Midland Firemen's Relief and Retirement Fund

Actuarial Valuation as of December 31, 2019

February 8, 2021

Rudd and Wisdom, Inc.

CONSULTING ACTUARIES

Mitchell L. Bilbe, F.S.A.
Evan L. Dial, F.S.A.
Philip S. Dial, F.S.A.
Charles V. Faerber, F.S.A., A.C.A.S.
Mark R. Fenlaw, F.S.A.
Brandon L. Fuller, F.S.A.
Shannon R. Hatfield, A.S.A.
Christopher S. Johnson, F.S.A.
Oliver B. Kiel, F.S.A.
Dustin J. Kim, A.S.A.
Edward A. Mire, F.S.A.
Rebecca B. Morris, A.S.A.
Amanda L. Murphy, F.S.A.
Michael J. Muth, F.S.A.
Khiem Ngo, F.S.A., A.C.A.S.
Timothy B. Seifert, F.S.A.
Chelsea E. Stewart, A.S.A.
Raymond W. Tilotta
Ronald W. Tobleman, F.S.A.
David G. Wilkes, F.S.A.

February 8, 2021

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, 2019. 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, 2020. 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, 2020. GASB 68 prescribes the city's accounting for your fund, while this actuarial valuation report reflects the assumed continuation of the current funding policy.

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

Rebecca B. Morris, A.S.A.

MRF/RBM:nlg

i:\clients\fire\wd\vals\2021\midland\midland-12-31-19.docx

TABLE OF CONTENTS

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, 2019 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, 2019. 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, 2017.

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 26.3%, leaving 10.1% available to amortize the unfunded actuarial accrued liability (UAAL) of $86,848,661. Assuming that the total payroll increases at the rate of 3.25% 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 amortization periods of 10 years to 25 years to be preferable and 40 years to be the current maximum acceptable amortization period. The PRB guidelines will be changing to a maximum of 30 years in 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 below chart shows what the increased city contribution would need to be in effect on the respective valuation dates in order for the fund to have a 25-year or a 30-year amortization period.

	City Contribution Rate	
	12/31/2017 Valuation	12/31/2019 Valuation
Current actual contribution rate	22.2%	22.2%
Hypothetical rate for a 25-year amortization period	34.2%	40.0%
Hypothetical rate for a 30-year amortization period	31.9%	37.4%

Projected Actuarial Valuation Results

In addition to completing this actuarial valuation, we estimated the amortization periods as of December 31, 2021 and as of December 31, 2023 by making projections from the December 31, 2019 actuarial valuation. 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 2016 and 2018, and gains in 2017 and 2019) that have been only partially recognized as of December 31, 2019. As shown in Exhibit 8, a smoothing method is used to determine the actuarial value of assets (AVA) for this valuation. This method phases in over a five-year period any investment gains or losses (net actual investment return greater or less than the actuarially assumed investment return) that the fund has had. The AVA used in this current valuation is deferring recognition of various portions of the gains and losses in 2016-2019 that the fund experienced. The AVA used in this valuation is $90,753,400. The market value of assets (MVA) is $84,848,966. The $5.9 million difference between the MVA and the AVA is the net deferred loss 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 2023 we used six scenarios of various assumed annual rates of investment return, net of investment-related expenses, over the 2020-2023 projection period. These projections show the expected effects over the next four years after the valuation date (1) of the recognition of the portions of the investment gains and losses over the past four years that are deferred as of December 31, 2019, (2) of investment returns over the next four years different from the 7.5% assumption used in this valuation, and (3) the city contribution rate beginning January 1, 2020 that would have been required to have an amortization period of 25 years (Scenarios 1-3) or 30 years (Scenarios 4-6).

	Scenario					
	1	2	3	4	5	6
Assumed Investment Return for Calendar Year						
2020	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%
2021	7.5	10.0	0.0	7.5	10.0	0.0
2022	7.5	10.0	0.0	7.5	10.0	0.0
2023	7.5	10.0	0.0	7.5	10.0	0.0
2024 and later	7.5	7.5	7.5	7.5	7.5	7.5
City Contribution Rate	40.0%	40.0%	40.0%	37.4%	37.4%	37.4%
Amortization Period in Years as of December 31:						
2019 (actual)	25.0	25.0	25.0	30.0	30.0	30.0
2021 (projected)	25.2	25.0	25.8	30.9	30.6	31.8
2023 (projected)	24.1	22.7	28.6	30.2	28.3	36.7

The projected future valuations in Scenarios 1 and 4, based on returns of 7.5% each year, reveal that instead of decreasing by two years, the amortization period as of December 31, 2021 is projected to increase. These increases are due primarily to the deferred losses that will be recognized as of December 31, 2021. Unless there are some significant investment gains in 2021, 2022, and 2023 from returns greater than 7.5%, the deferred net loss as of December 31, 2019 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, 2019.

We do not know what the investment experience will be for each of the next four calendar years. However, these scenarios show the changes from a starting point of a 25- or 30-year UAAL amortization period in the next two biennial actuarial valuations. Because of the $5.9 million deferred net loss, solid investment gains would be required in each of the next three years to overcome the effect of the deferred net loss and reduce the amortization period below either 25 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. Once changes are made to restore an adequate contribution arrangement, investment experience will be the biggest influence on future actuarial valuations. 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 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 convince the firefighters

that action needs to be taken soon to reduce future benefits. The magnitude of only increases in contribution rates is too great. 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, 2017 actuarial valuation. Exhibit 1A is a distribution of the active firefighters by age and service. In general, the assumed 2020 compensation used for projecting future contributions and benefits for each active firefighter in the valuation was the actual pay for calendar year 2019 increased by 3%. This increase was to reflect the effect of the 4% general pay increase effective October 1, 2019. The total of these assumed compensation amounts is our assumed annualized covered payroll for the plan year beginning January 1, 2020 and is used in the valuation to determine the UAAL amortization period and to calculate the actuarially determined contribution (ADC) rate. The averages of the assumed compensation amounts for the 2020 plan year are shown in Exhibit 1A.

