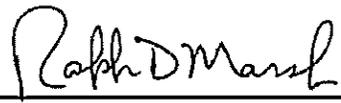


JOINT ADDENDUM TO FINAL RISK SHARING VALUATION STUDY FOR FY 2019

Pursuant to §13B(f)(2)(B)(ii) of Texas Revised Civil Statutes 6243e.2(1), the Executive Director for the Houston Firefighters' Relief and Retirement Fund ("Fund") and the Finance Director for the City of Houston (the "Municipality") do hereby execute this joint addendum to the respective Fund and Municipality final risk sharing valuation studies ("RSVS") reflecting the arithmetic average for fiscal year 2019 in which the difference between the Fund and Municipality's estimated contribution rate was greater than two percentage points.

| Fiscal Year | Estimated Contribution Rate from the Fund | Estimated Contribution Rate from the Municipality | Arithmetic Average of Estimated Contribution Rate |
|-------------|---|---|---|
| 2019 | 37.65% | 28.33% | 32.99% |

HOUSTON FIREFIGHTERS' RELIEF AND RETIREMENT FUND



Executive Director
JANUARY 4, 2018

Date

CITY OF HOUSTON



Finance Director
1/11/2018

Date



December 15, 2017

Mr. Ralph D. Marsh
 Executive Director
 Houston Firefighters' Relief and Retirement Fund
 4225 Interwood North Parkway
 Houston, Texas 77032

Re: Risk Sharing Valuation Study

Dear Ralph:

Pursuant to our engagement to provide actuarial services to the Houston Firefighters' Relief and Retirement Fund (the Fund), we have prepared this Risk Sharing Valuation Study, as required under Senate Bill 2190¹, for the Fund as of July 1, 2017. This reflects the provisions of the Fund as amended by, as well as funding policies mandated by, Senate Bill 2190.

Risk Sharing Valuation Results¹

| (\$000) | 2017 Risk Sharing Valuation Results | 2016 Initial Risk Sharing Valuation Results |
|---|--|--|
| Present Value of Future Benefits | \$5,623,339 | \$5,422,107 |
| Actuarial Accrued Liability | \$4,827,721 | \$4,629,893 |
| Actuarial Value of Assets ² | \$3,883,807 | \$3,729,670 |
| Unfunded Accrued Liability | \$943,914 | \$900,223 |
| Funded Ratio | 80.4% | 80.6% |
| City Normal Cost Rate ³ | 17.21% | 17.14% |
| City Accrued Liability Rate | 20.44% | 19.72% |
| Total City Contribution Rate ⁴ | 37.65% | 36.86% |
| Estimated City Contribution for following Fiscal Year | \$101,556 | \$100,628 |
| Employee Contribution Rate | 10.50% | 10.50% |

¹This Risk Sharing Valuation Study has been provided without waiving the Fund's right to litigate the constitutionality of SB2190.

²Re-set to market value of assets under the initial risk sharing valuation study (as of 7/1/2016).

³Contains an allowance for administrative expenses equal to 1.25% of payroll.

⁴as a percentage of pensionable compensation



Development of the Actuarial Value of Assets (\$000)

Actuarial Investment Gain (Loss)

| | Fiscal Year End June 30, 2017 |
|--|----------------------------------|
| Market Value of Assets at beginning of year | \$ 3,729,670 |
| Net Cash Flow | |
| Contributions | \$ 119,061 |
| Disbursements | <u>256,590</u> |
| Net Cash Flow | \$ (137,529) |
| Expected Investment Return | \$ 256,345 |
| Expected Market Value of Assets at end of year | \$ 3,848,486 |
| Market Value of Assets at end of year | \$ 4,025,090 |
| Investment Gain / (Loss) | \$ 176,604 |

Schedule of Actuarial Investment Gains (Losses)

| Plan Year Ending | Initial Actuarial Gain (Loss) | Five-Year Recognition | Gain (Loss) As of July 1, 2017 |
|------------------|----------------------------------|-----------------------|-----------------------------------|
| July 1, 2017 | \$ 176,604 | \$ 35,321 | \$ 141,283 |

Actuarial Value of Assets

| | |
|--|--------------|
| Market Value as of July 1, 2017 | \$ 4,025,090 |
| (Gain) Loss to be Recognized in Future Years | \$ (141,283) |
| Actuarial Value as of July 1, 2017 | \$ 3,883,807 |



(Gain) Loss Sources (\$000)

| (Gain) Loss Source | Amount |
|-----------------------------|--------------------|
| Actuarial Value of Assets | \$ (35,321) |
| Actuarial Accrued Liability | 60,350 |
| Contributions | (44,354) |
| Total | \$ (19,325) |

Change in Key Results since the Prior Valuation (\$000)

| Analysis of Change in Unfunded Liability | 2016/2017 |
|---|-------------|
| Unfunded at Beginning of Period | \$ 900,223 |
| Estimated Change Due to Normal Operation | |
| Normal Cost | \$ 68,987 |
| Contributions | (119,061) |
| Administrative Expenses | 7,196 |
| Interest | 61,540 |
| Net Change | \$ 18,662 |
| Estimated Change due to Actuarial Experience | |
| Actuarial (gain) loss from asset sources | \$ (35,321) |
| Actuarial (gain) loss from liability sources | 60,350 |
| Net change | \$ 25,029 |
| Unfunded Actuarial Accrued Liability at End of Period | \$ 943,914 |

Amortization Schedule as of July 1, 2017 (\$000)

| Plan Year Ending | Initial Liability Layer | Liability Layer as of July 1, 2017 | Payment for Fiscal Year 2019 | As a % of Fiscal Year 2019 Payroll |
|------------------|-------------------------|------------------------------------|------------------------------|------------------------------------|
| June 30, 2016 | \$ 900,223 | \$ 963,239 | \$ 56,326 | 20.88% |
| June 30, 2017 | (19,325) | (19,325) | (1,196) | (0.44)% |
| Total | | \$ 943,914 | \$ 55,130 | 20.44% |

Actuarial Certification

We certify that the information contained in this Risk Sharing Valuation Study has been prepared in accordance with the appropriate Actuarial Standards of Practice. To the best of our knowledge, the information fairly presents the actuarial position of the Houston Firefighters' Relief & Retirement Fund as of July 1, 2017 on the basis of the actuarial assumptions, methods and plan provisions set forth herein.

The Board of Trustees of the Fund may use this report for discussing and reaching consensus with the City of Houston on the Actuarial City Contribution Rate. Use of this report for any other purpose or by anyone other than the Board or the City of Houston may not be appropriate and may result in mistaken conclusions because of failure to understand applicable assumptions, methods, or inapplicability of the report for that purpose. Because of the risk of misinterpretation of actuarial results, Conduent recommends requesting an advance review of any statement, document, or filing to be based on information contained in this report. Conduent will accept no liability for any such statement, document or filing made without prior review by Conduent.

Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and demographic assumptions, increases or decreases expected as part of the natural operation of the methodology used for these measurements, and changes in plan provisions or applicable law. An analysis of the potential range of such future differences is beyond the scope of this valuation.

Where presented, references to "funded ratio" and "unfunded accrued liability" typically are measured on an actuarial value of assets basis. It should be noted that the same measurements using market value of assets could result in different funded ratios and unfunded accrued liabilities. Moreover, the funded ratio presented is appropriate for evaluating the need and level of future contributions but makes no assessment regarding the funded status of the plan if the plan were to settle (i.e., purchase annuities to cover) a portion or all of its liabilities.

In preparing the actuarial results, we have relied upon information provided by the Board of Trustees regarding plan provisions, plan participants, plan assets, contribution rates and other matters used in the actuarial valuation. Specifically, a market value of assets equal to \$4,025,089,667 has been provided by the Fund representatives. A summary of the actuarial assumptions, major plan provisions, and plan participant data used to calculate the results of this study can be found in the appendices. Although we did not audit the data, we reviewed the data for reasonableness and consistency with the prior year's information. The accuracy of the results of this valuation is dependent on the accuracy of the data.

Except as prescribed in Senate Bill 2190 (as noted in Appendix A), the Board of Trustees has sole authority to determine the actuarial assumptions and has selected the actuarial methods and assumptions used in this valuation. In our opinion, those actuarial assumptions selected by the Board are reasonably related to the experience of the Fund and to reasonable long-term expectations. The actuarial assumptions prescribed by Senate Bill 2190 have been reflected in this valuation.

Mr. Ralph D. Marsh
December 15, 2017



Based on the statutory requirements of Senate Bill 2190 it is our understanding that the actual City contribution rate may be established as an average of the contribution rates shown in this report and those shown in the Risk Sharing Valuation Study prepared by the City's actuary. If future contributions are established in this manner at levels below those presented in this report, the plan may not be expected to achieve a fully funded position over the 30-year time horizon as contemplated in the statute based on the data, assumptions and methods set forth on the attached pages.

I am a Member of the American Academy of Actuaries and meet the Qualification Standards of the Academy to render the actuarial opinions contained in this report. This report has been prepared in accordance with all applicable Actuarial Standards of Practice, and I am available to answer questions about it.

If you have any questions concerning this information, please let me know.

Respectfully submitted,

A handwritten signature in cursive script that reads "Aaron Shapiro".

