5% above the general compensation increase assumption of 3.5%. Because of the expected growth in number, we believe this 4% average annual growth in payroll is reasonable.
2. We changed the investment return assumption from 8% net of all expenses to 7.75% net of investment-related expenses which increased the present value of future benefits. Administrative expenses are now recognized explicitly as required for GASB 67 and 68. They are an assumed percent of payroll (1.40%) based on the average historical relationship in the last four years. It is added to the normal cost. We believe these assumptions are more reasonable for the long-term future.
3. We changed the compensation increase assumption for projecting future benefits to the combination of assumed general increases of 3.5% per year plus assumed promotion, step, and longevity increases that vary by year of service, and average 2.6% per year over a 25-year career. The assumption in the prior actuarial valuation consisted of the combination of assumed general increases of 6% plus

assumed promotion, step, and longevity increases that averaged 2.0% per year over a 25-year career. This change had a decreasing effect on projected compensation and benefits. We believe this compensation increase assumption is more reasonable for the long-term future.

4. We changed the demographic assumptions of withdrawal, disability, and retirement to ones with which we are more comfortable. However, the aggregate effect was very similar to the assumptions of the prior actuary.

The effects of these changes in assumptions in the UAAL amortization period are mentioned 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.

### **Supporting Exhibits**

Exhibit 13 contains definitions of terms used in this actuarial valuation report. Exhibit 14 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. As a result of GASB getting out of the business of providing a funding standard, the Texas Pension Review Board (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 10 to 25 years in the PRB's pension funding guidelines, and since the UAAL amortization period is above 40 years, we have shown the city contribution rate that would have been required beginning January 1, 2018 for amortization periods of 25, 30 and 40 years based on this December 31, 2017 actuarial valuation.

| UAAL Amortization Period | Actuarially Determined Contribution Rate by the City | Firefighter Contribution Rate | Total Contribution Rate |
|--------------------------|--|-------------------------------|-------------------------|
| 25 Years                 | 34.15%   | 14.2%                         | 48.35%                  |
| 30 Years                 | 31.86%   | 14.2%                         | 46.06%                  |
| 40 Years                 | 29.13%   | 14.2%                         | 43.33%                  |

In 2015, the Legislature passed HB 3310 which amended Sections 801 and 802 of the Government Code. It includes a new sentence in Section 802.101(a) which requires an actuarial valuation to include a recommended total contribution rate needed to have an amortization period for the UAAL that does not exceed 30 years. Since the current funding policy, 14.2% of pay by the firefighters and 22.2% of pay by the city, results in an amortization period of more than 40 years, we could recommend the 31.86% rate above to comply with H.B. 3310. However, with such a significant increase alone required for a 30-year amortization period, it is more practical for the recommended rate to be accompanied by some suggestions for reductions in future benefit accruals in order to restore an adequate contribution arrangement. So our recommendation to satisfy HB 3310 is all of Section III.

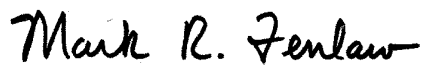
### Variability in Future Actuarial Measurement

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following:

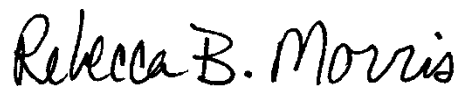
- Plan experience differing from that anticipated by the current economic or demographic assumptions;
- Increases or decreases expected as part of the natural operation of the methodology used for these measurements;
- Changes in economic or demographic assumptions; and
- Changes in plan provisions.

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. 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  
Member, American Academy of Actuaries



Rebecca B. Morris  
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**Section II**  
**Key Results of the Actuarial Valuation**

|  | December 31,<br>2015 <sup>1</sup> | December 31,<br>2017 |
|--|-----------------------------------|----------------------|
| 1. Actuarial present value of future benefits  |                                   |                      |
| a. Those now receiving benefits or former firefighters<br>entitled to receive benefits | \$ 62,364,243                     | \$ 74,208,569        |
| b. Firefighters  | 114,331,208                       | 112,628,447          |
| c. Total   | \$ 176,695,451                    | \$ 186,837,016       |
| 2. Actuarial present value of future normal cost contributions                         | \$ 44,426,369                     | \$ 36,027,875        |
| 3. Actuarial accrued liability (Item 1c – Item 2)                                      | \$ 132,269,082                    | \$ 150,809,141       |
| 4. Actuarial value of assets   | \$ 87,000,390                     | \$ 91,856,742        |
| 5. Unfunded actuarial accrued liability<br>(UAAL) (Item 3 - Item 4)                    | \$ 45,268,692                     | \$ 58,952,399        |
| 6. Contributions (percent of pay)  |                                   |                      |
| a. Firefighters  | 13.20%                            | 14.20%               |
| b. City of Midland   | 22.20%                            | 22.20%               |
| c. Total   | 35.40%                            | 36.40%               |
| 7. Normal cost (percent of payroll)  | 24.27%                            | 25.98%               |
| 8. Percent of payroll available to amortize the UAAL<br>(Item 6c - Item 7)             | 11.13%                            | 10.42%               |
| 9. Annualized covered payroll  | \$ 17,097,372                     | \$ 16,260,968        |
| 10. Present annual amount available to amortize the UAAL<br>(Item 8 x Item 9)          | \$ 1,902,938                      | \$ 1,694,393         |
| 11. Years to amortize the UAAL   | 44.7 years                        | never <sup>2</sup>   |
| 12. Funded ratio (Item 4 ÷ Item 3) <sup>3</sup>  | 65.8%                             | 60.9%                |

<sup>1</sup> All items are from the revised December 31, 2015 actuarial valuation by the prior actuary.

<sup>2</sup> The determination of the period required to amortize the UAAL reflected the November 4, 2018 effective date of the increase in the firefighter contribution rate from 13.2% to 14.2%.

<sup>3</sup> 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 61.2% as of December 31, 2015 and 59.0% as of December 31, 2017. **The best indicator of the fund's health is Item 11.**

## Change in Amortization Period

The amortization period, based on the Present Plan provisions, was determined in the actuarial valuation as of December 31, 2015 to be 44.7 years. Since two years have passed since that valuation date, a 42.7-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 “never” based on the same plan provisions. The actual experience occurring between December 31, 2015 and December 31, 2017 differed from the expected experience and significantly affected the amortization period. In addition, there were changes in assumptions, resulting in the amortization period being “never”.

Based on our roll forward of the December 31, 2015 actuarial valuation to December 31, 2017 with the 42.7-year amortization period, the changes in investment and payroll experience had the following effects on the amortization period, exaggerated because of the sensitivity of the elevated level of the amortization period:

- The average annual rate of investment return, net of all expenses, on the market value of assets during plan years 2016 and 2017 was 7.2%. 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 annual rate of return on the AVA, net of all expenses, for plan years 2016 and 2017 was 4.91% compared to the assumed rate of return for that year of 8%. This caused an **increase** in the amortization period of 13 years.
- The aggregate payroll decreased at an average rate of 2.5% per year, as the pay of many firefighters decreased from 2015 to 2017 (we assume as a result of less overtime), instead of increasing at the assumed 4.5% per year, which caused the amortization period to **increase** by 49 years.

The changes in demographic assumptions had a negligible effect on the amortization period. The changes in the economic assumptions, the change in the investment return assumption from 8% net of all expenses to 7.75% net of investment-related expenses and the reduction in the aggregate payroll increase assumption from 4.5% to 4%, caused the already-elevated amortization period (105 years) to become “never,” even with the increase in the firefighter contribution rate from 13.2% to 14.2%. In addition, the change in the city’s pay practice in 2017 from monthly pay to biweekly pay and the payment of one-time extra pay several times in the last three years both resulted in **significant** unintended benefit increases because of the Present Plan definition of average salary for benefit calculations.

### Section III

#### Restoring an Adequate Contribution Arrangement

The results of this actuarial valuation as of December 31, 2017 reveal that the fund, based on the Present Plan of benefits and the current contribution rates, has an inadequate contribution arrangement. There are three options for restoring an adequate contribution arrangement: (1) a sufficient increase in the total contribution rate, (2) a package of sufficient decreases in benefits, or (3) a sufficient combination of increases in contributions and decreases in benefits.