Exhibit 1B shows a historical comparison of the assumed payroll for the year following each of six actuarial valuation dates. It includes the average annual increase between the assumed payrolls from one valuation to the next. Exhibit 2 contains summary information on the pensioners. The monthly benefit payments are generally based on the amounts paid December 31, 2019. Exhibit 3 is a reconciliation of firefighters and pensioners from December 31, 2017 to December 31, 2019. Exhibit 4 shows a breakdown of the dollar amount of the monthly benefits for retirees and surviving spouses. Exhibit 5 shows a historical comparison of the actuarial accrued liability and the actuarial value of assets.

Asset information is contained in exhibits 6 through 10. The summary of assets contained in Exhibit 6 is based on the allocation of the December 31, 2019 market value of assets as provided to us. This exhibit also shows a comparison with the market values and actuarial values of assets as of December 31, 2017 and December 31, 2019. Exhibit 7 contains the statement of changes in assets for 2019 and 2018. Exhibit 8 shows the development of the actuarial value of assets. Exhibit 9 shows a historical comparison between the market value and actuarial value of assets. A comparison of the market value asset allocation by major asset class as of December 31, 2017 and December 31, 2019 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. 7.5% annual investment return net of investment-related expenses;

2. 3.25% general annual compensation increase combined with promotion, step, and longevity increases that average 2.57% per year over a 25-year career;

3. 3.25% aggregate payroll growth (for the purpose of amortizing the UAAL and calculating the ADC rate);

4. Retirement rates which result in an average expected age at retirement of 53.2; and

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

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, 2017 valuation:

1. We changed the investment return assumption from 7.75% to 7.5% net of investment-related expenses by lowering the inflation assumption from 3.25% to 3%. Administrative expenses are recognized explicitly as required for GASB 67 and 68. They are assumed to be 1.70% of payroll based on the average historical relationship in the last four years, an increase from 1.40% used in the last valuation. It is added to the normal cost. We believe these assumptions are more reasonable for the long-term future.

2. We reduced the general compensation increase assumption for projecting future benefits from 3.5% to 3.25%, reflecting the 0.25% reduction in inflation.

3. We reduced the aggregate payroll increase assumption used for determining the UAAL amortization period from 4% to 3.25%. We believe this assumption should usually be the same as the general compensation increase assumption. However, two years ago we 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 0.5% above the general compensation increase assumption of 3.5%.

Because of the recent growth in number which we have recognized in this valuation, we believe this 3.25% annual growth in payroll is reasonable.

4. The mortality assumption was changed from the RP-2000 Combined Healthy Mortality tables projected by Scale AA to 2024 to the PubS-2010 (public safety) total dataset mortality tables for employees and for retirees, projected for mortality improvement generationally using the projection scale MP-2019. The rationale for the change is to use the results of a new, first-ever study of the mortality of public employee pension plan participants by the Society of Actuaries. The new mortality assumption is more appropriate for the fund for the long-term future than the prior assumption.

The effects of these changes in assumptions in the UAAL and the ADC 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. Appendix A documents our review of the economic assumptions.

Funding Policy

A funding policy in compliance with state law would say that each actuarial valuation will include a benchmark actuarially determined contribution (ADC) rate using a closed amortization period of 30 years beginning January 1, 2020. The components of the ADC rate are the normal cost and the amortization cost, both expressed as contribution rates. The benchmark ADC rate as of January 1, 2020 for the fund, based on this December 31, 2019 actuarial valuation, is 51.6%, which is 15.2% more than the current total contribution rate of 36.4%. The actuarially determined amortization period for the fund of "never" is not reasonably close to the 30 years in the benchmark ADC.

	Total Contribution Rate
Funding policy benchmark as of December 31, 2019 with 30-year amortization period	51.6%
Current actual contribution rate	36.4%
Shortfall	(15.2)%

Negative divergence from the benchmark means that the board's next steps include (1) working with Rudd and Wisdom to develop potential changes that would reestablish an appropriate balance between benefits and contributions and (2) working with the firefighters and the city to achieve the necessary changes. Section III of this report gives the board some recommended changes and some examples of other potential changes.

Variability in Future Actuarial Measurement

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

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

Analysis of the potential range of such future measurements resulting from the possible sources of measurement variability was provided on pages 1-3 in the projected amortization periods for the next two biennial actuarial valuations under six scenarios. These projections were designed to assess the risk of variance of potential future investment rates of return in the four years following the actuarial valuation date from the assumed 7.5% rate and the potential effect on the amortization period. Additional or other sensitivity analysis could be performed in a subsequent report if desired by the board of trustees.

Respectfully submitted,
RUDD AND WISDOM, INC.

Mark R. Fenlaw
Fellow, Society of Actuaries
Member, American Academy of Actuaries

Rebecca B. Morris
Associate, Society of Actuaries
Member, American Academy of Actuaries

Section II

Key Results of the Actuarial Valuation

	December 31, 2017[1]	December 31, 2019
1. Actuarial present value of future benefits		
a. Those now receiving benefits or former firefighters entitled to receive benefits	$ 74,208,569	$ 91,672,314
b. Firefighters	112,628,447	133,663,297
c. Total	$ 186,837,016	$ 225,335,611
2. Actuarial present value of future normal cost contributions	$ 36,027,875	$ 47,733,550
3. Actuarial accrued liability (Item 1c – Item 2)	$ 150,809,141	$ 177,602,061
4. Actuarial value of assets	$ 91,856,742	$ 90,753,400
5. Unfunded actuarial accrued liability (UAAL) (Item 3 - Item 4)	$ 58,952,399	$ 86,848,661
6. Contributions (percent of pay)		
a. Firefighters	14.20%	14.20%
b. City of Midland	22.20%	22.20%
c. Total	36.40%	36.40%
7. Normal cost (percent of payroll)	25.98%	26.30%
8. Percent of payroll available to amortize the UAAL (Item 6c - Item 7)	10.42%	10.10%
9. Annualized covered payroll	$ 16,260,968	$ 20,092,471
10. Present annual amount available to amortize the UAAL (Item 8 x Item 9)	$ 1,694,393	$ 2,029,340
11. Years to amortize the UAAL	never	never
12. Funded ratio (Item 4 ÷ Item 3)[2]	60.9%	51.1%

[1] All items are from the December 31, 2017 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 59.0% as of December 31, 2017 and 47.8% as of December 31, 2019. **The best indicator of the fund's health is Item 11.**

Changes in the Unfunded Actuarial Accrued Liability

In comparing this actuarial valuation to the prior one, the UAAL increased by $27,896,262 from $58,952,399 as of December 31, 2017 to $86,848,661 as of December 31, 2019. The table below summarizes the reasons for the increase.