Aaron Shapiro, FSA, EA, MAAA, FCA
Principal, Consulting Actuary

Appendix A: Summary of Actuarial Methods and Assumptions

Basis for Assumptions

The economic and demographic assumptions used in the study (except for the investment return assumption) were adopted by the Board in consultation with Conduent Human Resource Services (Conduent). Senate Bill 2190 requires that an actuarial experience study be performed in order to review the experience of the Fund at least once every four years to determine if any changes to the valuation assumptions are warranted. In general, the assumptions used in the valuation are based on recommendations made and approved by the Board as part of an Experience Study covering plan years from July 1, 2009 through June 30, 2013. The mortality assumption used in this study is based on the most recent base mortality table published by the Society of Actuaries and the projection scale MP-2016, which was published in 2016. It was approved by the Board on June 27, 2017. Senate Bill 2190 requires the use of an investment return assumption of not more than 7.00%.

Actuarial Methods

Actuarial Value of Assets

Senate Bill 2190 requires the use of an asset valuation method that recognizes gains and losses on the market value of assets (based on the difference between the actual rate of return and the assumed rate of return) over five years. Past gains and losses were fully recognized in the Actuarial Value of Assets at July 1, 2016. New gains and losses will be recognized over five years beginning July 1, 2017.

Actuarial Cost Method

Senate Bill 2190 requires the use of the Ultimate Entry Age Method with liabilities allocated from date of entry to expected payment of benefit. Under the Ultimate Entry Age Method, future normal cost for active employees is calculated based on the plan provisions in effect for the most recently hired employees.

Senate Bill 2190 also requires the use of a 30-year, closed, level percent of payroll amortization period, in which new gain/loss amortization bases are established each year. The Unfunded Actuarial Accrued Liability at July 1, 2016 was amortized as a level percentage of payroll over a closed amortization period of 30 years with payments effective for fiscal year beginning July 1, 2017. Additional actuarial experience losses will be amortized over a closed amortization period of 30 years in future valuations. If in any given year the Fund experiences an actuarial gain, any such gain will be used to offset the largest outstanding loss amortization base, if applicable.

Appendix A: Summary of Actuarial Methods and Assumptions (continued)

Key Economic Assumptions

Investment Return

| | |
|---------------------|-------------|
| Real Rate of Return | 4.0% |
| Price Inflation | <u>3.0%</u> |
| Total Nominal Rate | 7.0% |

Expected future investment returns are assumed to be net of investment expenses.

Wage and Price Inflation

3.0%

Payroll Growth Rate

3.0%

Normal Cost Load for Administrative Expenses

1.25% of pensionable payroll*

* required by Senate Bill 2190

Individual Pay Increase Rate

| Age | (Nominal = Merit + Wage Inflation) | |
|-----|---------------------------------------|-------|
| | Nominal | Merit |
| 20 | 7.00% | 4.00% |
| 25 | 6.25% | 3.25% |
| 30 | 5.50% | 2.50% |
| 35 | 5.00% | 2.00% |
| 40 | 4.00% | 1.00% |
| 45 | 3.70% | 0.70% |
| 50 | 3.40% | 0.40% |
| 55 | 3.00% | 0.00% |

Appendix A: Summary of Actuarial Methods and Assumptions (continued)

Key Demographic Assumptions

Retirement Rates

| Number of Years of Service | Probability of Retiring Within One Year |
|----------------------------|---|
| Less than 25 | 1% |
| 25 | 5% |
| 26 | 5% |
| 27 | 5% |
| 28 | 5% |
| 29 | 5% |
| 30 | 15% |
| 31 | 15% |
| 32 | 15% |
| 33 | 15% |
| 34 | 15% |
| 35 | 25% |
| 36 | 25% |
| 37 | 30% |
| 38 | 35% |
| 39 | 40% |
| 40+ | 100% |

Appendix A: Summary of Actuarial Methods and Assumptions (continued)

DROP Duration

| Duration of DROP at Retirement | Percentage of Participants Electing Retirement at the Specified Duration |
|--------------------------------|--|
| 0 | 0% |
| 3 | 0 |
| 5 | 5 |
| 8 | 30 |
| 10 | 65 |

DROP balances for active members are assumed to be paid out over 15 years and are discounted at the future DROP return assumption from the date payments begin. The liability for DROP balances of members who have left active service is assumed to be equal to the total of all of the DROP balances. This conservative assumption is used because individual DROP balances were not available for inactive members, and evidence was provided that members have been withdrawing their entire balance earlier and more often.

Sample Rates

| Number of Years of Service at Actual Retirement | Percentage of Participants Retiring with Specific Drop Durations | | | | |
|---|--|--------|--------|--------|---------|
| | 0 yr. | 3 yrs. | 5 yrs. | 8 yrs. | 10 yrs. |
| 20 | 0% | 0% | 0% | 0% | 0% |
| 25 | 0 | 0 | 100 | 0 | 0 |
| 30 | 0 | 0 | 5 | 30 | 65 |
| 35 | 0 | 0 | 5 | 30 | 65 |
| 40 | 0 | 0 | 0 | 0 | 100 |

Mortality Rates

Active participants and nondisabled pensioners

Based on the RP-2014 Mortality Table with Blue Collar Adjustment with generational improvement using MP-2016. Changes have been applied by adjusting RP-2014 backward to 2006 with MP-2014, and then applying generational projection from 2006 using MP-2016.

Note: These mortality rates are used to determine the mortality assumptions for the plan, including the probability of ceasing active service due to death.

Appendix A: Summary of Actuarial Methods and Assumptions (continued)

Disabled pensioners

Based on the RP-2014 Total Data Set for Disabled Lives Mortality Table with generational improvement using MP-2016. Changes have been applied by adjusting RP-2014 backward to 2006 with MP-2014, and then applying generational projection from 2006 using MP-2016.

Disability Rates

Graduated rates (see table below for sample rates).

Percentage of Deaths and Disabilities in the Line of Duty

| Age | Death | Disability ¹ |
|-----|-------|-------------------------|
| 25 | 100% | 60% |
| 35 | 100 | 60 |
| 45 | 42 | 34 |
| 55 | 20 | 25 |

Termination Rates

| Age | Termination Rate |
|-----|------------------|
| 20 | 1.30% |
| 25 | 1.30 |
| 30 | 1.18 |
| 35 | 0.70 |
| 40 | 0.40 |
| 45 | 0.45 |
| 50 | 0.00 |

For members hired prior to July 1, 2017 who are terminating with at least 10 years but less than 20 years of service:

- 50% will elect a contribution refund
- 50% will elect a deferred monthly pension benefit

For members hired on or after July 1, 2017 who terminate with at least 10 years of service, but whose age plus service is not at least 70, they are assumed to elect a monthly pension benefit deferred to the year in which their age plus service equals 70.

¹ 1% of firefighters who become disabled in the line of duty are assumed to be incapable of performing any substantial gainful activity.

Appendix A: Summary of Actuarial Methods and Assumptions (continued)

Marital Status at Benefit Eligibility

Percentage married

90% of participants are assumed to be married.

No beneficiaries other than the spouse assumed.

Age difference

Husbands assumed to be three years older than wives.

Adjustment to Reflect Definition of Average Monthly Salary

For members hired prior to July 1, 2017, active liabilities and normal costs were increased 5% to account for differences between the plan's definition of average monthly salary, the average of the highest 78 pay periods, and the compensation data available for the valuation.

Adjustment to Reflect Definition of Pensionable Compensation after July 1, 2017

Pensionable compensation for years after July 1, 2017 is assumed to represent 91% of gross compensation.

Development of Valuation Pay

Valuation pay is developed by increasing the prior year's pay with the nominal individual pay increase rate.

Age at which Benefits End for Child Beneficiaries

Benefits are assumed to end once the child beneficiary reaches age 23.

Future DROP Returns

Future DROP interest crediting rates are assumed to be equal to 4.55% (65% of the assumed asset return of 7%)

Future Cost-of-Living Adjustments

COLAs paid in October 2017 and 2018 are assumed to be equal to 2% (the assumed asset return of 7% less 5%). COLAs paid after October 2018 are assumed to be equal to 2.25% (the assumed asset return of 7% less 4.75%).

Census Dates

All dates in the census used to calculate liabilities are set as July 1st in the year of the event.

Appendix A: Summary of Actuarial Methods and Assumptions (continued)

Missing Data Assumptions

Pay for New Hires

None were missing.

Employee Contributions

Based on the prior year's contributions and current year's pay.

Age at First Payment for Vested Terminations:

50

Benefits Not Valued

The proportional retirement program between the Houston municipal, police and fire pension funds which allows for combining service credit from two or more City of Houston pension plans was not valued because its impact is expected not to be material.

Sample Rates

| Sample Rates per 100 Participants | |
|-----------------------------------|------------|
| Age | Disability |
| 20 | 0.75 |
| 25 | 0.75 |
| 30 | 0.75 |
| 35 | 1.50 |
| 40 | 1.50 |
| 45 | 1.50 |
| 50 | 1.50 |
| 55 | 1.50 |
| 60 | 3.00 |

Appendix B: Summary of Plan Provisions

Membership

Any firefighter who has not reached the age of 36 at the time he or she first enters employment shall automatically become a participant in the Fund upon completing the training period. Before October 1, 1990, the eligibility age was age 31. Before 1984, participants entered the Fund on January 1 or July 1.

Average Salary

For members hired prior to July 1, 2017, the average of the highest 36 months of pensionable pay (or 78 pay periods). For members hired on or after July 1, 2017, the average of the final 36 months of pensionable pay (or 78 pay periods).