Regardless of whether increases in contributions or decreases in benefits or both are made, **there are two changes that we strongly recommend be made as soon as possible.** The first recommendation is to correct a deficiency in benefit design. The definition of Highest 60-Month Average Salary should be improved. Using the 60 highest months of pay allows months with unusual amounts of overtime to enhance the retirement benefit. The definition allows for some manipulations of overtime in the later part of a firefighter's career to increase the retirement benefit. In other words, the current definition allows for "spiking", as some people label it. Given the significant overtime the department has had in the last several years, the "spiking" effect has been magnified. A better definition with a much better perception is to use **consecutive** pay periods.

A recent change in the city's pay practices has magnified the deficiency in the current definition. Through the end of 2016, the city paid compensation monthly. Beginning in 2017, firefighters are paid biweekly. However, the plan document has not been changed, and definition of average salary is based on calendar month of pay. We have been told that the administrative practice for calculating a retirement benefit is to treat a month of pay that includes two biweekly pay periods as a full month and the same as a month with three biweekly pay periods. These months with three biweekly pay periods will amplify the "cherry-picking" nature of the current definition and increase the Highest 60-Month Average Salary. In addition, it is our understanding that the hours reflected in each biweekly pay period are not uniform but are actual hours worked based on the firefighters' schedules. This will also lead to swings in monthly pay amounts. This change in the city's pay practices will result in an unintended increase in benefits which we have anticipated with an assumed average adjustment factor based on the continuation of the pay practices and of the administrative practice for benefit calculations.

**We strongly recommend an amendment to the plan to change the definition of Highest 60-Month Average Salary** to be "the sum of the firefighter's pay in the 130 **consecutive** biweekly pay periods with the highest pay out of the last 156 biweekly pay periods divided by 60." This definition would need a transition to bridge from monthly pay through 2016 to biweekly pay since then. Alternatively, the definition could be changed to "the sum of the firefighter's pay in the 60 **consecutive** calendar months with the highest pay out of the last 72 months divided by 60." No transition would be needed

for the change to biweekly pay periods. Either way, the amendment would be worded to protect the vested accrued benefit on the effective date of the change based on the Present Plan provisions and on the service and pay history up to the effective date.

**We also recommend an additional change to treat a one-time lump sum of extra pay that is a percentage of an annual rate of pay as if it had been paid uniformly over the 26 biweekly pay periods ending with the pay period in which the payment was made. Both of these changes are needed to remove the distorting effects of city pay practices which result in significant unintended increases in pension benefits. These two recommended changes will be important parts of any package of changes to strengthen the actuarial condition of the fund and enhance its long-term sustainability for all current pensioners and all future pensioners.**

At the end of Section I, we showed the higher city contribution rate of 29.13% (assumed effective December 31, 2017) that would result in an amortization period of 40 years as of December 31, 2017. Reflecting a delay in the effective date to January 1, 2020, the city contribution rate for a 40-year amortization period would be 29.8%. Alternatively, a city contribution rate of 28.1% and a firefighter contribution rate of 16%, both beginning January 1, 2020, would also result in an amortization period of 40 years.

Even though the 40-year amortization period would restore an adequate contribution arrangement as of December 31, 2017, there are challenges looking ahead. First, the deferred net loss of \$2.8 million as of December 31, 2017 coupled with the adverse investment experience in 2018 will increase the amortization period in the next two biennial actuarial valuations to over 40 years. Then the inflation assumption, which keys the investment return and pay increases, may also need to be lowered in the future. In addition, there will be a needed update in the mortality assumption reflecting longer lifetimes. A concluding significant challenge is that the PRB funding guidelines were amended in 2017 so that beginning in 2025, the maximum acceptable amortization period for an adequate contribution arrangement will be 30 years.

Because of these challenges, the board may want to consider combining contribution rate increases with some decreases in benefits, in addition to the two changes we recommended. Changes in benefit provisions that would help the fund are painful, but here are some examples of modest changes:

- Increase the minimum age and service requirement for all of the DROP plan benefits from age 50 and 20 years of service or 25 years of service at any age to age 52 and 22 years of service.
- Decrease the maximum DROP period by 12 months for all of the DROP plans.
- Discontinue the crediting of any interest in the determination of a DROP lump sum.
- Increase the earliest retirement age with 20 years of service from 50 to 51.

- Discontinue the supplemental \$500 per month benefit, or require a later eligibility of age 55 with 25 years of service for example.
- Reduce the 75% of average salary in order to increase the dollar amount of the additional benefit for years over 20 above \$80. At a minimum, this could be done for future hires.
- Change the normal surviving spouse benefit as a percentage of the retiree's benefit from 75% to 66.67%.
- Amend Section F of the plan that provides for a 2% increase in benefits to certain pensions when the fund's investment rate of return averages at least 8.25% over the most recent five consecutive years to add the requirement that the period required to amortize the resulting UAAL would not exceed 25 years.
- Discontinue retirement before age 50 (or 51).

Any changes in plan provisions to reduce future benefit accruals would be designed by the board of trustees and Rudd and Wisdom working together to protect vested accrued benefits as of the effective date of change. The effect of any of these potential changes would have to be studied before any vote of the firefighters so the board and firefighters would know the potential effect and how it might be combined with other potential changes and with an increase in contribution rates in order to reestablish an adequate contribution arrangement. We encourage the board and the city to begin working with us toward this goal as soon as possible this year. Delays in making changes will likely result in larger changes needing to be made.

**Exhibit 1A**  
**Distribution of Firefighters by Age and Service on December 31, 2017**  
**with Average Annual Compensation**

| Years of Service | Age      |          |          |          |          |          |          |          |            | Total    | Average Compensation |
|------------------|----------|----------|----------|----------|----------|----------|----------|----------|------------|----------|----------------------|
|                  | Under 25 | 25-29    | 30-34    | 35-39    | 40-44    | 45-49    | 50-54    | 55-59    | 60 or Over |          |                      |
| 0                | 6        | 5        | 4        | 1        | 0        | 1        | 0        | 0        | 0          | 17       | \$ 46,000            |
| 1                | 5        | 4        | 3        | 0        | 0        | 0        | 0        | 0        | 0          | 12       | 56,200               |
| 2                | 3        | 10       | 4        | 1        | 0        | 0        | 0        | 0        | 0          | 18       | 55,665               |
| 3                | 3        | 8        | 3        | 1        | 0        | 0        | 0        | 0        | 0          | 15       | 60,797               |
| 4                | 2        | 6        | 3        | 5        | 0        | 0        | 0        | 0        | 0          | 16       | 65,790               |
| 5                | 0        | 1        | 3        | 3        | 0        | 0        | 0        | 0        | 0          | 7        | 64,415               |
| 6                | 0        | 2        | 4        | 1        | 0        | 0        | 0        | 0        | 0          | 7        | 72,104               |
| 7                | 0        | 0        | 1        | 0        | 0        | 0        | 0        | 0        | 0          | 1        | 100,925              |
| 8                | 0        | 0        | 0        | 1        | 1        | 0        | 1        | 0        | 0          | 3        | 87,561               |
| 9                | 0        | 0        | 3        | 1        | 0        | 0        | 0        | 0        | 0          | 4        | 73,312               |
| 10               | 0        | 0        | 3        | 5        | 0        | 3        | 0        | 0        | 0          | 11       | 80,060               |
| 11               | 0        | 0        | 5        | 6        | 2        | 0        | 0        | 0        | 0          | 13       | 81,361               |
| 12               | 0        | 0        | 2        | 3        | 2        | 1        | 0        | 0        | 0          | 8        | 82,740               |
| 13               | 0        | 0        | 0        | 3        | 1        | 0        | 0        | 0        | 0          | 4        | 80,920               |
| 14               | 0        | 0        | 0        | 2        | 1        | 1        | 0        | 0        | 0          | 4        | 100,322              |
| 15               | 0        | 0        | 0        | 2        | 0        | 0        | 0        | 0        | 0          | 2        | 106,160              |
| 16               | 0        | 0        | 0        | 3        | 2        | 0        | 0        | 0        | 0          | 5        | 86,018               |
| 17               | 0        | 0        | 0        | 1        | 4        | 0        | 0        | 0        | 0          | 5        | 100,073              |
| 18               | 0        | 0        | 0        | 0        | 2        | 2        | 0        | 0        | 0          | 4        | 107,414              |
| 19               | 0        | 0        | 0        | 0        | 3        | 2        | 3        | 0        | 0          | 8        | 89,992               |
| 20-24            | 0        | 0        | 0        | 0        | 5        | 12       | 3        | 1        | 0          | 21       | 103,195              |
| 25-29            | 0        | 0        | 0        | 0        | 0        | 0        | 4        | 5        | 2          | 11       | 110,025              |
| 30-34            | 0        | 0        | 0        | 0        | 0        | 0        | 4        | 3        | 2          | 9        | 109,961              |
| 35+              | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>1</u> | <u>1</u>   | <u>2</u> | 120,452              |
| Totals           | 19       | 36       | 38       | 39       | 23       | 22       | 15       | 10       | 5          | 207      | \$ 78,555            |