Reason for Change	Amount
• Expected increase (interest on UAAL more than expected amortization payments, accumulated with interest)	$ 5,924,380
• Investment loss for the two years (based on the AVA average annual return of 2.7%)	9,550,615
• Experience loss (net difference between actual experience and assumed experience for pay increases, retirements, mortality, and terminations)	4,109,296
• Change in assumptions	8,311,971
Total	$ 27,896,262

Analysis of Changes in the ADC

Since the UAAL will never be amortized based on the benefit provisions and the contribution arrangement reflected in this December 31, 2019 actuarial valuation, it is impossible to analyze changes since the December 31, 2017 actuarial valuation in terms of the amortization period as we usually do. Instead, the below shows an analysis in terms of an actuarially determined contribution rate by the city (ADC) that with the 14.2% contribution rate by the firefighters would be adequate to pay the normal cost and to amortize the UAAL in 30 years. The beginning point in the December 31, 2017 actuarial valuation report was an ADC of 31.86%. The ending point is the December 31, 2019 actuarial valuation with an ADC of 37.40%. The items below identify changes and experience since the prior actuarial valuation and the resulting increase in the ADC of 5.54% from the 31.86% two years ago to the 37.40% in this actuarial valuation.

1. The average annual rate of investment return, net of investment-related expenses, on the market value of assets during the two plan years 2018 and 2019 was 0.6%. However, the actuarial value of assets (AVA) used in the valuation and the determination of the amortization period is based on an adjusted market value. The average annual rate of return on the AVA, net of investment-related expenses, for plan years 2018 and 2019 was 2.7%, less than the assumed rate of return for those years of 7.75%. This resulted in an increase in the ADC of 3.12%.

2. The aggregate payroll increased at an average rate of 11.2% per year instead of the assumed 4% per year rate, which caused the ADC to decrease by 3.03%.

3. The net result of all experience compared to the assumptions, other than the investment experience and the aggregate payroll experience, had the combined effect of decreasing the ADC by 0.01%.

4. All of the changes in assumptions (mortality, investment return, general compensation increase, aggregate payroll increase, and administrative expenses) resulted in an increase in the ADC of 5.27%.

5. The shortfall in contributions due to the starting 31.86% ADC not being contributed in 2018 and 2019 increased the ADC by 1.13%.

6. Starting over with a new 30-year amortization period instead of staying at 28 years with the elapse of two years between the actuarial valuation dates decreased the ADC by 0.94%.

Section III

Restoring an Adequate Contribution Arrangement

The results of this actuarial valuation as of December 31, 2019 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 what increases in contributions and/or decreases in benefits are and when they 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 2017 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 the 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 has resulted and will continue to result in an unintended increase in benefits which we have attempted to anticipate 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 consecutive months as 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 should be made as soon as possible. These two changes are important steps, in addition to other changes that will need to be studied and examined, to restore an adequate contribution arrangement for the fund and to make it sustainable for the long-term future for all current pensioners and all future pensioners.**

In Section I, we showed the higher city contribution rate of 37.4% (assumed effective December 31, 2019) that would result in an amortization period of 30 years as of December 31, 2019. Reflecting a delay in the effective date to January 1, 2022, the city contribution rate for a 30-year amortization period would be 39.6%. An increase of 17.4% in the city's contribution rate is unrealistic. Even an increase in the firefighter contribution rate from 14.2% to 18% would still leave the required increase in the city rate around 14%.

Even though the 30-year amortization period would restore an adequate contribution arrangement as of December 31, 2019, there are challenges looking ahead. First, the deferred net loss of $5.9 million as of December 31, 2019 will increase the amortization period in the next two biennial actuarial valuations to over 30 years unless there are investment returns consistently over 7.5%. Then the inflation assumption, which keys the investment return and pay increases, may also need to be lowered in the future, which would result in lowering the investment return assumption below 7.5%.

Because of these challenges, the board will need to consider combining contribution rate increases with a package of 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 changes to be part of package:

- Reduce the benefit formula from 75% of average salary for the first 20 years of service plus the $80 benefit for each year over 20 to a level percentage of average salary for each year of service. Potentially in the range of 2.2% to 2.5%.
- 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.

- Discontinue the crediting of any interest in the determination of a DROP lump sum.
- Make the Reverse DROP actuarially equivalent to the normal retirement benefit by changing the reduction factor from 90% to 80% for those retiring after the effective date of changes.
- Discontinue the supplemental $500 per month benefit for those who retire after the effective date of changes.
- Change the normal surviving spouse benefit as a percentage of the retiree's benefit from 75% to 66.67% for those retiring after the effective date of changes.
- 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 15 years.
- Discontinue the $10,000 death benefit.