Pensionable Pay

Pensionable pay prior to July 1, 2017 includes base pay and overtime, before reduction for pre-tax employee contributions and salary deferrals. Pensionable pay after July 1, 2017 includes base pay, before reduction for pre-tax employee contributions and salary deferrals.

Appendix B: Summary of Plan Provisions (continued)

Standard Service Pension – Members hired prior to July 1, 2017

Eligibility

20 years of service

Benefit

For retirement on or after November 1, 1997 and applicable for service accrued prior to July 1, 2017, 50% of average monthly salary; plus 3% of average monthly salary per year of service in excess of 20 years. For service accrued after July 1, 2017, 2.75% of average monthly salary per year of service for the member's first 20 years of service; plus 2.00% of average monthly salary per year of service in excess of 20 years.

For retirement on or after November 1, 1996 and prior to November 1, 1997, 48.334% of average monthly salary, plus 2.834% of average monthly salary per year of service in excess of 20 years.

For retirement on or after November 1, 1995 and prior to November 1, 1996, 46.667% of average monthly salary, plus 2.667% of average monthly salary per year of service in excess of 20 years.

For retirement on or after September 1, 1991 and prior to November 1, 1995, 45% of average monthly salary, plus 2.5% of average monthly salary per year of service in excess of 20 years, up to 30 years, plus 1.0% of average monthly salary in excess of 30 years.

For retirement on or after September 1, 1989 and prior to September 1, 1991, 45% of average monthly salary, plus 2.5% of average monthly salary per year of service in excess of 20 years.

For retirement on or after September 1, 1987 and prior to September 1, 1989, 45% of average monthly salary, plus 2% of average monthly salary per year of service in excess of 20 years.

For retirement on or after July 1, 1986 and prior to September 1, 1987, 40% of average monthly salary plus 2% of average monthly salary per year of service in excess of 20 years.

For retirement on or after January 1, 1970 and prior to July 1, 1986, 35% of average monthly salary plus 3% of average monthly salary per year of service in excess of salary per year of service in excess of 25 years.

Appendix B: Summary of Plan Provisions (continued)

Standard Service Pension – Members hired prior to July 1, 2017 (continued)

Maximum

For retirement on or after July 1, 2017, none.

For retirement on or after September 1, 1991, 80% of average monthly salary.

For retirement on or after September 1, 1989 and prior to September 1, 1991, 70% of average monthly salary.

For retirement on or after September 1, 1987 and prior to September 1, 1989, 65% of average monthly salary.

For retirements on or after January 1, 1970 and prior to September 1, 1987, 60% of average monthly salary.

In addition, a member will receive a \$5,000 lump sum payment upon retirement.

Standard Service Pension – Members hired on or after July 1, 2017

Eligibility

Age at which the sum of the member's age and service equals 70.

Benefit

2.25% of average monthly salary per year of service for the member's first 20 years of service; plus 2.00% of average monthly salary per year of service in excess of 20 years.

Maximum

80% of average monthly salary.

In addition, a member will receive a \$5,000 lump sum payment upon retirement.

Alternate Service Pension

Eligibility

Firefighters who became participants prior to September 1, 1987 and who attain age 50 with 20 years of service will receive the greater of the standard or alternate pension.

Benefit

50% of average monthly salary plus 1% of average monthly salary per year of service after becoming eligible to retire on an alternate pension.

Maximum

65% of average monthly salary.

Appendix B: Summary of Plan Provisions (continued)

Supplemental Bonus Check

Supplemental payments totaling up to \$5 million will be payable on a prorated basis determined by the Board of Trustees to all retirees and survivors.

Deferred Retirement Option Plan (DROP)

Eligibility

20 years of service. Members hired on or after July 1, 2017 are not eligible to enter DROP.

Benefit

Effective July 1, 2000, eligible participants may elect to participate in the DROP. The member's standard or alternate service pension (whichever is greater) will be calculated based on service and earnings at the time the DROP is elected.

A notional account will be maintained for each DROP participant. This account will be credited with the following amounts while the member is a participant of the DROP:

- The member's monthly retirement pension, including applicable cost-of-living adjustments (no cost-of living adjustments will be granted while a member is a participant in DROP after July 1, 2017),
- The member's contributions to the Retirement Fund contributed prior to July 1, 2017, and
- Investment earnings/losses at the rate of the Retirement Fund's earnings/losses averaged over a five-year period. Effective July 1, 2017, investment earnings will be contributed to a member's DROP account at the rate of 65% of the Retirement Fund's earnings/losses averaged over a five-year period.

A benefit equal to the DROP account balance would be paid at the time the member leaves active service. The payment would be made as a single lump sum or as the member chooses.

Effective on July 1, 2000, a three-year back DROP is available for all eligible participants. The DROP account would be recalculated based on what the account balance would have been had the participant elected the DROP up to 3 years earlier than he/she actually did. The initial DROP entry date cannot be backdated prior to September 1, 1995, or prior to completion of 20 years of credited service, and must be on the first day of the month selected.

The monthly benefit for a participant at actual retirement will increase 2% for every year of DROP participation, not to exceed 10 years.

Members can remain in the DROP for 13 years. If a member remains in active service after 13 years in DROP, no further deposits other than unused leave pay will be made to the DROP account, but the DROP account will continue to accrue interest.

If a DROP participant suffers an on-duty disability resulting in the inability to perform any gainful activity or dies in the line of duty, the death or disability annuity benefit would be calculated as though the participant had not entered the DROP. In addition, the DROP account would be payable to the participant or beneficiary.

Appendix B: Summary of Plan Provisions (continued)

Service-Connected Disability Pension

Eligibility

No age or service requirements.

Benefit

50% of average monthly salary, or service pension if greater and eligible. Firefighters who are not capable of performing any substantial gainful activity will receive 75% of average monthly salary, or service pension, if greater and eligible.

In addition, a member will receive a \$5,000 lump sum.

Non-Service-Connected Disability Pension

Eligibility

No age or service requirements.

Benefit

25% of average monthly salary, plus 2.5% of average monthly salary per year of service.

Maximum

50% of average monthly salary or service pension, if greater and eligible.

In addition, a member will receive a \$5,000 lump sum

Vested Pension

Eligibility

For members hired prior to July 1, 2017, at least 10 but less than 20 years of service. For members hired on or after July 1, 2017, at least ten years of service but less than the age at which the sum of the member's age and service equals 70.

Benefit

For members hired prior to July 1, 2017, 1.7% of average monthly salary per year of service payable beginning at age 50. For members hired on or after July 1, 2017, the benefit is equal to their accrued service pension benefit deferred to the age at which the sum of the member's age and service equals 70. Members may also receive an optional refund of contributions with interest credited at a flat rate of 5% not compounded on contributions made prior to July 1, 2017.

Appendix B: Summary of Plan Provisions (continued)

Death Benefits

Payable as specified below if survived by a spouse, dependent children, or dependent parents. Effective November 1, 1997 dependent children can continue to receive benefits between the ages of 18 and 22 if they are in college.

Non-service-connected

Monthly benefit that would have been payable had the participant retired for non-service-connected disability on the date of his or her death (or service pension if greater).

Postretirement

Monthly benefit payable to the participant prior to his or her death. Effective July 1, 1998, a "graded" postretirement death benefit is payable to a surviving spouse if the retiree was not married at the time of retirement. This "graded" benefit is equal to 20% of the postretirement death benefit for each year of marriage to a maximum 100% after five years of marriage.

Preretirement

In the case of the death of an active firefighter in the line of duty, eligible survivor will receive a benefit equal to 100% of the decedent's average monthly salary. Refund of contributions made if no eligible survivors. If death occurs after 10 years of service, interest is credited on the contributions at the flat rate of 5% not compounded. If death occurs before 10 years of service, no interest is credited.

Lump sum

A one-time \$5,000 lump sum death benefit for any active or retired firefighter. This benefit applies to active members, current retirees, and disabled participants.

Additional Benefit

Effective on or after July 1, 2001, an extra monthly benefit of \$150 is payable for life to any retired or disabled member or to an eligible survivor of a deceased member. This benefit is not subject to the postretirement adjustment.

Excess Benefit

Benefit equal to the excess of any members' standard service pension benefit over the limit imposed by Section 415 of the code.

Appendix B: Summary of Plan Provisions (continued)

Postretirement Adjustment

Prior to October 1, 1990

Pensions adjusted each year based on changes in the CPI-U, but not below original amount or above original amount increased 3% each year, not compounded.

Pension adjustments for participants who retire after March 1, 1982 begin at age 55.

Pension adjustments begin immediately for participants whose benefits become payable on or after July 1, 1986 and are based upon 30 or more years of service.

On or after October 1, 1990 and prior to November 1, 1997

Pensions adjusted each year based on changes in the CPI-U. The adjustment is based on the amount of benefits payable at the time of adjustment. The maximum annual increase shall be 3% of the benefits payable at the time of adjustment.

Pension adjustments begin immediately for participants whose benefits become payable on or after July 1, 1986 and are based upon 30 or more years of service.

On or after November 1, 1997 and prior to October 1, 2017

Pensions adjusted each year at a fixed rate of 3%. The adjustment is based on the amount of benefits payable at the time of adjustment.

Pension adjustments for participants who retire or terminate with a vested benefit after March 1, 1982 begin at age 48. Pension adjustments begin immediately for participants who become disabled and cannot perform any substantial gainful activity (current and future) and qualify for general on-duty disability benefits. Participants whose benefits become payable on or after July 1, 1986 and are based upon 30 or more years of service are also eligible for pension adjustments to begin immediately.