Average Compensation    \$53,272                      \$68,442                      \$97,401                      \$101,099                      \$114,030  
    \$59,217                      \$77,046                      \$93,740                      \$112,224                      \$78,555

Average age                                      37.5  
 Average years of service                      11.0  
 Average age at hire                              26.5

**Exhibit 1B**  
**Historical Comparison of Assumed Payroll**

| Actuarial Valuation Date | Number Of Active Firefighters | Assumed Payroll | Average Annual Pay  | Average Annual Increase |                    |
|--------------------------|-------------------------------|-----------------|---------------------|-------------------------|--------------------|
|                          |                               |                 |                     | Assumed Payroll         | Average Annual Pay |
| 12/31/2009               | 188                           | \$11,901,777    | \$63,307            | --                      | --                 |
| 12/31/2011               | 190                           | 12,720,349      | 67,303 <sup>1</sup> | 3.4%                    | 3.1%               |
| 12/31/2013               | 178                           | 14,597,213      | 82,939 <sup>2</sup> | 7.1                     | 11.0               |
| 12/31/2015               | 193                           | 17,097,372      | 89,986 <sup>3</sup> | 8.2                     | 4.2                |
| 12/31/2017               | 207                           | 16,260,968      | 78,555              | (2.5)                   | (6.6) <sup>4</sup> |

<sup>1</sup> The payroll excludes one above the latest assumed retirement age (59).

<sup>2</sup> The payroll excludes two above the latest assumed retirement age (59).

<sup>3</sup> The payroll excludes three above the latest assumed retirement age (59).

<sup>4</sup> If the 207 total number of firefighters and the \$16.26 million payroll excluded 17 firefighters with less than a full year of service, for whom we assumed an annual rate of pay of \$46,000, the average annual pay was \$81,468, a 4.9% average reduction in pay from two years earlier.

**Exhibit 2**  
**Summary of Pensioner Data**

| Type of Benefit              | Pensioner Data Used in<br>December 31, 2017 Valuation |                                   |
|------------------------------|---|-----------------------------------|
|                              | Number of<br>Recipients                               | Total Monthly<br>Benefit Payments |
| Service Retirement           | 136 <sup>2</sup>                                      | \$499,305                         |
| Disability Retirement        | 3   | 7,639                             |
| Vested Terminated (Deferred) | 8   | 23,059                            |
| Surviving Spouse             | 24  | 43,626                            |
| Surviving Child              | <u>6</u>  | <u>5,099</u>                      |
| Total                        | 177   | \$ 578,728                        |

| Type of Benefit              | Comparison of Pensioner Count by Type as of<br>The Prior and Current Actuarial Valuations |          |          |                   |
|------------------------------|---|----------|----------|-------------------|
|                              | December 31, 2015   | New      | Ceased   | December 31, 2017 |
| Service Retirement           | 127 <sup>1</sup>  | +15      | -6       | 136 <sup>2</sup>  |
| Disability Retirement        | 3   | 0        | 0        | 3                 |
| Vested Terminated (Deferred) | 8   | +1       | -1       | 8                 |
| Surviving Spouse             | 22  | +4       | -2       | 24                |
| Surviving Child              | <u>6</u>  | <u>0</u> | <u>0</u> | <u>6</u>          |
| Total                        | 166   | +20      | -9       | 177               |

<sup>1</sup> Includes six alternate payees entitled to receive benefits according to the terms of a Qualified Domestic Relations Order (QDRO).

<sup>2</sup> Includes seven alternate payees entitled to receive benefits according to the terms of a QDRO.

**Exhibit 3**  
**Firefighter and Pensioner Reconciliation**

|                            | Firefighters           | Current<br>Payment<br>Status | Vested<br>Terminated<br>Firefighters | Total     |
|----------------------------|------------------------|------------------------------|--------------------------------------|-----------|
| 1. As of December 31, 2015 | 193                    | 158 <sup>1</sup>             | 8                                    | 359       |
| 2. Change of status        |                        |                              |                                      |           |
| a. retirement              | (14)                   | 14                           | 0                                    | 0         |
| b. disability              | 0                      | 0                            | 0                                    | 0         |
| c. death                   | 0                      | (8)                          | 0                                    | (8)       |
| d. survivor payment begins | 0                      | 4                            | 0                                    | 4         |
| e. withdrawal              | (18)                   | 0                            | (1)                                  | (19)      |
| f. vested termination      | (1)                    | 0                            | 1                                    | 0         |
| g. QDRO alternate payee    | 0                      | 1                            | 0                                    | 1         |
| h. child benefit ceases    | 0                      | 0                            | 0                                    | 0         |
| i. correction              | <u>0</u>               | <u>0</u>                     | <u>0</u>                             | <u>0</u>  |
| j. net changes             | (33)                   | 11                           | 0                                    | (22)      |
| 3. New firefighters        | <u>47</u> <sup>2</sup> | <u>0</u>                     | <u>0</u>                             | <u>47</u> |
| 4. As of December 31, 2017 | 207                    | 169 <sup>3</sup>             | 8                                    | 384       |

<sup>1</sup> Includes six alternate payees entitled to receive benefits according to the terms of a Qualified Domestic Relations Order (QDRO).

<sup>2</sup> Includes one firefighter who was rehired.

<sup>3</sup> Includes seven alternate payees entitled to receive benefits according to the terms of a QDRO.