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 restore an adequate contribution arrangement. **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, 2019 with Average Annual Compensation

Years of Service	Age									Total	Average Compen-sation
	Under 25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60 or Over		
0	2	25	2	0	0	0	0	0	0	29	$ 45,000
1	5	5	9	0	0	0	0	0	0	19	52,301
2	5	7	8	4	0	0	0	0	0	24	65,723
3	3	2	3	0	0	0	0	0	0	8	76,873
4	3	4	2	3	0	0	0	0	0	12	75,036
5	1	5	5	0	1	0	0	0	0	12	82,397
6	0	4	3	5	1	0	0	0	0	13	87,668
7	0	0	4	2	1	0	0	0	0	7	79,527
8	0	1	3	2	1	0	0	0	0	7	85,489
9	0	0	0	1	0	0	0	0	0	1	133,179
10	0	0	0	0	2	0	0	1	0	3	107,954
11	0	0	3	1	0	0	0	0	0	4	102,104
12	0	0	0	4	3	2	0	0	0	9	100,931
13	0	0	1	7	4	1	0	0	0	13	101,521
14	0	0	0	3	3	0	1	0	0	7	102,247
15	0	0	0	1	3	0	0	0	0	4	93,375
16	0	0	0	1	2	1	0	0	0	4	123,483
17	0	0	0	1	1	0	0	0	0	2	132,996
18	0	0	0	0	3	1	0	0	0	4	126,387
19	0	0	0	0	3	2	0	0	0	5	120,206
20-24	0	0	0	0	3	13	3	2	0	21	126,447
25-29	0	0	0	0	0	2	2	3	1	8	134,326
30-34	0	0	0	0	0	0	0	7	2	9	150,985
35+	0	0	0	0	0	0	0	1	1	2	139,621
Totals	19	53	43	35	31	22	6	14	4	227	$ 88,513

Average	$60,400	$74,484	$100,668	$125,956	$130,111
Compensation	$59,872	$97,599	$125,067	$143,176	$88,513

Average age	35.9
Average years of service	9.7
Average age at hire	26.2

Exhibit 1B

Historical Comparison of Assumed Payroll

				Average Annual Increase from Prior Valuation	
Actuarial Valuation Date	Number Of Active Firefighters	Assumed Payroll	Average Annual Pay	Assumed Payroll	Average Annual Pay
12/31/2009	188	$11,901,777	$63,307	--	--
12/31/2011	190	12,720,349	67,303[1]	3.4%	3.1%
12/31/2013	178	14,597,213	82,939[2]	7.1	11.0
12/31/2015	193	17,097,372	89,986[3]	8.2	4.2
12/31/2017	207	16,260,968	78,555	(2.5)	(6.6)[4]
12/31/2019	227	20,092,471	88,513	11.2	6.1

[1] The payroll excludes one above the latest assumed retirement age (59).

[2] The payroll excludes two above the latest assumed retirement age (59).

[3] The payroll excludes three above the latest assumed retirement age (59).

[4] 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 December 31, 2019 Valuation	
	Number of Recipients	Total Monthly Benefit Payments
Service Retirement	146[2]	$ 587,601
Disability Retirement	4	13,607
Vested Terminated (Deferred)	8	22,748
Surviving Spouse	29	58,066
Surviving Child	6	5,099
Total	193	$ 687,121

Type of Benefit	Comparison of Pensioner Count by Type as of The Prior and Current Actuarial Valuations			
	December 31, 2017	New	Ceased	December 31, 2019
Service Retirement	136[1]	+16	-6	146[1]
Disability Retirement	3	+1	0	4
Vested Terminated (Deferred)	8	+1	-1	8
Surviving Spouse	24	+6	-1	29
Surviving Child	6	0	0	6
Total	177	+24	-8	193

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

Exhibit 3

Firefighter and Pensioner Reconciliation

	Firefighters	Current Payment Status	Vested Terminated Firefighters	Total
1. As of December 31, 2017	207	169 [1]	8	384
2. Change of status				
a. retirement	(15)	16	(1)	0
b. disability	(1)	1	0	0
c. death	0	(7)	0	(7)
d. survivor payment begins	0	5	0	5
e. withdrawal	(23)	0	0	(23)
f. vested termination	(1)	0	1	0
g. QDRO alternate payee	0	0	0	0
h. child benefit ceases	0	0	0	0
i. correction	0	1	0	1
j. net changes	(40)	16	0	(24)
3. New firefighters	60 [2]	0	0	60
4. As of December 31, 2019	227	185 [1]	8	420

[1] Includes seven alternate payees receiving benefits according to the terms of a Qualified Domestic Relations Order (QDRO).
[2] Includes 20 John Does to reflect the staffing level during 2020.