On or after October 1, 2017 and prior to October 1, 2019

Pensions adjusted each year at a rate equal to the Fund's most recent five fiscal years' smoothed return minus 5% (but not less than 0% nor greater than 4%). The adjustment is based on the amount of benefits payable at the time of adjustment. Pension adjustments only paid to members who are at least 70 years old.

On or after October 1, 2019

Pensions adjusted each year at a rate equal to the Fund's most recent five fiscal years' smoothed return minus 4.75% (but not less than 0% nor greater than 4%). The adjustment is based on the amount of benefits payable at the time of adjustment. Pension adjustments only paid to members who are at least 70 years old in October 2019. Pension adjustments only paid to members who are at least 55 years old after October 2019.

Appendix B: Summary of Plan Provisions (continued)

Contribution Rates

Members

10.5% of salary effective July 1, 2017. Members receive a refund of contributions without interest in the event of termination before 10 years of service. Members who elect a refund of contributions after attaining 10 years of service receive interest only on contributions made prior to July 1, 2017.

City

Effective for fiscal year ending 2018, city contribution rates will be made in accordance with the annual risk sharing valuation study. The city contribution rate in any fiscal year will not be greater than the city contribution rate projected in the initial risk sharing valuation study for that fiscal year plus 5%. The city contribution rate in any fiscal year will not be less than the city contribution rate projected in the initial risk sharing valuation study for that fiscal year minus 5%.

Appendix C: Participant Information

Summary of Active Participants as of July 1, 2017

| Attained Age | Under 1 | 1 to 4 | 5 to 9 | 10 to 14 | 15 to 19 | 20 to 24 | 25 to 29 | 30 to 34 | 35 to 39 | 40 & up | Total |
|--------------------|---------|--------|--------|----------|----------|------------------|----------|----------|----------|---------|--------|
| Under 25 | 44 | 55 | - | - | - | - | - | - | - | - | 99 |
| Avg. Pay | 38,807 | 46,995 | - | - | - | - | - | - | - | - | 43,356 |
| 25 to 29 | 67 | 326 | 73 | - | - | - | - | - | - | - | 466 |
| Avg. Pay | 38,565 | 49,372 | 55,983 | - | - | - | - | - | - | - | 48,854 |
| 30 to 34 | 40 | 327 | 255 | 89 | - | - | - | - | - | - | 711 |
| Avg. Pay | 38,667 | 49,171 | 59,078 | 66,086 | - | - | - | - | - | - | 54,251 |
| 35 to 39 | 11 | 97 | 191 | 391 | 74 | - | - | - | - | - | 764 |
| Avg. Pay | 42,153 | 48,885 | 58,828 | 66,448 | 71,175 | - | - | - | - | - | 62,421 |
| 40 to 44 | - | 2 | 90 | 361 | 248 | 26 | - | - | - | - | 727 |
| Avg. Pay | - | 57,240 | 58,088 | 65,715 | 69,842 | 78,199 | - | - | - | - | 66,602 |
| 45 to 49 | - | - | 1 | 153 | 208 | 39 | 1 | - | - | - | 402 |
| Avg. Pay | - | - | 54,733 | 64,106 | 74,022 | 77,597 | 91,377 | - | - | - | 70,590 |
| 50 to 54 | - | - | - | 8 | 77 | 20 | - | 1 | - | - | 106 |
| Avg. Pay | - | - | - | 62,337 | 70,785 | 77,489 | - | 89,320 | - | - | 71,588 |
| 55 to 59 | - | - | - | - | 1 | 1 | - | - | - | - | 2 |
| Avg. Pay | - | - | - | - | 77,796 | 80,608 | - | - | - | - | 79,202 |
| 60 to 64 | - | - | - | - | - | - | - | - | - | - | - |
| Avg. Pay | - | - | - | - | - | - | - | - | - | - | - |
| 65 to 69 | - | - | - | - | - | - | - | - | - | - | - |
| Avg. Pay | - | - | - | - | - | - | - | - | - | - | - |
| 70 & up | - | - | - | - | - | - | - | - | - | - | - |
| Avg. Pay | - | - | - | - | - | - | - | - | - | - | - |
| Total | 162 | 807 | 610 | 1,002 | 608 | 86 | 1 | 1 | - | - | 3,277 |
| Avg. Pay | 38,900 | 49,089 | 58,476 | 65,761 | 71,567 | 77,789 | 91,377 | 89,320 | - | - | 60,379 |
| Average Age: | | | | 36.86 | | Average Service: | | | | 9.36 | |

Appendix C: Participant Information (continued)

Summary of DROP Participants as of July 1, 2017

| Attained Age | Under 1 | 1 to 4 | 5 to 9 | 10 to 14 | 15 to 19 | 20 to 24 | 25 to 29 | 30 to 34 | 35 to 39 | 40 & up | Total |
|--------------------|---------|--------------------|--------|----------|----------|------------------------|----------|----------|----------|---------|--------|
| Under 25 | - | - | - | - | - | - | - | - | - | - | - |
| Avg. Pay | - | - | - | - | - | - | - | - | - | - | - |
| 25 to 29 | - | - | - | - | - | - | - | - | - | - | - |
| Avg. Pay | - | - | - | - | - | - | - | - | - | - | - |
| 30 to 34 | - | - | - | - | - | - | - | - | - | - | - |
| Avg. Pay | - | - | - | - | - | - | - | - | - | - | - |
| 35 to 39 | - | - | - | - | - | - | - | - | - | - | - |
| Avg. Pay | - | - | - | - | - | - | - | - | - | - | - |
| 40 to 44 | - | - | - | - | - | 26 | - | - | - | - | 26 |
| Avg. Pay | - | - | - | - | - | 83,951 | - | - | - | - | 83,951 |
| 45 to 49 | - | - | - | - | - | 189 | 50 | - | - | - | 239 |
| Avg. Pay | - | - | - | - | - | 79,778 | 82,764 | - | - | - | 80,402 |
| 50 to 54 | - | - | - | - | - | 134 | 86 | 40 | - | - | 260 |
| Avg. Pay | - | - | - | - | - | 76,800 | 78,049 | 77,897 | - | - | 77,382 |
| 55 to 59 | - | - | - | - | - | 53 | 41 | 100 | 58 | - | 252 |
| Avg. Pay | - | - | - | - | - | 74,640 | 72,494 | 78,475 | 81,838 | - | 77,470 |
| 60 to 64 | - | - | - | - | - | 3 | 4 | 10 | 17 | 2 | 36 |
| Avg. Pay | - | - | - | - | - | 66,733 | 73,483 | 70,707 | 77,350 | 74,620 | 74,039 |
| 65 to 69 | - | - | - | - | - | - | - | - | 2 | 2 | 4 |
| Avg. Pay | - | - | - | - | - | - | - | - | 76,440 | 79,625 | 78,033 |
| 70 & up | - | - | - | - | - | - | - | - | - | - | - |
| Avg. Pay | - | - | - | - | - | - | - | - | - | - | - |
| Total | - | - | - | - | - | 405 | 181 | 150 | 77 | 4 | 817 |
| Avg. Pay | - | - | - | - | - | 78,292 | 77,992 | 77,803 | 80,707 | 77,123 | 78,357 |
| | | Average Age: 52.35 | | | | Average Service: 26.58 | | | | | |

Appendix C: Participant Information (continued)

Summary of Active and DROP Participants as of July 1, 2017

| Attained Age | Under 1 | 1 to 4 | 5 to 9 | 10 to 14 | 15 to 19 | 20 to 24 | 25 to 29 | 30 to 34 | 35 to 39 | 40 & up | Total | | | | |
|--------------------|---------|--------|--------|----------|----------|----------|----------|------------------|----------|---------|--------|-------|--|--|--|
| Under 25 | 44 | 55 | - | - | - | - | - | - | - | - | 99 | | | | |
| Avg. Pay | 38,807 | 46,995 | - | - | - | - | - | - | - | - | 43,356 | | | | |
| 25 to 29 | 67 | 326 | 73 | - | - | - | - | - | - | - | 466 | | | | |
| Avg. Pay | 38,565 | 49,372 | 55,983 | - | - | - | - | - | - | - | 48,854 | | | | |
| 30 to 34 | 40 | 327 | 255 | 89 | - | - | - | - | - | - | 711 | | | | |
| Avg. Pay | 38,667 | 49,171 | 59,078 | 66,086 | - | - | - | - | - | - | 54,251 | | | | |
| 35 to 39 | 11 | 97 | 191 | 391 | 74 | - | - | - | - | - | 764 | | | | |
| Avg. Pay | 42,153 | 48,885 | 58,828 | 66,448 | 71,175 | - | - | - | - | - | 62,421 | | | | |
| 40 to 44 | - | 2 | 90 | 361 | 248 | 52 | - | - | - | - | 753 | | | | |
| Avg. Pay | - | 57,240 | 58,088 | 65,715 | 69,842 | 81,075 | - | - | - | - | 67,201 | | | | |
| 45 to 49 | - | - | 1 | 153 | 208 | 228 | 51 | - | - | - | 641 | | | | |
| Avg. Pay | - | - | 54,733 | 64,106 | 74,022 | 79,405 | 82,933 | - | - | - | 74,248 | | | | |
| 50 to 54 | - | - | - | 8 | 77 | 154 | 86 | 41 | - | - | 366 | | | | |
| Avg. Pay | - | - | - | 62,337 | 70,785 | 76,889 | 78,049 | 78,176 | - | - | 75,704 | | | | |
| 55 to 59 | - | - | - | - | 1 | 54 | 41 | 100 | 58 | - | 254 | | | | |
| Avg. Pay | - | - | - | - | 77,796 | 74,751 | 72,494 | 78,475 | 81,838 | - | 77,484 | | | | |
| 60 to 64 | - | - | - | - | - | 3 | 4 | 10 | 17 | 2 | 36 | | | | |
| Avg. Pay | - | - | - | - | - | 66,733 | 73,483 | 70,707 | 77,350 | 74,620 | 74,039 | | | | |
| 65 to 69 | - | - | - | - | - | - | - | - | 2 | 2 | 4 | | | | |
| Avg. Pay | - | - | - | - | - | - | - | - | 76,440 | 79,625 | 78,033 | | | | |
| 70 & up | - | - | - | - | - | - | - | - | - | - | - | | | | |
| Avg. Pay | - | - | - | - | - | - | - | - | - | - | - | | | | |
| Total | 162 | 807 | 610 | 1,002 | 608 | 491 | 182 | 151 | 77 | 4 | 4,094 | | | | |
| Avg. Pay | 38,900 | 49,089 | 58,476 | 65,761 | 71,567 | 78,204 | 78,066 | 77,879 | 80,707 | 77,123 | 63,967 | | | | |
| Average Age: | | | | 39.95 | | | | Average Service: | | | | 12.80 | | | |