Exhibit 4

Breakdown of Monthly Benefit Payment Amounts as of December 31, 2017

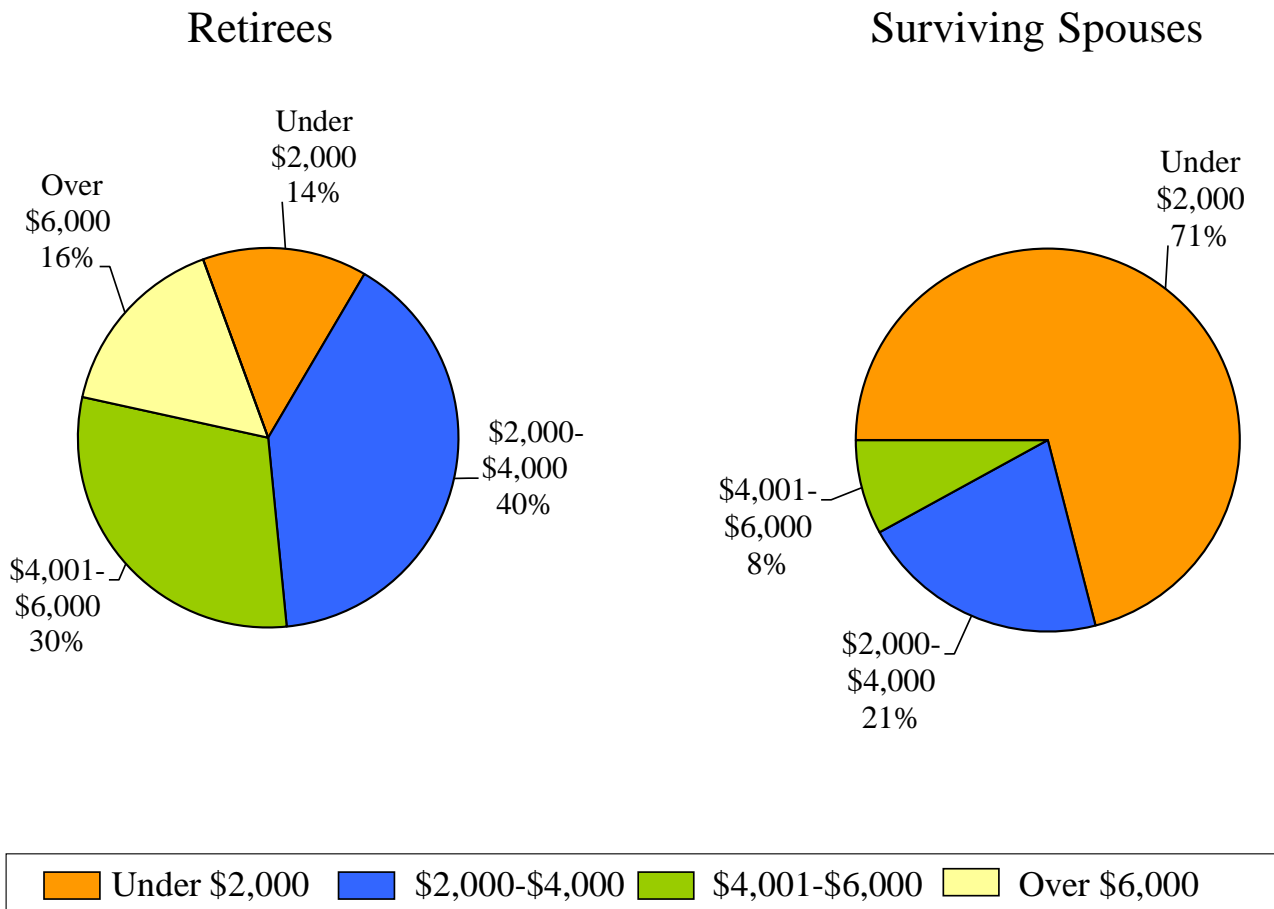
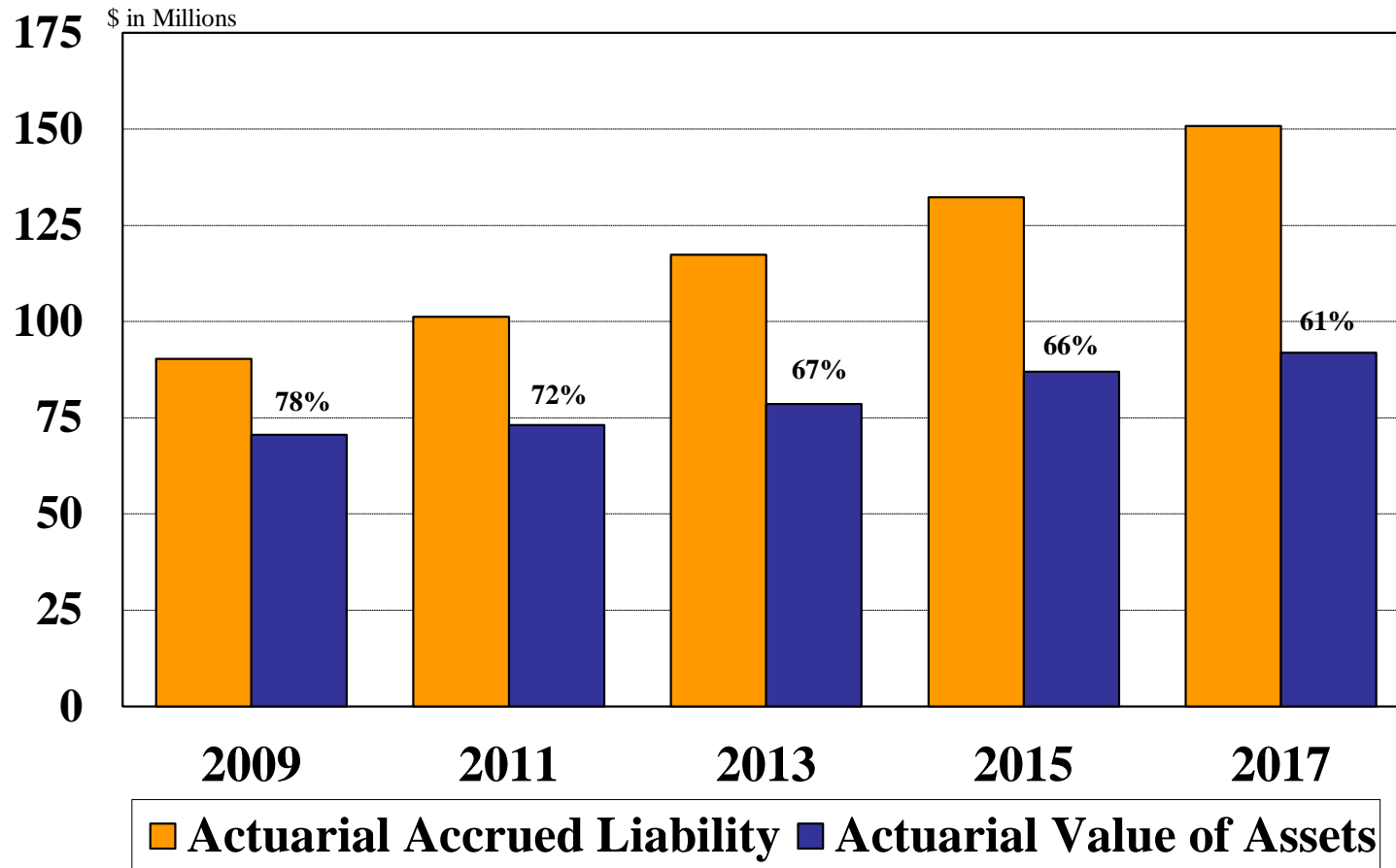


Exhibit 5

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<br>as of<br>December 31, 2017 | Allocation<br>As a Percent<br>of Grand Total |
|-----------------------------------|--|--|
| Equities                          |  |  |
| U.S. Large Cap                    | \$ 9,865,099                               | 11.1%  |
| U.S. Small/Mid Cap                | 2,409,097                                  | 2.7  |
| International Developed           | 12,012,316                                 | 13.5   |
| Emerging Markets                  | <u>3,179,758</u>                           | <u>3.6</u>                                   |
| Total                             | 27,466,270                                 | 30.9   |
| Alternatives                      |  |  |
| Venture Capital                   | 1,076,379                                  | 1.2  |
| Real Estate                       | 30,460,104                                 | 34.2   |
| Private Equity                    | <u>0</u>                                   | <u>0.0</u>                                   |
| Total                             | 31,536,483                                 | 35.4   |
| Fixed Income                      | 24,291,051                                 | 27.3   |
| Cash Equivalents, Net of Payables | <u>5,729,311</u>                           | <u>6.4</u>                                   |
| Grand Total                       | \$89,023,115 <sup>1</sup>                  | 100.0%                                       |

<sup>1</sup> The grand total is the audited amount. All of the invested amounts except cash are from December 31, 2017 report from the board chairman. Cash was the balancing item.

| Comparison of Asset Values as of the Prior<br>and Current Actuarial Valuation Dates |                          |                          |
|---|--------------------------|--------------------------|
|   | <u>December 31, 2015</u> | <u>December 31, 2017</u> |
| Market Value  | \$ 80,942,385            | \$ 89,023,115            |
| Actuarial Value   | \$ 87,000,390            | \$ 91,856,744            |
| Actuarial Value as a Percent<br>of Market Value                                     | 107.5%                   | 103.2%                   |