Exhibit 4

Breakdown of Monthly Benefit Payment Amounts as of December 31, 2019

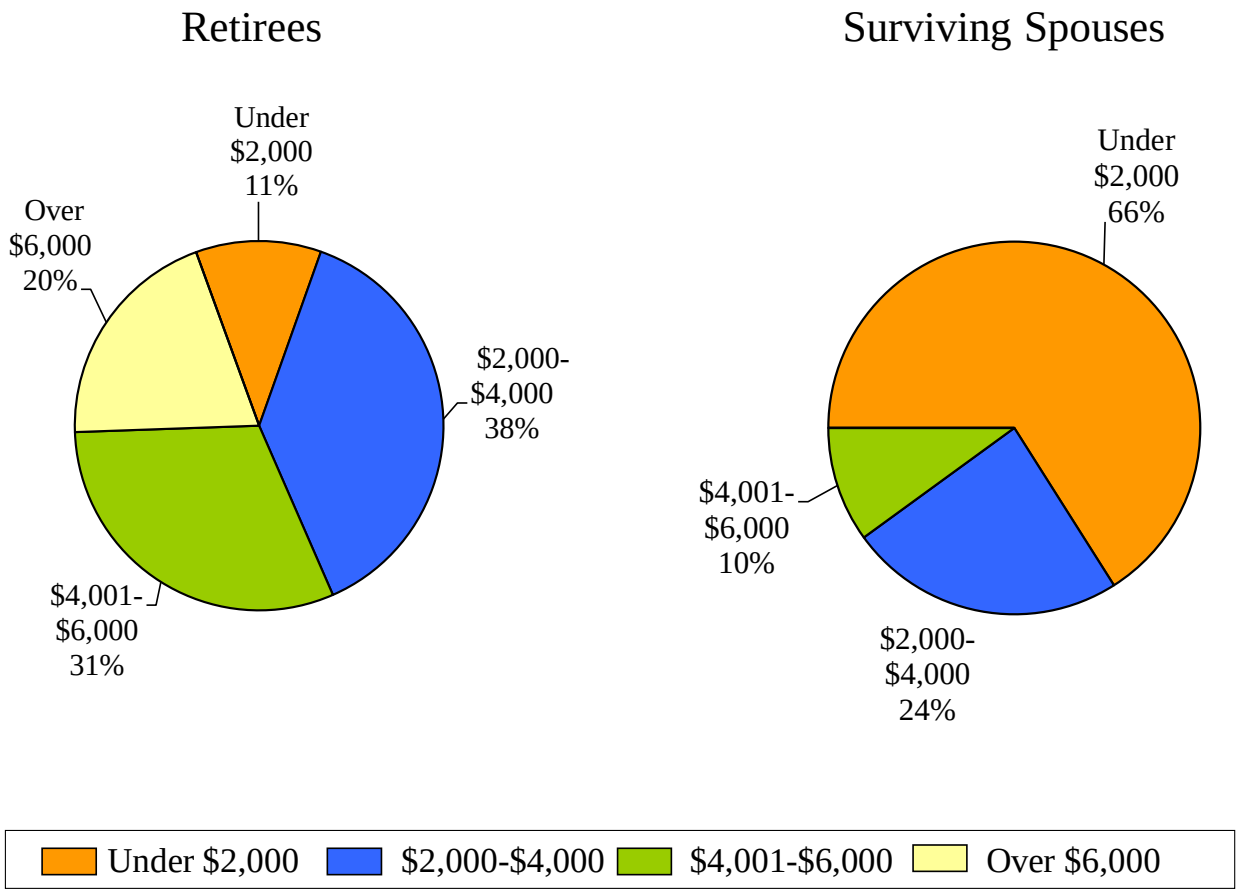


Exhibit 5

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

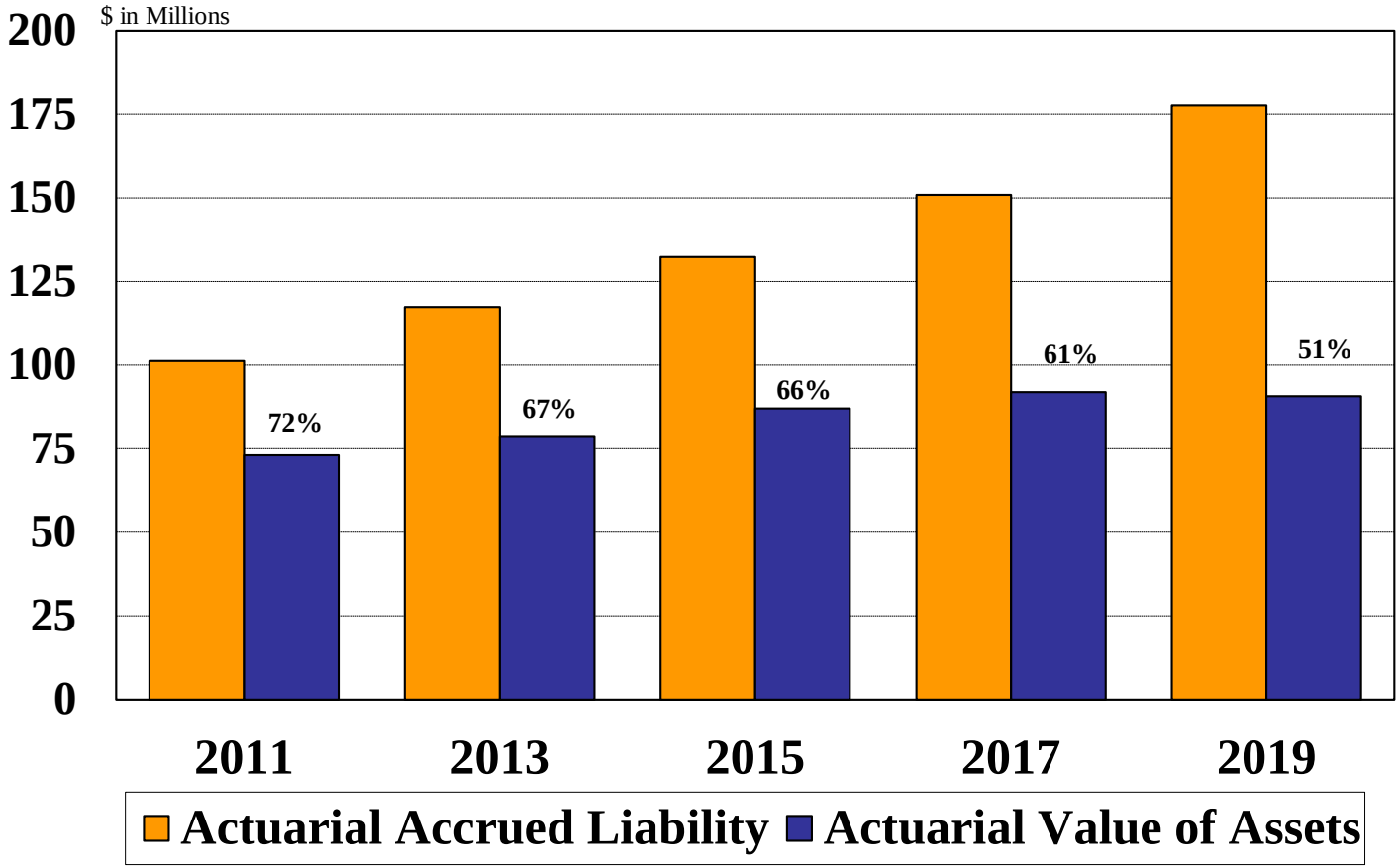


Exhibit 6

Summary of Asset Data

Asset Type	Market Value as of December 31, 2019	Allocation As a Percent of Grand Total
Equities		
U.S. Large Cap	$ 8,849,521	10.4%
U.S. Small/Mid Cap	2,749,288	3.2
International	13,816,532	16.3
Total	25,415,341	29.9
Alternatives		
Venture Capital	5,308,466	6.3
Real Estate	14,887,909	17.5
Total	20,196,375	23.8
Fixed Income	37,151,793	43.8
Cash Equivalents, Net of Payables	2,085,457	2.5
Grand Total	$84,848,966 [1]	100.0%

[1] The grand total is the audited amount. All of the invested amounts except cash are from December 31, 2019 report from the board chairman. Cash was the balancing item.