Appendix C: Participant Information (continued)

Summary of Inactive Participants as of July 1, 2017

| | Number | Annual Benefits (\$000) | Average Annual Benefits |
|--------------------------------|------------|-------------------------|-------------------------|
| Benefits in Pay Status | | | |
| Retirees | 2,352 | \$ 122,667 | \$ 52,154 |
| Beneficiaries | 591 | 24,540 | 41,523 |
| Disabled Participants | <u>307</u> | <u>15,464</u> | <u>50,373</u> |
| Total | 3,250 | \$ 162,671 | \$ 50,053 |
| Deferred Benefits | | | |
| Vested Terminated Participants | 53 | \$ 94 ² | \$ 7,199 |
| Beneficiaries | N/A | N/A | N/A |
| Disabled Participants | <u>N/A</u> | <u>N/A</u> | <u>N/A</u> |
| Total | 53 | \$ 94 | \$ 7,199 |

² Does not include \$946,560 in pending refunds.

Appendix C: Participant Information (continued)

Participant Data Reconciliation

| | Active | DROP | Deferred Vested | Retired | Total |
|--|--------|-------|--------------------|---------|-------|
| Number of members as of July 1, 2016 | 3,321 | 773 | 43 | 3,138 | 7,275 |
| Change in status during the plan year: | | | | | |
| Actives who retired | (5) | (155) | | 160 | 0 |
| Actives who terminated | (24) | | 24 | | 0 |
| Actives who entered DROP | (202) | 202 | | | 0 |
| Inactives who returned to service | 1 | | (1) | | |
| Inactives who retired | | | (1) | 1 | 0 |
| Participants who became disabled | (2) | | | 2 | 0 |
| No longer members due to: | | | | | |
| Death | (1) | (3) | | (88) | (92) |
| Non-vested terminations | | | | | 0 |
| Child attained cut-off age | | | | (7) | (7) |
| Benefits no longer due | (20) | | (12) | | (32) |
| New member due to: | | | | | |
| Initial membership | 209 | | | | 209 |
| Death of another member | | | | 44 | 44 |
| Correction | | | | | 0 |
| Number of members as of July 1, 2017 | 3,277 | 817 | 53 | 3,250 | 7,397 |



Appendix C: Participant Information (continued)

Retiree and Beneficiaries Added to and Removed from Rolls

| Period Ended | Added to Rolls | | Removed from Rolls | | Rolls at the End of the Year | | | Percentage Increase in Annual Benefits | Average Annual Benefit |
|----------------------------|----------------|-------------------------|--------------------|-------------------------|------------------------------|-------------------------|-----------------|--|------------------------|
| | Number | Annual Benefits (\$000) | Number | Annual Benefits (\$000) | Number | Annual Benefits (\$000) | Annual Benefits | | |
| December 31, 1978 | 72 | 719 | 23 | 76 | 794 | 4,294 | 15.8% | 5,408 | |
| December 31, 1979 | 67 | 719 | 21 | 83 | 840 | 5,008 | 16.6 | 5,962 | |
| December 31, 1980 | 33 | 473 | 23 | 84 | 850 | 5,498 | 9.8 | 6,468 | |
| December 31, 1981 | 61 | 862 | 38 | 159 | 873 | 6,097 | 10.9 | 6,983 | |
| December 31, 1982 | 63 | 644 | 26 | 171 | 910 | 6,772 | 11.1 | 7,442 | |
| December 31, 1983 | 54 | 605 | 39 | 207 | 925 | 7,403 | 9.3 | 8,003 | |
| June 30, 1984 ¹ | 41 | 619 | 17 | 98 | 949 | 3,952 | 6.8 | 8,328 | |
| June 30, 1985 | 75 | 968 | 53 | 290 | 971 | 8,432 | 6.7 | 8,684 | |
| June 30, 1986 | 54 | 752 | 38 | 243 | 987 | 9,550 | 13.3 | 9,676 | |
| June 30, 1987 | 76 | 1,101 | 33 | 235 | 1,030 | 10,522 | 10.2 | 10,215 | |
| June 30, 1988 | 121 | 2,002 | 38 | 311 | 1,113 | 12,754 | 21.2 | 11,459 | |
| June 30, 1989 | 74 | 1,306 | 42 | 299 | 1,145 | 14,032 | 10.0 | 12,255 | |
| June 30, 1990 | 111 | 1,996 | 37 | 288 | 1,219 | 16,428 | 17.1 | 13,477 | |
| June 30, 1991 | 129 | 1,784 | 38 | 401 | 1,310 | 17,888 | 8.9 | 13,665 | |
| June 30, 1992 | 78 | 1,588 | 44 | 401 | 1,344 | 19,866 | 11.1 | 14,781 | |
| June 30, 1993 | 82 | 1,717 | 48 | 585 | 1,378 | 21,516 | 8.3 | 15,614 | |
| June 30, 1994 | 112 | 2,006 | 58 | 660 | 1,432 | 23,297 | 8.3 | 16,269 | |
| June 30, 1995 | 87 | 1,728 | 28 | 353 | 1,491 | 25,142 | 7.9 | 16,863 | |
| June 30, 1996 | 67 | 1,402 | 56 | 660 | 1,502 | 26,379 | 4.9 | 17,563 | |

¹ Six-month period

Retirees and Beneficiaries Added to and Removed from Rolls (continued)

| Period Ended | Added to Rolls | | Removed from Rolls | | Rolls at the End of the Year | | | Percentage Increase in Annual Benefits | Average Annual Benefit |
|----------------------------|----------------|-------------------------|--------------------|-------------------------|------------------------------|-------------------------|-----------------|--|------------------------|
| | Number | Annual Benefits (\$000) | Number | Annual Benefits (\$000) | Number | Annual Benefits (\$000) | Annual Benefits | | |
| June 30, 1997 | 56 | 1,050 | 37 | 487 | 1,521 | 27,581 | 4.6 | 18,133 | |
| June 30, 1998 | 54 | 1,064 | 43 | 477 | 1,532 | 28,675 | 4.0 | 18,717 | |
| June 30, 1999 | 64 | 1,840 | 28 | 551 | 1,568 | 30,233 | 5.4 | 19,281 | |
| June 30, 2000 | 95 | 2,364 | 71 | 1,167 | 1,592 | 34,583 | 14.4 | 21,723 | |
| June 30, 2001 | 127 | 3,581 | 47 | 775 | 1,672 | 38,347 | 10.9 | 22,935 | |
| June 30, 2002 | 172 | 5,493 | 61 | 998 | 1,783 | 44,300 | 15.5 | 24,846 | |
| June 30, 2004 ⁴ | 377 | N/A | 109 | N/A | 2,051 | 57,676 | 30.2 | 28,121 | |
| June 30, 2005 | 135 | 4,353 | 53 | 1,107 | 2,133 | 62,882 | 9.0 | 29,481 | |
| June 30, 2006 | 195 | 7,231 | 60 | 1,437 | 2,268 | 70,420 | 12.0 | 31,050 | |
| June 30, 2007 | 106 | 3,822 | 59 | 1,407 | 2,315 | 74,948 | 6.4 | 32,375 | |
| June 30, 2008 | 166 | 9,334 | 21 | 828 | 2,460 | 98,216 | 31.0 | 39,925 | |
| June 30, 2009 | 133 | 3,369 | 43 | 2,081 | 2,550 | 94,536 | -3.7 | 37,073 | |
| June 30, 2010 | 162 | 7,159 | 103 | 2,886 | 2,609 | 96,580 | 2.2 | 37,018 | |
| June 30, 2011 | 181 | 8,905 | 64 | 1,489 | 2,726 | 106,832 | 10.6 | 39,190 | |
| June 30, 2012 | 141 | 7,042 | 77 | 2,398 | 2,790 | 114,176 | 6.8 | 40,923 | |
| June 30, 2013 | 170 | 8,286 | 54 | 1,837 | 2,906 | 124,080 | 8.7 | 42,698 | |
| June 30, 2014 | 162 | 7,772 | 70 | 1,401 | 2,998 | 132,749 | 7.0 | 44,279 | |
| June 30, 2015 | 147 | 7,273 | 85 | 383 | 3,060 | 140,629 | 5.9 | 45,957 | |
| June 30, 2016 | 138 | 7,496 | 60 | 2,302 | 3,138 | 150,005 | 6.7 | 47,803 | |
| June 30, 2017 | 207 | 11,829 | 95 | 3,667 | 3,250 | 162,671 | 8.4 | 50,053 | |