**Exhibit 7**

**Statement of Changes in Audited Assets  
for the Years Ended December 31, 2017 and 2016**

|   | <u>12/31/2017</u>    | <u>12/31/2016</u>   |
|---|----------------------|---------------------|
| <b>Additions</b>                                |                      |                     |
| 1. Contributions                                |                      |                     |
| a. Employer                                     | \$ 3,555,264         | \$ 3,582,056        |
| b. Employees                                    | <u>2,113,940</u>     | <u>2,129,871</u>    |
| c. Total  | \$ 5,669,204         | \$ 5,711,927        |
| 2. Investment Income                            |                      |                     |
| a. Interest and dividends                       | \$ 3,675,072         | \$ 1,804,566        |
| b. Net appreciation in fair value               | <u>6,537,175</u>     | <u>1,932,627</u>    |
| c. Total  | \$ 10,212,247        | \$ 3,737,193        |
| 3. Other Additions                              | <u>3,627</u>         | <u>66</u>           |
| <b>Total Additions</b>                          | <b>\$ 15,885,078</b> | <b>\$ 9,449,186</b> |
| <b>Deductions</b>                               |                      |                     |
| 4. Benefit Payments                             | \$ 8,252,601         | \$ 6,843,836        |
| 5. Expenses                                     |                      |                     |
| a. Investment-related                           | \$ 735,812           | \$ 631,166          |
| b. General administrative                       | <u>538,498</u>       | <u>251,621</u>      |
| c. Total  | \$ 1,274,310         | \$ 882,787          |
| <b>Total Deductions</b>                         | <b>\$ 9,526,911</b>  | <b>\$ 7,726,623</b> |
| <b>Net Increase in Assets</b>                   | <b>\$ 6,358,167</b>  | <b>\$ 1,722,563</b> |
| Market Value of Assets (Fiduciary Net Position) |                      |                     |
| Beginning of Year                               | \$ 82,664,948        | \$ 80,942,385       |
| End of Year                                     | \$ 89,023,115        | \$ 82,664,948       |
| Rate of Return                                  |                      |                     |
| Net of All Expenses                             | 10.99%               | 3.55%               |
| Net of Investment-Related Expenses              | 11.69%               | 3.87%               |
| Gross   | 12.65%               | 4.68%               |
| Direct Investment-Related Expenses              | 0.96%                | 0.81%               |

**Exhibit 8**

**Development of Actuarial Value of Assets**

| Calculation of Actuarial Investment Gain/(Loss) Based on Market Value for Plan Years Ending December 31 |                   |                   |                   |                   |
|---|-------------------|-------------------|-------------------|-------------------|
|   | 2017              | 2016              | 2015              | 2014              |
| 1. Market Value of Assets as of beginning of year   | \$82,664,948      | \$80,942,385      | \$82,552,420      | \$80,950,814      |
| 2. Firefighter Contributions  | 2,113,940         | 2,129,871         | 2,258,218         | 2,055,503         |
| 3. City Contributions   | 3,555,264         | 3,582,056         | 3,729,857         | 3,318,107         |
| 4. Benefit Payments and Administrative Expenses <sup>1</sup>  | (8,791,099)       | (7,095,457)       | (6,896,336)       | (6,523,748)       |
| 5. Expected Investment Return <sup>2</sup>  | <u>6,285,560</u>  | <u>6,219,423</u>  | <u>6,362,617</u>  | <u>6,229,120</u>  |
| 6. Expected Market Value of Assets as of end of year  | 85,828,613        | 85,778,278        | 88,006,776        | 86,029,796        |
| 7. Actual Market Value of Assets as of end of year  | <u>89,023,115</u> | <u>82,664,948</u> | <u>80,942,385</u> | <u>82,552,420</u> |
| 8. Actuarial Investment Gain/(Loss)   | 3,194,502         | (3,113,330)       | (7,064,391)       | (3,477,376)       |
| 9. Market Value Rate of Return Net of Expenses  | 11.69%            | 3.87%             | (0.85)%           | 3.42%             |
| 10. Rate of Actuarial Investment Gain/(Loss)  | 3.94%             | (3.88)%           | (8.60)%           | (4.33)%           |

<sup>1</sup> Administrative expenses are included for all years to retroactively make the investment return assumption net of investment-related expenses.

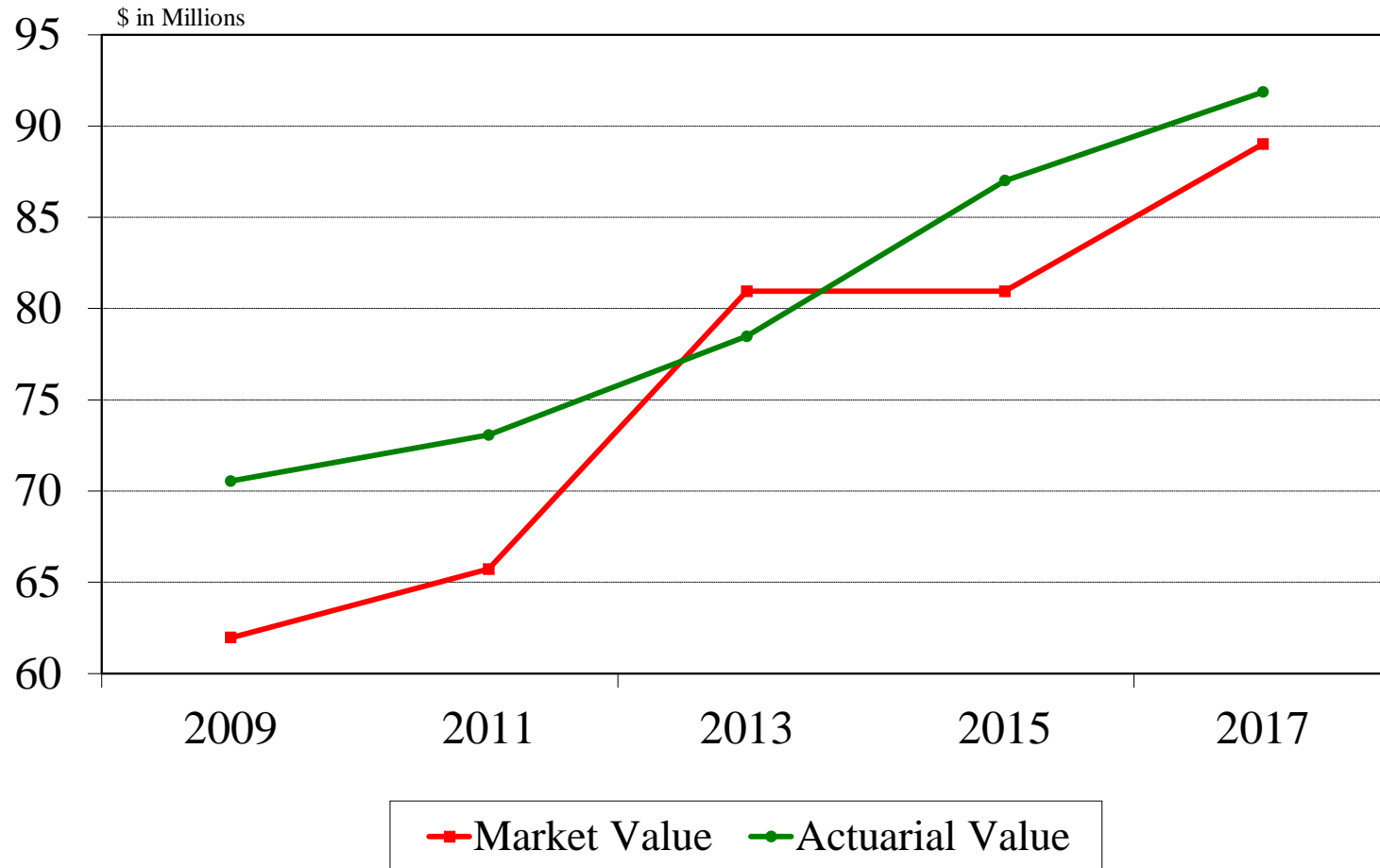
<sup>2</sup> Assuming uniform distribution of contributions and payments during the plan year; investment return assumed to be 7.75% per year.