Comparison of Asset Values as of the Prior and Current Actuarial Valuation Dates		
	December 31, 2017	December 31, 2019
Market Value	$ 89,023,115	$ 84,848,966
Actuarial Value	$ 91,856,744	$ 90,753,400
Actuarial Value as a Percent of Market Value	103.2%	107.0%

Exhibit 7

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

	12/31/2019	12/31/2018
Additions		
1. Contributions		
a. Employer	$ 4,307,624	$ 3,900,148
b. Employees	2,755,199	2,339,699
c. Total	$ 7,062,823	$ 6,239,847
2. Investment Income		
a. Interest and dividends	$ 2,338,376	$ 916,150
b. Net appreciation in fair value	7,008,485	(7,244,784)
c. Total	$ 9,346,861	$ (6,328,634)
3. Other Additions	7,654	2,253
Total Additions	**$ 16,417,338**	**$ (86,534)**
Deductions		
4. Benefit Payments	$ 9,976,378	$ 8,609,277
5. Expenses		
a. Investment-related	$ 1,215,007	$ 814,762
b. General administrative	390,407	230,738
c. Total	$ 1,605,414	$ 1,045,500
Total Deductions	**$ 11,581,792**	**$ 9,654,777**
Net Increase in Assets	**$ 4,835,546**	**$ (9,741,311)**
Market Value of Assets (Fiduciary Net Position)		
Beginning of Year	$ 80,013,420	$ 89,754,731
End of Year	$ 84,848,966	$ 80,013,420
Rate of Return		
Net of All Expenses	9.86%	(8.32)%
Net of Investment-Related Expenses	10.39%	(8.07)%
Gross	12.03%	(7.19)%
Direct Investment-Related Expenses	1.64%	0.88%

Exhibit 8

Development of Actuarial Value of Assets

Calculation of Actuarial Investment Gain/(Loss) Based on Market Value for Plan Years Ending December 31				
	2019	2018	2017	2016
1. Market Value of Assets as of beginning of year	$80,013,420	$89,754,731	$82,664,948	$80,942,385
2. Firefighter Contributions	2,755,199	2,339,699	2,113,940	2,129,871
3. City Contributions	4,307,624	3,900,148	3,555,264	3,582,056
4. Benefit Payments and Administrative Expenses[1]	(10,366,785)	(8,840,015)	(8,532,170)	(7,095,457)
5. Expected Investment Return[2]	6,073,012	6,855,235	6,295,594	6,219,423
6. Expected Market Value of Assets as of end of year	82,782,470	94,009,798	86,097,576	85,778,278
7. Actual Market Value of Assets as of end of year	84,848,966	80,013,420	89,754,731	82,664,948
8. Actuarial Investment Gain/(Loss)	2,066,496	(13,996,378)	3,657,155	(3,113,330)
9. Market Value Rate of Return Net of Expenses	10.39%	(8.07)%	12.25%	3.87%
10. Rate of Actuarial Investment Gain/(Loss)	2.64%	(15.82)%	4.50%	(3.88)%

[1] Administrative expenses are included for all years to retroactively make the investment return assumption net of investment-related expenses.
[2] 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 12/31/2019
2019	$ 2,066,496	80%	$ 1,653,197
2018	(13,996,378)	60%	(8,397,827)
2017	3,657,155	40%	1,462,862
2016	(3,113,330)	20%	(622,666)
Total			$ (5,904,434)

Actuarial Value of Assets as of December 31, 2019	
11. Market Value of Assets as of December 31, 2019	$ 84,848,966
12. Deferred Gain/(Loss) to be Recognized in Future	(5,904,434)
13. Preliminary Value (Item 12 – Item 13)	$ 90,753,400
14. Corridor for Actuarial Value of Assets	
a. 80% of Market Value as of December 31, 2019 (minimum)	$ 67,879,173
b. 120% of Market Value as of December 31, 2019 (maximum)	$ 101,818,759
15. Actuarial Value as of December 31, 2019	$ 90,753,400
16. Write Up/(Down) of Assets (Item 15 – Item 11)	$ 5,904,434