⁴ Two-year period



City of Houston
HFRRF
Final Risk Sharing
Valuation Study
As of July 1, 2017

December 22, 2017



December 22, 2017

Ms. Tantri Emo
Interim Director, Finance Department
City of Houston
611 Walker
Houston, TX 77002

Re: HFRRF Final Risk Sharing Valuation Study as of July 1, 2017

Dear Tantri:

Texas Revised Statutes article 6243e.2(1) (the Article) sets forth requirements for a Risk Sharing Valuation Study (RSVS) of the Houston Firefighters' Relief and Retirement Fund (HFRRF). The purpose of this study is to determine the City Contribution Rate for the following fiscal year. Retirement Horizons Inc. (RHI) was engaged by the City of Houston to perform this Risk Sharing Valuation Study as of July 1, 2017 as the municipal actuary. This report provides the results of the Study and is organized as follows:

- Section 1 – Risk Sharing Valuation Study Results
- Section 2 – Actuarial Exhibits
- Section 3 – Summary of Plan Provisions
- Section 4 – Actuarial Methods and Assumptions
- Section 5 – Summary of Valuation Data
- Section 6 – Data Sources

RHI received Actuarial Data as defined in Section 1-a of the Article and required by Section 13C(b) of the Article. RHI conducted our RSVS using the Actuarial Data provided and plan provisions as summarized in this report. The analysis presented in this report is based on the interest rate assumption and actuarial cost and asset methods prescribed by the Article. All other actuarial methods and assumptions summarized in this report were adopted by the City of Houston Finance Department with review and concurrence by RHI and based on existing assumptions used in the July 1, 2016 Risk Sharing Valuation Study as required by the Article.

The HFRRF actuary conducted a proposed RSVS dated November 27, 2017. That report was then provided to RHI on the same day by the HFRRF actuary. RHI conducted our proposed RSVS dated November 27, 2017 using the Actuarial Data provided and plan provisions described therein.

Pursuant to the reconciliation and finalization process described in Section 13C(c) of the Article, RHI has updated its RSVS to reflect the use of compound interest in the calculation of the Actuarial Value of Assets.

During the reconciliation process, we determined that the primary reason for the differences in the results of the two 2017 Proposed Risk Sharing Valuation Studies continues to be differences in the underlying assumptions. As the 2017 RSVS assumptions must align with those used in the 2016 RSVS until the recommendations from the next experience study are adopted, there were no changes to the assumptions made for the 2017 RSVS.

Ms. Tantri Emo
December 22, 2017

As described in the Article, results of the Risk Sharing Valuation Study performed by the HFRRF actuary will be compared to the results in this report. Since it is anticipated the results will be greater than two percentage points different, a mathematical average of the municipal and Fund actuary's results will be used.

The actual costs, City Contribution Rates, and other results could be materially different from those described in this report in the future if actual plan experience differs significantly from the underlying valuation basis. Differences could occur for a number of reasons such as plan experience differing from the underlying demographic and economic assumptions or changes in plan provisions. Due to the limited scope of this report, analysis of the potential range of such future measurements has not been performed.

The results in this report and any measures of funded status are predicated on the notion of the Fund's ongoing operation and should not be relied upon for assessing the sufficiency of plan assets for settlement of plan termination liabilities.

The information contained in this report was prepared as requested by the City of Houston and solely for the purpose of satisfying the RSVS requirements of the Article, and should not be used for any other purpose. As significantly different results from those contained in this report may be needed for other purposes, this report should only be provided to other parties in its entirety.

The signing actuary for this report is a member of the Society of Actuaries and other professional actuarial organizations and meets the "Qualification Standards for Actuaries Issuing Statements of Actuarial Opinion." The undersigned is available to answer questions regarding the information contained in this report or to provide further explanations or details as needed.

Respectfully submitted by Retirement Horizons Inc.



David A. Sawyer, FSA EA MAAA
Senior Consultant

Risk Sharing Valuation Study Results

Corridor Midpoint

The table below contains the Corridor Midpoint, along with the corresponding Minimum and Maximum Contribution Rates using a 5% Corridor Margin as specified in the Article. Based on RHI's proposed RSVS results, the City Contribution Rate for FY 2019 would be 28.33% of pensionable payroll, which is within the Corridor.

| FY | Corridor Midpoint | Corridor Minimum | Corridor Maximum | Calculated City Contribution Rate (Before Adjustment) | Adjusted City Contribution Rate |
|------|-------------------|------------------|------------------|---|---------------------------------|
| 2018 | 31.89% | 26.89% | 36.89% | 26.98% | 31.89% |
| 2019 | 31.89% | 26.89% | 36.89% | 28.33% | |
| 2020 | 31.89% | 26.89% | 36.89% | | |
| 2021 | 31.89% | 26.89% | 36.89% | | |
| 2022 | 31.89% | 26.89% | 36.89% | | |
| 2023 | 31.89% | 26.89% | 36.89% | | |
| 2024 | 31.89% | 26.89% | 36.89% | | |
| 2025 | 31.89% | 26.89% | 36.89% | | |
| 2026 | 31.89% | 26.89% | 36.89% | | |
| 2027 | 31.89% | 26.89% | 36.89% | | |
| 2028 | 31.89% | 26.89% | 36.89% | | |
| 2029 | 31.89% | 26.89% | 36.89% | | |
| 2030 | 31.89% | 26.89% | 36.89% | | |
| 2031 | 31.89% | 26.89% | 36.89% | | |
| 2032 | 31.89% | 26.89% | 36.89% | | |
| 2033 | 31.89% | 26.89% | 36.89% | | |
| 2034 | 31.89% | 26.89% | 36.89% | | |
| 2035 | 31.89% | 26.89% | 36.89% | | |
| 2036 | 31.89% | 26.89% | 36.89% | | |
| 2037 | 31.89% | 26.89% | 36.89% | | |
| 2038 | 31.89% | 26.89% | 36.89% | | |
| 2039 | 31.89% | 26.89% | 36.89% | | |
| 2040 | 31.89% | 26.89% | 36.89% | | |
| 2041 | 31.89% | 26.89% | 36.89% | | |
| 2042 | 31.89% | 26.89% | 36.89% | | |
| 2043 | 31.89% | 26.89% | 36.89% | | |
| 2044 | 31.89% | 26.89% | 36.89% | | |
| 2045 | 31.89% | 26.89% | 36.89% | | |
| 2046 | 31.89% | 26.89% | 36.89% | | |
| 2047 | 31.89% | 26.89% | 36.89% | | |
| 2048 | 15.92% | 10.92% | 20.92% | | |

Risk Sharing Valuation Study Results

City Contribution Rate

The City Contribution Rate is equal to the sum of the Employer Normal Cost and the Amortization Rate from any Liability Layers.

| FY | Employer Normal Cost | Liability Layer Amortization Rate | Estimated City Contribution Rate |
|------|----------------------|-----------------------------------|----------------------------------|
| 2018 | 14.74% | 12.24% | 26.98% |
| 2019 | 14.72% | 13.61% | 28.33% |
| 2020 | | | |
| 2021 | | | |
| 2022 | | | |
| 2023 | | | |
| 2024 | | | |
| 2025 | | | |
| 2026 | | | |
| 2027 | | | |
| 2028 | | | |
| 2029 | | | |
| 2030 | | | |
| 2031 | | | |
| 2032 | | | |
| 2033 | | | |
| 2034 | | | |
| 2035 | | | |
| 2036 | | | |
| 2037 | | | |
| 2038 | | | |
| 2039 | | | |
| 2040 | | | |
| 2041 | | | |
| 2042 | | | |
| 2043 | | | |
| 2044 | | | |
| 2045 | | | |
| 2046 | | | |
| 2047 | | | |
| 2048 | | | |

Actuarial Exhibits

3.1. Fair Value of Assets

| | July 1, 2016 | July 1, 2017 |
|---|------------------|------------------|
| A. Fair Value of Plan Assets | | |
| 1. Cash & Short Term Investments | \$ 228,538,860 | \$ 75,531,237 |
| 2. Fixed Income | 1,138,667,369 | 1,096,640,070 |
| 3. Equity Securities | 1,357,841,761 | 1,981,027,963 |
| 4. Alternative Investments | 795,038,696 | 629,037,826 |
| 5. Real Estate | 186,825,185 | 194,666,779 |
| 6. Land, Building, Etc. | 5,723,983 | 5,351,239 |
| 7. Accrued Interest & Dividends | 11,927,699 | 8,807,917 |
| 8. Accrued City Contributions | 3,433,983 | 3,623,511 |
| 9. Accrued Member Contributions | 926,600 | 982,278 |
| 10. Other | 745,873 | 29,420,847 |
| 11. Total Fair Value | \$ 3,729,670,009 | \$ 4,025,089,667 |
| B. Change in Fair Value | | |
| | | Change |
| 1. Contributions | | |
| a. Members | | \$ 25,403,621 |
| b. City | | 93,657,800 |
| c. Total | | \$ 119,061,421 |
| 2. Disbursements | | |
| a. Benefit Payments | | \$ (249,394,107) |
| b. Administrative Expenses | | (7,195,777) |
| c. Total | | \$ (256,589,884) |
| 3. Investment Return | | |
| a. Interest and Dividends | | \$ 47,625,215 |
| b. Realized and Unrealized Gain/(Loss) | | 392,156,366 |
| c. Plan Investment Expenses | | (6,833,460) |
| d. Total Return | | \$ 432,948,121 |
| 4. Net Change | | \$ 295,419,658 |
| 5. Average Rate of Return | | |
| a. Average Asset Value | | \$3,660,905,778 |
| b. Income Net of Investment Expenses | | \$ 432,948,121 |
| c. Annual Rate of Return - Net of Investment Expenses | | 11.83% |
| d. Annual Rate of Return - Gross | | 12.02% |