| Plan Year | Investment Gain/(Loss) | Deferral Percentage | Deferred Gain/(Loss) as of 12/31/2017 |
|-----------|------------------------|---------------------|---------------------------------------|
| 2017      | \$ 3,194,502           | 80%                 | \$ 2,555,602                          |
| 2016      | (3,113,330)            | 60%                 | (1,867,998)                           |
| 2015      | (7,064,391)            | 40%                 | (2,825,756)                           |
| 2014      | (3,477,376)            | 20%                 | (695,475)                             |
| Total     |                        |                     | <u>\$ (2,833,627)</u>                 |

| Actuarial Value of Assets as of December 31, 2017         |                    |
|---|--------------------|
| 11. Market Value of Assets as of December 31, 2017        | \$ 89,023,115      |
| 12. Deferred Gain/(Loss) to be Recognized in Future       | <u>(2,833,627)</u> |
| 13. Preliminary Value (Item 12 – Item 13)                 | \$ 91,856,742      |
| 14. Corridor for Actuarial Value of Assets                |                    |
| a. 80% of Market Value as of December 31, 2017 (minimum)  | \$ 71,218,492      |
| b. 120% of Market Value as of December 31, 2017 (maximum) | \$ 106,827,738     |
| 15. Actuarial Value as of December 31, 2017               | \$ 91,856,742      |
| 16. Write Up/(Down) of Assets (Item 15 – Item 11)         | \$ 2,833,627       |

Exhibit 9

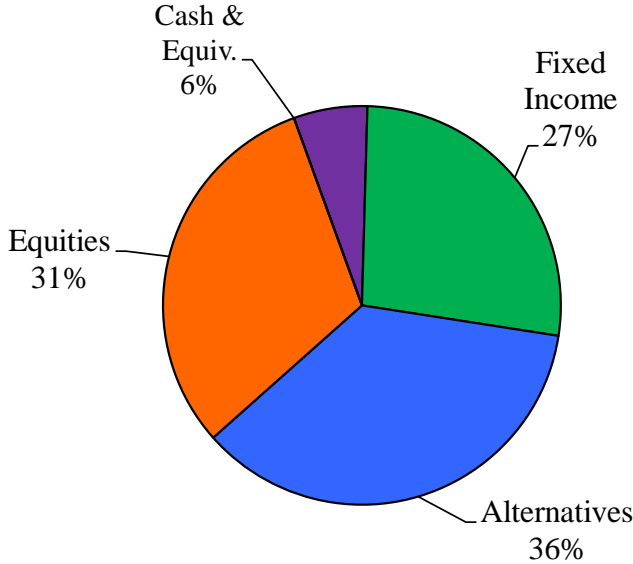
Historical Comparison of Market and Actuarial Value of Assets  
(Valuation as of December 31)



**Exhibit 10**

**Market Value Asset Allocation as of the Current Actuarial Valuation Date**

December 31, 2017



## 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 4% 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 80% of market value nor greater than 120% of market value. The 7.75% investment return assumption net of investment-related

expenses used in this actuarial valuation was made retroactive for determining the actuarial gains or losses. See Exhibit 8.

## 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 try to 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 estimates of future experience for the fund for the long-term future.

### 1. Investment Return

7.75% per year net of investment-related expenses.

### 2. Inflation

3.25% per year included in compensation increases and investment return assumptions.

### 3. Mortality Rates

RP-2000 Combined Healthy Mortality Table projected to 2024 by scale AA 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 3.50% per year in addition promotion, step, and longevity increases that average 2.57% per year over a 25-year career. See Exhibit 12.

5. Retirement Rates

| Age   | Rate per Year for Firefighters<br>Eligible to Retire |
|-------|--|
| 50    | 30%  |
| 51-52 | 10   |
| 53    | 40   |
| 54-55 | 25   |
| 56-59 | 50   |
| 60    | 100  |

The average expected retirement age for paid firefighters not yet eligible to retire based on these rates is 53.2.

6. DROP Elections

- a. Percent of firefighters eligible electing Retroactive DROP: 100% of service retirements eligible to elect at least a 24-month lump sum.
- b. Months assumed for Retroactive DROP lump sum: Maximum they are eligible for, up to 36 months.
- c. Percent of firefighters electing Reverse DROP: 100% of service retirements not eligible to elect at least a 24-month lump sum Retroactive DROP.
- d. Percent of firefighters electing Forward DROP and Combined DROP: 0%

7. Withdrawal Rates

See Exhibit 12.

8. Disability Rates

See Exhibit 12.

9. Reduction in Benefit after 2½ Years of Disability Retirement

15% 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 three years younger and female firefighters having a spouse three years older.

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

- Joint and 75% to surviving spouse for the 90% assumed to be married
- Life annuity for the 10% assumed to be single

12. Surviving Child's Death Benefit

None are assumed as a result of future deaths.

13. Firefighters' Contribution Rate

14.2% of covered pay began November 4, 2018, a 1% increase.

14. City's Contribution Rate

22.2% of covered pay for at least as long as the period required to amortize the UAAL.

15. Covered Payroll for First Year Following Valuation Date

Actual (or annualized) pay for 2017 with an adjustment of 5% for each firefighter to reflect the average effect of the variable general pay increases effective October 1, 2017.

16. General Administrative Expenses

The expenses paid by fund assets for other than investment-related expenses are assumed to be 1.40% of payroll. The normal cost rate as a percent of payroll is assumed to be 1.40% of payroll higher to reflect these expenses.

17. Increase in Future Pay-Related Benefits Due to Definition of Average Salary in Combination with Unusual Amounts of Overtime

1.5%

18. Increase in Future Pay-Related Benefits Due to Combined Effect of Pay Practices and the Definitions of Salary and of Average Salary

8%

**Exhibit 12**  
**Disability, Mortality, and Withdrawal Rates per 1,000 Active Members**  
**Compensation Increases by Years of Service**