Exhibit 9

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

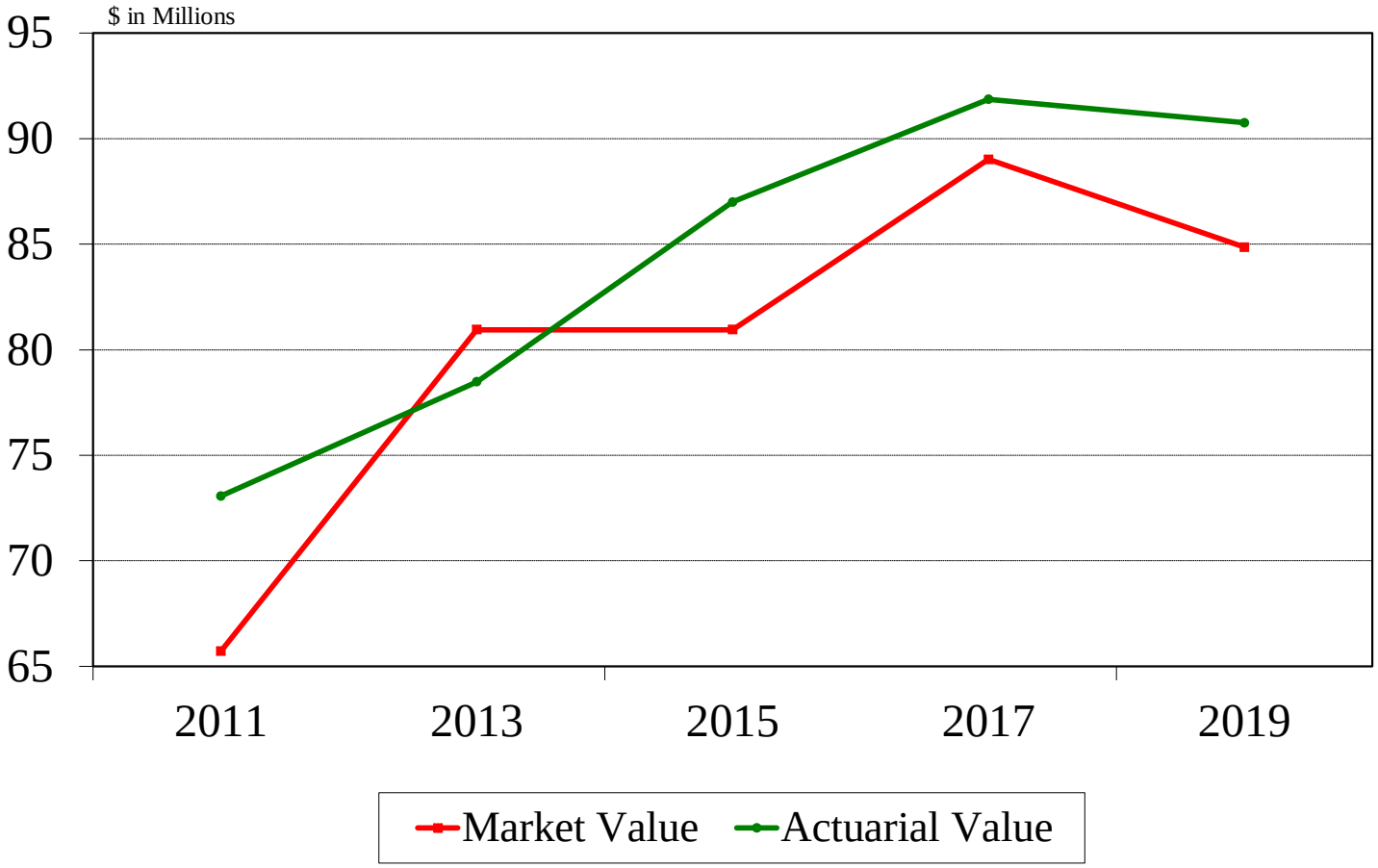
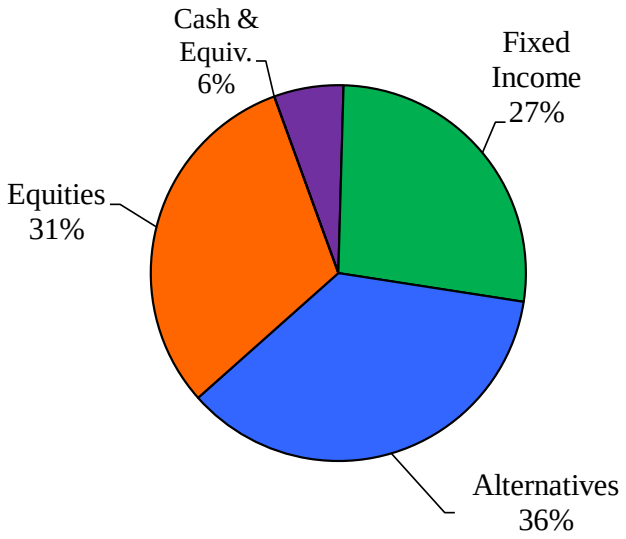


Exhibit 10

Market Value Asset Allocation for Prior and Current Actuarial Valuation Dates

December 31, 2017



December 31, 2019

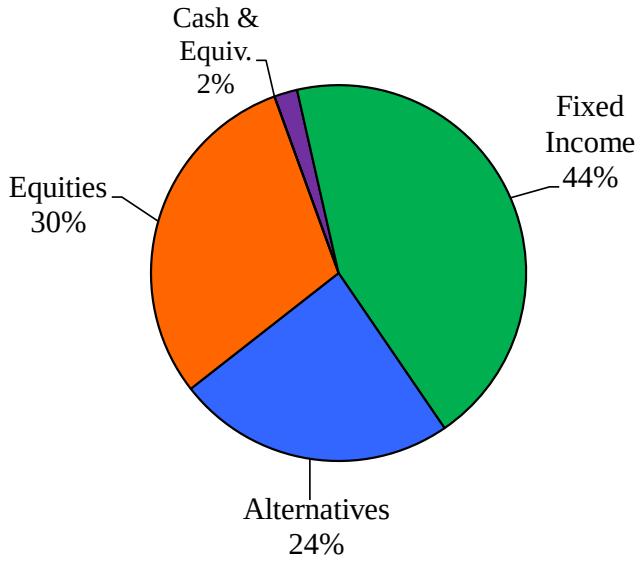


Exhibit 11

Actuarial Methods and Assumptions

A. Actuarial Methods

1. Actuarial Cost Method

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

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

2. Amortization Method

The UAAL is assumed to be amortized with level percentage of payroll contributions (total assumed contribution rate less normal cost contribution rate) based on assumed payroll growth of 3.25% 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. 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

   7.5% per year net of investment-related expenses.

2. Inflation

   3% per year included in compensation increases and investment return assumptions.

3. Mortality Rates

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

4. Compensation Increases

   General increases of 3.25% per year combined with 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 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. Termination 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.

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

    In general, actual (or annualized) pay for 2019 with an adjustment of 3% for each firefighter to reflect the effect of the 4% general pay increase effective October 1, 2019.

16. Administrative Expenses

    The expenses paid by fund assets for other than investment-related expenses are assumed to be 1.7% of payroll. The normal cost rate as a percent of payroll is assumed to be 1.7% 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