Actuarial Exhibits

3.2. Actuarial Value of Assets

| | |
|--|------------------|
| 1. Market Value of Assets at beginning of year | \$ 3,729,670,009 |
| 2. Net Cash Flow | |
| a. Contributions | \$ 119,061,421 |
| b. Benefit Disbursements | (249,394,107) |
| c. Administrative Expenses | (7,195,777) |
| d. Net Cash Flow [2.a. + 2.b. + 2.c.] | \$ (137,528,463) |
| 3. Expected Investment Return [1. x 0.07] + [2.d. x ((1.07) ^{.5-1})] | \$ 256,344,815 |
| 4. Expected Market Value of Assets at end of year [1. + 2.d. + 3.] | \$ 3,848,486,361 |
| 5. Market Value of Assets at end of year | \$ 4,025,089,667 |
| 6. Investment Gain/(Loss) [5. - 4.] | \$ 176,603,306 |
| 7. Schedule of Actuarial Investment Gains (Losses) | |

| | Fiscal Year End | Initial Actuarial Gain (Loss) | Five-Year Recognition | Deferred Gain (Loss) As of July 1, 2017 |
|--|--------------------|----------------------------------|--------------------------|---|
| | 2017 | \$ 176,603,306 | \$35,320,661 | \$ 141,282,645 |
| | 2018 | N/A | N/A | N/A |
| | 2019 | N/A | N/A | N/A |
| | 2020 | N/A | N/A | N/A |
| | 2021 | N/A | N/A | N/A |
| | Total | \$ 176,603,306 | \$35,320,661 | \$ 141,282,645 |

| | |
|--|------------------|
| 8. Market Value as of July 1, 2017 | \$ 4,025,089,667 |
| (Gain) Loss to be Recognized in Future Years | (141,282,645) |
| Actuarial Value as of July 1, 2017 | \$ 3,883,807,022 |
| 9. Actuarial Value of Assets, Prior Year | \$ 3,729,670,009 |
| 10. Rate of Return on Actuarial Value of Assets (Net of Investment Expenses) | 8.0% |

Actuarial Exhibits

3.3. Actuarial Accrued Liability

| | July 1, 2016 | July 1, 2017 |
|--|------------------|------------------|
| A. Discount Rate | 7.0% | 7.0% |
| B. Actuarial Accrued Liability | | |
| 1. Active | \$1,504,876,227 | \$1,422,535,541 |
| 2. Terminated Vested | \$1,473,695 | \$1,915,864 |
| 3. Disabled | \$203,184,724 | \$211,992,718 |
| 4. Retired | \$2,621,867,347 | \$2,876,789,437 |
| 5. Total | \$4,331,401,993 | \$4,513,233,560 |
| C. Change in Actuarial Accrued Liability | 2017 Fiscal Year | |
| 1. Benefits Accumulated | \$62,873,466 | |
| 2. Benefits Paid | (\$249,394,107) | |
| 3. Decrease in Discount Period | \$296,780,329 | |
| 4. Plan Experience | \$71,571,879 | |
| 5. Actuarial Assumptions | \$0 | |
| 6. Actuarial Methods | \$0 | |
| 7. Plan Amendments | \$0 | |
| 8. Net Change | \$181,831,567 | |
| D. Actuarial Value of Assets | \$ 3,729,670,009 | \$ 3,883,807,022 |
| E. Unfunded Actuarial Liability | \$601,731,984 | \$629,426,538 |
| F. Total Normal Cost % of Payroll ¹ | 25.24% | 25.22% |
| G. Member Contribution % of Payroll | 10.50% | 10.50% |
| H. Employer Normal Cost Rate [F - G] | 14.74% | 14.72% |

¹ Includes administrative expense load

Actuarial Exhibits

3.4. Gain/Loss Analysis

| | Liability | Assets | Unfunded |
|---|-----------------|--------------------|----------------|
| A. Values at Prior Year Beginning | \$4,331,401,993 | \$ (3,729,670,009) | \$601,731,984 |
| B. Expected Changes During Year | | | |
| 1. Normal Cost | \$ 62,873,466 | N/A | \$ 62,873,466 |
| 2. Contributions | N/A | (119,061,421) | (119,061,421) |
| 3. Benefits Paid | (249,394,107) | 249,394,107 | 0 |
| 4. Plan Expenses | N/A | 7,195,777 | 7,195,777 |
| 5. Interest on | | | |
| a. Item A | 303,198,140 | (261,076,901) | 42,121,239 |
| b. Item B.1 | 2,163,353 | N/A | 2,163,353 |
| c. Item B.2 | N/A | (4,096,670) | (4,096,670) |
| d. Item B.3 | (8,581,163) | 8,581,163 | 0 |
| e. Item B.4 | N/A | 247,593 | 247,593 |
| 6. Total Expected Changes | \$ 110,259,689 | (\$118,816,352) | \$ (8,556,663) |
| C. Expected Values at Prior Year End | \$4,441,661,682 | \$ (3,848,486,361) | \$ 593,175,321 |
| D. Other Changes | | | |
| 1. Plan Experience | \$71,571,878 | (\$35,320,661) | \$36,251,217 |
| 2. Actuarial Assumptions | 0 | 0 | 0 |
| 3. Actuarial Methods | 0 | 0 | 0 |
| 4. Plan Amendments | 0 | 0 | 0 |
| 5. Total Other Changes | \$71,571,878 | (\$35,320,661) | \$36,251,217 |
| E. Actual Values as of Current Year Beginning | \$4,513,233,560 | (\$3,883,807,022) | \$629,426,538 |

Actuarial Exhibits

3.5. Liability Layers

| Fiscal Year | Initial Amount of Liability Layer (BOY) | Liability Layer to be Amortized as of Valuation Date | Remaining Amortization Payments as of 7/1/2018 | Payoff Year | Amortization Amount for FY 2019 |
|---|--|--|---|----------------|---------------------------------------|
| 2017 | \$601,731,984 | \$581,893,105 | 29 | 2047 | \$34,026,222 |
| 2018 | \$47,533,433 | <u>\$47,533,433</u> | 30 | 2048 | <u>\$2,803,361</u> |
| Total | | \$629,426,538 | | | \$36,829,583 |
| Projected Payroll for Fiscal Year +1 | | | | | \$270,561,419 |
| Amortization Payments as a % of Projected Payroll | | | | | 13.61% |

Summary of Plan Provisions

Eligibility and Participation

Any firefighter shall automatically become a participant in the plan upon completing the training period, as long as he or she has not reached age 36.

Final Average Pay (FAP)

For members hired prior to July 1, 2017, the average of the highest 78 bi-weekly payroll periods of salary, before reduction for pre-tax employee contributions and salary deferrals. Overtime and any excess of the salary earned on the basis of the member's appointed position over the salary of the member's highest tested rank are excluded for pay periods after July 1, 2017. For members hired after July 1, 2017, the average of the highest 78 bi-weekly payroll periods of salary, before reduction for pre-tax employee contributions and salary deferrals, and excluding overtime and any excess of the salary earned on the basis of the member's appointed position over the salary of the member's highest tested rank.

Credited Service

Elapsed time from date of hire, for all periods of service classified as full-time, fully paid, active duty employment with the City of Houston Fire Department.

Retirement Benefit

Eligibility

20 years of service if hired prior to July 1, 2017. Attainment of age plus service of at least seventy (Rule of 70) for those hired on or after July 1, 2017.

Amount

Prior to July 1, 2017, 2.5% of FAP times credited service up to 20 years of service, plus 3.0% of FAP for credited service in excess of 20 years, up to a maximum pension of 80% of FAP. In addition, the member will receive a \$5,000 lump sum.

On or after July 1, 2017, 2.75% per year prior to 20 years of service and 2.00% thereafter for those hired prior to July 1, 2017 (no maximum). For those hired on or after that date, 2.25% per year up to 20 years of service and 2.00% thereafter, up to a maximum of 80% of FAP. Percentages earned prior to July 1, 2017 are retained. \$5,000 lump sum payable upon retirement if member has completed 20 years of service, regardless of date of hire.