| Attained Age | Disability and Mortality Rates |           |       | Withdrawal Rates |      | Compensation Increases |                  |
|--------------|--------------------------------|-----------|-------|------------------|------|------------------------|------------------|
|              | Disability                     | Mortality |       | Years of Service | Rate | Years of Service       | Increase Percent |
| Male         |                                | Female    |       |                  |      |                        |                  |
| 20           | 0.14                           | 0.218     | 0.130 | 0                | 119  | 1                      | 10.75%           |
| 21           | 0.15                           | 0.231     | 0.126 | 1                | 107  | 2                      | 10.75            |
| 22           | 0.16                           | 0.243     | 0.129 | 2                | 95   | 3                      | 10.75            |
| 23           | 0.17                           | 0.260     | 0.134 | 3                | 84   | 4                      | 10.75            |
| 24           | 0.18                           | 0.275     | 0.140 | 4                | 73   | 5                      | 10.75            |
| 25           | 0.19                           | 0.295     | 0.148 | 5                | 63   | 6                      | 6.61             |
| 26           | 0.21                           | 0.327     | 0.160 | 6                | 54   | 7                      | 6.61             |
| 27           | 0.23                           | 0.339     | 0.167 | 7                | 48   | 8                      | 6.61             |
| 28           | 0.25                           | 0.348     | 0.176 | 8                | 42   | 9                      | 6.61             |
| 29           | 0.28                           | 0.365     | 0.186 | 9                | 38   | 10                     | 6.61             |
| 30           | 0.31                           | 0.394     | 0.207 | 10               | 33   | 11                     | 5.57             |
| 31           | 0.35                           | 0.442     | 0.253 | 11               | 28   | 12                     | 5.57             |
| 32           | 0.40                           | 0.498     | 0.289 | 12               | 24   | 13                     | 5.57             |
| 33           | 0.45                           | 0.559     | 0.317 | 13               | 21   | 14                     | 5.57             |
| 34           | 0.49                           | 0.622     | 0.342 | 14               | 19   | 15                     | 5.57             |
| 35           | 0.52                           | 0.685     | 0.364 | 15               | 18   | 16                     | 4.54             |
| 36           | 0.54                           | 0.746     | 0.385 | 16               | 18   | 17                     | 4.54             |
| 37           | 0.57                           | 0.802     | 0.405 | 17               | 16   | 18                     | 4.54             |
| 38           | 0.62                           | 0.834     | 0.426 | 18               | 15   | 19                     | 4.54             |
| 39           | 0.73                           | 0.863     | 0.451 | 19               | 15   | 20                     | 4.54             |
| 40           | 0.92                           | 0.890     | 0.491 | 20 & Over        | 0    | 21                     | 3.50             |
| 41           | 1.14                           | 0.919     | 0.539 |                  |      | 22                     | 3.50             |
| 42           | 1.32                           | 0.955     | 0.593 |                  |      | 23                     | 3.50             |
| 43           | 1.48                           | 0.996     | 0.652 |                  |      | 24                     | 3.50             |
| 44           | 1.73                           | 1.046     | 0.716 |                  |      | 25                     | 3.50             |
| 45           | 2.09                           | 1.102     | 0.763 |                  |      | 26                     | 3.50             |
| 46           | 2.55                           | 1.152     | 0.810 |                  |      | 27                     | 3.50             |
| 47           | 2.98                           | 1.206     | 0.857 |                  |      | 28                     | 3.50             |
| 48           | 3.34                           | 1.263     | 0.927 |                  |      | 29                     | 3.50             |
| 49           | 3.62                           | 1.322     | 1.002 |                  |      | 30                     | 3.50             |
| 50           | 3.79                           | 1.383     | 1.111 |                  |      | 31                     | 3.50             |
| 51           | 3.92                           | 1.545     | 1.258 |                  |      | 32                     | 3.50             |
| 52           | 4.04                           | 1.642     | 1.439 |                  |      | 33                     | 3.50             |
| 53           | 4.24                           | 1.796     | 1.652 |                  |      | 34                     | 3.50             |
| 54           | 4.56                           | 1.968     | 1.904 |                  |      | 35                     | 3.50             |
| 55           | 0.00                           | 2.287     | 2.241 |                  |      | 36                     | 3.50             |
| 56           | 0.00                           | 2.716     | 2.674 |                  |      | 37                     | 3.50             |
| 57           | 0.00                           | 3.110     | 3.084 |                  |      | 38                     | 3.50             |
| 58           | 0.00                           | 3.580     | 3.478 |                  |      | 39                     | 3.50             |
| 59           | 0.00                           | 4.037     | 3.938 |                  |      | 40                     | 3.50             |
| 60           |                                | 4.581     | 4.482 |                  |      |                        |                  |
| 61           |                                | 5.341     | 5.155 |                  |      |                        |                  |
| 62           |                                | 6.093     | 5.902 |                  |      |                        |                  |
| 63           |                                | 7.138     | 6.781 |                  |      |                        |                  |
| 64           |                                | 8.042     | 7.642 |                  |      |                        |                  |

## 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 or Disability Retirement Monthly Benefit
  - (a) Percentage of Highest 60-Month Average Salary 75%
  - (b) Additional amount per year of service over 20 years \$80.00
  
2. Normal Service Retirement Eligibility (Minimum) Age 50 and 20 Years or  
25 Years and Under 50
  
3. Supplemental Monthly Benefit
  - (a) Monthly amount \$500.00
  - (b) Eligibility requirement (Minimum) Age 50 and 20 Years
  
4. Actuarially Equivalent Early Service Retirement Eligibility Age 45 and 20 Years
  
5. Retroactive Deferred Retirement Option Plan (RETRO DROP)
  - (a) Earliest RETRO DROP benefit calculation date Normal Service  
Retirement Eligibility
  - (b) Maximum RETRO DROP benefit accumulation period 36 Months
  - (c) RETRO DROP lump sum includes
    - (i) Monthly benefits that would have been received  
between RETRO DROP benefit calculation date  
and termination of employment,
    - (ii) accumulated contributions made by the firefighter  
after the RETRO DROP benefit calculation date, and
    - (iii) 4% annual interest
  
6. Reverse DROP
  - (a) Eligible upon attaining Normal Service Retirement Eligibility
  - (b) Monthly benefit of 90% of regular benefit
  - (c) Lump sum of 24 times the reduced monthly benefit
  - (d) No return of accumulated contributions and no interest

- |   |                                       |
|---|---------------------------------------|
| 7. Forward DROP   |                                       |
| (a) Earliest Forward DROP irrevocable election  | Normal Service Retirement Eligibility |
| (b) Maximum Forward DROP accumulation period  | 36 months                             |
| (c) Forward DROP lump sum includes  |                                       |
| (i) Monthly benefits that would have been received between the DROP election date and termination of employment,  |                                       |
| (ii) accumulated contributions made by the firefighter after the DROP election date, and  |                                       |
| (iii) 4% annual interest  |                                       |
| 8. Vested Terminated Benefit  |                                       |
| (a) Eligibility for firefighters  | 10 Years                              |
| (b) Percent vested with 10 years  | 50%                                   |
| (c) Additional percent vested for each year above 10 years  | 5%                                    |
| (d) Percent vested with 20 or more years  | 100%                                  |
| (e) Benefit is deferred to date person would have satisfied normal service retirement eligibility date  |                                       |
| (f) Benefit is percent vested times service retirement benefit  |                                       |
| 9. 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 amount per year of service over 20 years  |                                       |
| (b) Following initial 30-month period is (i), or (ii), or (iii), depending upon status  |                                       |
| (i) Initial benefit   |                                       |
| (ii) Initial benefit multiplied by one-half   |                                       |
| (iii) Zero  |                                       |
| (c) Upon attaining eligibility for normal retirement, the member's vested retirement benefit becomes payable if the disability benefit has been reduced or terminated |                                       |
| 10. Surviving Spouse's Monthly Benefit as a Percentage of Benefit Active Would Have Been Entitled to as a Normal Service Retirement Benefit                           | 75%                                   |
| 11. Surviving Children's Monthly Benefit as a Percentage of Highest 60-Month Average Salary   |                                       |
| (a) Where the spouse is receiving a benefit   | 11.25%                                |
| (b) Where the spouse is not receiving a benefit or there is no spouse   | 22.50%                                |

12. Contributions as a Percent of Payroll by:
- |                     |        |
|---------------------|--------|
| (a) Firefighters    | 14.20% |
| (b) City of Midland | 22.20% |
13. The normal form of annuity payment at retirement is a Joint and 75% to Surviving Spouse. In lieu of the normal form, an optional reduced Joint and 100% to Surviving Spouse may be elected.
14. Salary used to determine the Highest 60-Month Average Salary includes total pay except any lump sum distributions for unused sick leave or vacation are excluded. The average is based on the pay for the 60 months during which the total pay was highest.
15. 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.
16. Pensioners who have received benefits for five full plan years or more will receive a 2% cost-of-living adjustment on August 1 provided the fund's investment performance over the five plan years ending the previous December 31 averages 8.25% or more. DROP participation does not constitute time credited to the five-year requirement. The \$500 per month supplemental benefit will not be increased by the 2% cost-of-living adjustments.
17. A lump sum death benefit of \$10,000 will be paid to the designated beneficiary of a deceased firefighter, whether active or inactive (retired firefighter or a vested terminated firefighter).