    2.0%

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

    8.5%

Exhibit 12

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

Disability Rates		Termination Rates		Compensation Increases	
Attained Age	Rate per 1,000	Years of Service	Rate per 1,000	Years of Service	Increase Percent
20	0.14	0	119	1	10.48%
21	0.15	1	107	2	10.48
22	0.16	2	95	3	10.48
23	0.17	3	84	4	10.48
24	0.18	4	73	5	10.48
25	0.19	5	63	6	6.35
26	0.21	6	54	7	6.35
27	0.23	7	48	8	6.35
28	0.25	8	42	9	6.35
29	0.28	9	38	10	6.35
30	0.31	10	33	11	5.32
31	0.35	11	28	12	5.32
32	0.40	12	24	13	5.32
33	0.45	13	21	14	5.32
34	0.49	14	19	15	5.32
35	0.52	15	18	16	4.28
36	0.54	16	18	17	4.28
37	0.57	17	16	18	4.28
38	0.62	18	15	19	4.28
39	0.73	19	15	20	4.28
40	0.92	20 & Over	0	21	3.25
41	1.14			22	3.25
42	1.32			23	3.25
43	1.48			24	3.25
44	1.73			25	3.25
45	2.09			26	3.25
46	2.55			27	3.25
47	2.98			28	3.25
48	3.34			29	3.25
49	3.62			30	3.25
50	3.79			31	3.25
51	3.92			32	3.25
52	4.04			33	3.25
53	4.24			34	3.25
54	4.56			35	3.25
55	0.00			36	3.25
56	0.00			37	3.25
57	0.00			38	3.25
58	0.00			39	3.25
59	0.00			40	3.25

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. Payment is the last day of each month.

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, 2019 Actuarial Valuation

Theoretical Investment Return Assumption Development

		Asset Allocation		
Asset Class	Gross Annual Real Rate of Investment Return (ROR)[1]	Actual 12/31/2019[2]	Estimated 12/31/2020[2]	Projected Target[3]
Domestic Equities				
Large Cap	6.5%	10.4%	8.4%	14%
Small/Mid Cap	7.0	3.3	3.5	3
International Equities				
Developed	7.0	12.3	15.5	13
Emerging Markets	8.0	4.0	4.0	4
Fixed Income	2.3	43.7	25.0	15
Alternatives				
Real Estate	5.5	17.5	21.2	23
Venture Capital	8.0	6.3	13.3	23
Cash	0.5	2.5	9.1	5
Total		100.0%	100.0%	100%
Weighted Average Gross Real ROR Assumption		4.57%	5.05%	5.83%
Weighted Average Net Real ROR Assumption[4]		3.57%	4.05%	4.83%
Possible Theoretical Annual Investment Return Assumption: Net Real ROR Plus Assumed Annual Rate of Inflation				
Assumed 3.00% Inflation		6.57%	7.05%	7.83%
Assumed 2.75% Inflation		6.32%	6.80%	7.58%

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

[2] This allocation is from Mr. David Stacy.

[3] This allocation is based on a conversation with Mr. David Stacy.

[4] A weighted average Net Real ROR is an annual rate equal to the weighted average Gross Real ROR reduced by investment-related expenses of an assumed annual rate of 1.00%. The average for the last four years was 1.02% as shown on the next page.

Appendix A (continued)

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

Years (Dec. to Dec.)	Number of Years	Average Annual Increase
1955 – 2020	65	3.56%
1960 – 2020	60	3.68
1965 – 2020	55	3.90
1970 – 2020	50	3.83
1975 – 2020	45	3.50
1980 – 2020	40	2.80
1985 – 2020	35	2.51
1990 – 2020	30	2.25
1995 – 2020	25	2.14
2000 – 2020	20	2.04

Most inflation forecasts are for 10 years or less. For example, the average 10-year forecast in the December 2020 Livingston Survey published by the Federal Reserve Bank of Philadelphia was 2.23%. However, 10 years is much too short a forecast period for a public employee defined benefit pension plan. In the 2020 annual report of the OASDI Trust Funds (Social Security), the ultimate inflation assumptions for their 75-year projections are 3.0%, 2.4%, and 1.8% for the low-cost, intermediate, and high-cost assumptions, respectively. Looking at the average annual increase in the CPI-U over historical periods of 30 to 65 years above and considering the Social Security forecasts, we believe that reasonable assumed rates of inflation for the long-term future would range from 2.25% to 3.25%. Shorter term considerations make the bottom half of that range more desirable.

Expenses Paid from Fund

		Expenses		Expenses as a % of Assets	
Plan Year Ending 12/31	Beginning of Year Assets	Admin.	Direct Investmt	Admin. (3) ÷ (2)	Investmt (4) ÷ (2)
(1)	(2)	(3)	(4)	(5)	(6)
2019	$ 80,013,420	$390,407	$1,215,007	0.49%	1.52%
2018	89,754,731	230,738	814,762	0.26	0.91
2017	82,664,948	279,569	735,812	0.34	0.89
2016	80,942,385	251,621	631,166	0.31	0.78
2016-2019	$333,375,484		$3,396,747		1.02%

Appendix A (continued)

Administrative Expenses Paid by the Fund

Plan Year Ending 12/31 (1)	Administrative Expenses Paid by the Fund (2)	Covered Payroll (3)	% of Payroll (2) ÷ (3) (4)
2019	$ 390,407	$19,403,712	2.01%
2018	230,738	17,568,234	1.31
2017	279,569	16,014,697	1.75
2016	251,621	16,135,386	1.56
2016-2019	$1,152,335	$69,122,029	1.67%

The 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. We recommend 1.70%, the average developed above for the last four plan years, rounded up to a multiple of 0.05%. (The covered payroll was determined as the contributions by the firefighters or the city for the plan year divided by the appropriate contribution rate during the plan year.) This is an increase from 1.40% for the prior valuation.

Comparison of 12/31/2017 Actuarial Economic Assumptions with 12/31/2019 Actuarial Economic Assumptions

Actuarial Assumption[1]	12/31/2017 Actuarial Economic Assumptions	12/31/2019 Actuarial Economic Assumptions
Inflation (Price)	3.25%	3.00%
Net real rate of return[2]	4.50	4.50
Net total investment return[2]	7.75%	7.50%
Firefighter pay increase[3]	6.07%	5.82%
Aggregate payroll increase	4.00%	3.25%
Administrative expenses	1.40% of payroll	1.70% of payroll

[1] All assumptions are annual rates.
[2] Net of all investment-related expenses.
[3] For 12/31/2017, an annual general pay increase of 3.50% combined with annual promotion, step, and longevity pay increases that vary by length of service, which together average 6.07% over a 25-year career. For 12/31/2019, a 3.25% annual general pay increase combined with annual promotion, step, and longevity pay increases that vary by length of service, which together average 5.82% over a 25-year career.