## Appendix A

### Review of the Actuarial Economic Assumptions for the December 31, 2017 Actuarial Valuation

#### Section 1. Asset Allocation and Investment Return Assumption Development

| Asset Class  | Gross Annual<br>Real Rate of<br>Investment<br>Return (ROR) <sup>1</sup> | Asset Allocation                  |                         |                     |
|--|---|-----------------------------------|-------------------------|---------------------|
|  |   | Actual<br>12/31/2017 <sup>2</sup> | Estimated<br>12/31/2019 | Policy<br>Mid-Range |
| Domestic Equities  |   |                                   |                         |                     |
| Large Cap  | 6.5%  | 11%                               | 11%                     | 15%                 |
| Small/Mid Cap  | 7.0   | 3                                 | 3                       | 5                   |
| International Equities   |   |                                   |                         |                     |
| Developed  | 7.0   | 13                                | 13                      | 15                  |
| Emerging Markets   | 8.5   | 4                                 | 4                       | 5                   |
| Fixed Income   | 2.3   | 28                                | 28                      | 20                  |
| Alternatives   |   |                                   |                         |                     |
| Real Estate  | 5.5   | 35                                | 25                      | 25                  |
| Private Equity   | 8.5   | 0                                 | 10                      | 10                  |
| Hedge Funds  | 3.5   | 1                                 | 1                       | 0                   |
| Cash   | 0.5   | <u>5</u>                          | <u>5</u>                | <u>5</u>            |
| Total  |   | 100%                              | 100%                    | 100%                |
| <b><u>Weighted Average Gross Real ROR Assumption</u></b>           |   | 4.80%                             | 5.10%                   | 5.51%               |
| <b><u>Weighted Average Net Real ROR Assumption<sup>3</sup></u></b> |   | 3.95                              | 4.25                    | 4.66                |
| <b>Possible Theoretical Annual Investment Return Assumption:</b>   |   |                                   |                         |                     |
| <b><u>Net Real ROR Plus Assumed Annual Rate of Inflation</u></b>   |   |                                   |                         |                     |
| Assumed 3.25% Inflation  |   | 7.20                              | 7.50                    | 7.91                |
| Assumed 3.00% Inflation  |   | 6.95                              | 7.25                    | 7.66                |
| Assumed 2.75% Inflation  |   | 6.70                              | 7.00                    | 7.41                |

<sup>1</sup> 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.

<sup>2</sup> This allocation is from a 12/31/2017 report from Mr. David Stacy.

<sup>3</sup> 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 0.85%. See Section 3.

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

| <u>Years<br/>(Dec. to Dec.)</u> | <u>Number<br/>of Years</u> | <u>Average<br/>Annual Increase</u> |
|---------------------------------|----------------------------|------------------------------------|
| 1952 – 2017                     | 65                         | 3.48%                              |
| 1957 – 2017                     | 60                         | 3.67                               |
| 1962 – 2017                     | 55                         | 3.88                               |
| 1967 – 2017                     | 50                         | 4.05                               |
| 1972 – 2017                     | 45                         | 3.98                               |
| 1977 – 2017                     | 40                         | 3.51                               |
| 1982 – 2017                     | 35                         | 2.68                               |
| 1987 – 2017                     | 30                         | 2.56                               |
| 1992 – 2017                     | 25                         | 2.23                               |
| 1997 – 2017                     | 20                         | 2.14                               |

Most inflation forecasts are for 10 years or less. For example, the 10-year forecast in the June 2018 Livingston Survey published by the Federal Reserve Bank of Philadelphia was 2.28%. Similarly, the 2018 Wall Street Censuses Survey for the next decade included an average inflation forecast of 2.4%. However, 10 years is much too short a forecast period for a public employee defined benefit pension plan. In the 2018 annual report of the OASDI Trust Funds (Social Security), the ultimate inflation assumptions for their 75-year projections were 3.2%, 2.6%, and 2.0% 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 2.5% to 3.5%. Shorter term considerations make the bottom half of that range more desirable.**

**Section 3. Retirement Plan's Expenses**

| <u>Plan<br/>Year</u> | <u>Market Value of Assets</u> |                        | <u>Expenses</u>          |                            | <u>Expenses as a % of Assets</u> |                  |                  |
|----------------------|-------------------------------|------------------------|--------------------------|----------------------------|----------------------------------|------------------|------------------|
|                      | <u>Beginning<br/>of Year</u>  | <u>End<br/>of Year</u> | <u>General<br/>Admin</u> | <u>Direct<br/>Investmt</u> | <u>(4) ÷ (2)</u>                 | <u>(5) ÷ (2)</u> | <u>(6) + (7)</u> |
| (1)                  | (2)                           | (3)                    | (4)                      | (5)                        | (6)                              | (7)              | (8)              |
| 2017                 | \$82,664,948                  | \$89,023,115           | \$538,498                | \$735,812                  | 0.65%                            | 0.89%            | 1.54%            |
| 2016                 | 80,942,385                    | 82,664,948             | 251,621                  | 631,166                    | 0.31                             | 0.78             | 1.09             |
| 2015                 | 82,552,420                    | 80,942,385             | 211,442                  | 717,159                    | 0.26                             | 0.87             | 1.12             |
| 2014                 | 80,950,814                    | 82,552,420             | 222,705                  | 531,563                    | 0.28                             | 0.66             | 0.93             |
| 2013                 | 72,112,476                    | 80,950,814             | 208,539                  | 355,950                    | 0.29                             | 0.49             | 0.78             |
| 2012                 | 65,724,726                    | 72,112,476             | 227,958                  | 317,959                    | 0.35                             | 0.48             | 0.83             |
| 2015-2017            | \$246,159,753                 |                        |                          | \$2,084,137                |                                  | 0.85%            |                  |

The three most recent years are fairly consistent in the direct investment expenses as a percent of assets. The pattern in column (7) indicates changes in the asset allocation and money managers since 2012 and 2013. We recommend assuming that investment expenses will average 0.85% of assets in the future.

**Section 4. General Administrative Expenses  
As a Percent of Payroll**

| <u>Plan Year<br/>Ending 12/31</u><br>(1) | <u>General Administrative<br/>Expenses Paid by the Fund</u><br>(2) | <u>Estimated Payroll</u><br>(3) | <u>% of Payroll<br/>(2) ÷ (3)</u><br>(4) |
|--|--|---------------------------------|--|
| 2017                                     | \$224,657  | \$16,014,697                    | 1.40%                                    |
| 2016                                     | 251,621  | 16,135,386                      | 1.56                                     |
| 2015                                     | 211,442  | 17,107,712                      | 1.24                                     |
| 2014                                     | 222,705  | 15,571,992                      | 1.43                                     |
| 2014-2017                                | \$910,425  | \$64,829,787                    | 1.40%                                    |

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, 2017 actuarial valuation, we recommend 1.40%, which is the average developed above for the last four plan years. (The estimated payroll was determined as the firefighter contributions for the plan year divided by the firefighter contribution rate during the plan year.) The \$224,657 amount for 2017 excludes \$313,841 of miscellaneous expenses.

**Section 5. Comparison of Actuarial Economic Assumptions**

| <u>Actuarial Assumption<sup>1</sup></u>      | <u>12/31/2015<br/>Actuarial<br/>Economic<br/>Assumptions</u> | <u>12/31/2017<br/>Actuarial<br/>Economic<br/>Assumptions</u> |
|--|--|--|
| Inflation (Price)                            | 3.00%  | 3.25%  |
| Net real rate of return <sup>2</sup>         | <u>5.00%</u>   | <u>4.50%</u>   |
| Net Total investment return <sup>2</sup>     | 8.00%  | 7.75%  |
| Firefighter pay increase <sup>3</sup>        | 7.96%  | 6.07%  |
| Aggregate payroll increase                   | 4.50%  |  |
| • before reflecting growth in number         |  | 3.50%  |
| • after reflecting growth in number          |  | 4.00%  |
| General administrative expenses <sup>4</sup> | N/A  | 1.40%  |

<sup>1</sup> All assumptions are annual rates.

<sup>2</sup> Net of all expenses as of 12/31/2015 and net of investment-related expenses as of 12/31/2017.

<sup>3</sup> 6% annual general pay increase and 1.96% average annual promotion, step, and longevity pay increase over a 25-year career in the 12/31/2015 assumptions, and a 3.50% annual general pay increase with 2.57% average annual promotion, step, and longevity pay increase over a 25-year career in the 12/31/2017 assumptions.

<sup>4</sup> In the 12/31/2015 assumptions, the investment return assumption was net of both investment-related expenses and general administrative expenses. For the 12/31/2017 valuation, general administrative expenses are reflected as a percent of payroll that is added to the normal cost contribution rate.