Summary of Plan Provisions

Termination Benefit

| | |
|-------------|--|
| Eligibility | Termination of employment prior to satisfying the retirement eligibility requirements. |
| Amount | Hired prior to July 1, 2017 with less than 10 years of service: Lump sum refund of member contributions without interest. Hired prior to July 1, 2017 with at least 10 but less than 20 years of service: Choice of <ul style="list-style-type: none">• Refund of contributions (with 5% interest, not compounded, on contributions made prior to July 1, 2017), or• Monthly benefit of 1.7% of final average pay per year of service, payable at age 50 Hired on or after July 1, 2017: Lump sum refund of member contributions without interest. |

On-Duty Disability

| | |
|-------------|--|
| Eligibility | No age or service requirements. |
| Amount | Firefighters who are not capable of performing their normal and customary firefighter duties receive the greater of their accrued retirement benefit or 50% of FAP (75% of FAP for firefighters not capable of performing any substantial gainful activity). In addition, the member will receive a \$5,000 lump sum. This benefit was assumed to be payable immediately, even if the member does not yet meet retirement eligibility. |

Off-Duty Disability

| | |
|-------------|--|
| Eligibility | No age or service requirements. |
| Benefit | Firefighters who are not capable of performing their normal and customary firefighter duties receive the greater of their accrued retirement benefit or 25% of FAP plus 2.5% of FAP per year of service (up to a maximum of 50% of FAP). In addition, the member will receive a \$5,000 lump sum. This benefit was assumed to be payable immediately, even if the member does not yet meet retirement eligibility. |

Summary of Plan Provisions

Active Member Death

| | |
|-----------------------------|--|
| Eligibility | No age or service requirements. |
| Duty Related Benefit | 100% of FAP. In addition, the beneficiary will receive a \$5,000 lump sum. |
| Non-Duty Related Benefit | Greater of the accrued retirement benefit or Off-Duty Disability benefit. In addition, the beneficiary will receive a \$5,000 lump sum. |
| Allocation to Beneficiaries | The benefit amount above is payable to a surviving spouse, or allocated 50% to the surviving spouse with the remaining 50% divided equally among any eligible children, or if no surviving spouse divided equally among any eligible children, or otherwise paid to any eligible parents if no surviving spouse or eligible children. An eligible child enrolled in college must be unmarried. |

Please Note: Members who become disabled or die from heart or lung disease or cancer must have at least six years of service to receive a disability or death benefit. They must also have passed a physical upon beginning employment or prior to the claimed disability or death which did not reveal evidence of the condition.

Retired Member Death

| | |
|-----------------------------|--|
| Eligibility | Retired and receiving monthly pension. |
| Amount | 100% of monthly pension the retired member was receiving. |
| Allocation to Beneficiaries | The benefit amount above is payable to a surviving spouse, or allocated 50% to the surviving spouse with the remaining 50% divided equally among any eligible children, or if no surviving spouse divided equally among any eligible children, or otherwise paid to any eligible parents if no surviving spouse or eligible children. An eligible child enrolled in college must be unmarried. |

Supplemental Annuity

An extra monthly benefit of \$150 is payable for life to any retired or disabled member or to an eligible survivor of a deceased member.

Supplemental Bonus Checks

Annual payments of up to \$5 million are provided to retirees and beneficiaries.

Summary of Plan Provisions

Cost of Living Adjustment

Beginning at age 55, a retired member or beneficiary will receive an adjustment reflecting the Fund's 5-year average investment return less 4.75%, with a floor of 0% and a cap of 4%. Prior to July 1, 2020, no COLA is provided to members under age 70. Notwithstanding the foregoing, prior to July 1, 2019, COLA provided to members who are at least 70 years of age is the Fund's 5-year average investment return less 5%, with a floor of 0% and a cap of 4%.

DROP

Hired prior to July 1, 2017: Upon reaching retirement eligibility, members may enter the Deferred Retirement Option Plan (DROP). The member's monthly annuity is added to a notional account. Interest is credited on the account using 65% of the 5-year average of the Fund's rate of return, with a minimum of 2.5%. COLAs are not applied to the monthly benefit until the member exits DROP, and member contributions are not credited to the DROP account.

For those eligible to retire prior to July 1, 2017, upon exiting the DROP for retirement, the member's monthly benefit is increased by 2% of the original monthly benefit for each year the member remained in DROP, up to 10 years.

Please note: for accumulation to the valuation date, DROP accounts include the value of COLAs after age 48 at 3.0% per year, as well as member contributions of 9% of total pay.

Hired on or after July 1, 2017: not available.

PROP

Prior to July 1, 2017, a member could elect to have all or a portion of his or her monthly annuity credited to the Post Retirement Option Plan (PROP) account, along with interest. On and after July 1, 2017, the interest credit is 65% of the 5-year average of the Fund's rate of return, with a minimum of 2.5% (same as DROP crediting rate). Additionally, no new amounts are eligible for deferral into the PROP.

Contribution Rates

Members

10.50% of pensionable pay.

City

The City Contribution Rate from the RSVS applied to pensionable payroll.

Actuarial Methods and Assumptions

Actuarial Cost Methods

| | |
|---------------------------|---|
| Measurement Date | Census data as of July 1, 2017. Impact of plan changes measured on future accruals only; no impact to accruals through the valuation date, including for back-DROP accruals based on dates before the valuation date. |
| Actuarial Value of Assets | Five-year smoothing of future gains and losses. 20% of each gain or loss will be recognized each year. Gains and losses are based on the difference between the actual and expected fair market value each year. The expected value is based on the assumed rate of return on investments and is net of investment expenses. |
| Actuarial Cost Method | <u>The Ultimate Entry Age Normal Actuarial Cost Method</u> As used in the City Funding Policy, a method under which the actuarial present value of all potential future projected benefits of each individual included in the valuation is calculated, assuming continued service and pay increases. The <i>normal cost</i> is calculated as the average uniform percentage of payroll which, if applied to the compensation of each participant during the entire period of anticipated covered service, would meet the cost of all benefits payable based on benefits provisions for new hires. The portion of the actuarial present value of future benefits not provided for at the valuation date by the present value of future normal costs is called the <i>actuarial accrued liability</i> . |

Key Economic Assumptions

| | |
|---------------------------|----------------------------|
| Interest Rate | 7.0%, as prescribed by law |
| Inflation | 2.25% |
| Wage Inflation | 3.00% |
| Payroll Growth | 3.00% |
| Cost of Living Adjustment | 2.00% |

Actuarial Methods and Assumptions

Individual Pay Increase Rate

| Age | Assumed Increase |
|------------|-------------------------|
| 20 | 7.00% |
| 25 | 6.25% |
| 30 | 5.50% |
| 35 | 5.00% |
| 40 | 4.00% |
| 45 | 3.70% |
| 50 | 3.40% |
| 55 | 3.00% |

DROP Interest Crediting Rate

4.75%. Please note: 8.50% was assumed to be credited prior to the valuation date. This reflects the historical expected rate of return on the trust, since actual rates of return on DROP balances were not provided.

Demographic Assumptions

Mortality Rates

Active and nondisabled members

RP-2000 Combined Healthy Mortality Tables with longevity improvement projected generationally using Scale AA.

Disabled pensioners

RP-2000 Disabled Mortality Tables with longevity improvement projected generationally using Scale AA.

Actuarial Methods and Assumptions

Retirement Rates

| Years of Service | Probability of Retiring Within One Year |
|-------------------------|--|
| 20 - 24 | 1% |
| 25 - 29 | 5% |
| 30 - 34 | 15% |
| 35 - 36 | 25% |
| 37 | 30% |
| 38 | 35% |
| 39 | 40% |
| 40+ | 100% |

These rates apply to members hired on or after July 1, 2017 once they are eligible to retire.

Members currently in DROP are assumed to retire according to the retirement rates, with 100% retirement assumed after ten years in DROP.

The following table shows, for sample years of service, the assumed probability of the active members not currently in DROP having been in the DROP for a certain number of years at retirement:

| Years of Service at Retirement | Percent Electing Specified DROP Period at Retirement | | | | |
|---------------------------------------|---|----------------|----------------|----------------|-----------------|
| | 0 Years | 3 Years | 5 Years | 8 Years | 10 Years |
| 20 | 0% | 0% | 0% | 0% | 0% |
| 25 | 0% | 0% | 100% | 0% | 0% |
| 30 | 0% | 0% | 5% | 30% | 65% |
| 35 | 0% | 0% | 5% | 30% | 65% |
| 40 | 0% | 0% | 0% | 0% | 100% |

Actuarial Methods and Assumptions

Disability Rates

| <i>Disability per 100</i> | |
|---------------------------|------------|
| <i>Age</i> | <i>All</i> |
| 20 | 0.75 |
| 25 | 0.75 |
| 30 | 0.75 |
| 35 | 1.50 |
| 40 | 1.50 |
| 45 | 1.50 |
| 50 | 1.50 |
| 55 | 1.50 |
| 60 | 3.00 |

Percentage of Disabilities in the Line of Duty

- Deaths 50%
- Disabilities 50%

All Deaths are assumed to occur in the Line of Duty.

Actuarial Methods and Assumptions

Termination Rates

Sample Rates

| Age | Termination Rate |
|------------|-------------------------|
| 20 | 1.30% |
| 25 | 1.30% |
| 30 | 1.18% |
| 35 | 0.70% |
| 40 | 0.40% |
| 45 | 0.45% |
| 50 | 0.00% |

For participants hired prior to July 1, 2017 with at least 10 years of service but not yet eligible to retire, 50% are assumed to elect a contribution refund, and 50% are assumed to elect a deferred monthly benefit payable at age 55.

Percentage married

90% of participants are assumed to be married.
No beneficiaries other than the spouse assumed.

Age difference

Husbands assumed to be three years older than wives.

Administrative Expenses

1.25% of payroll

Development of Valuation Pay

Valuation pay is projected by increasing the prior year's pay with the individual pay increase rate. Historical valuation pay was regressed with the individual pay increase rate where it was not available. Because overtime pay is no longer included in the definition of pensionable pay, the valuation pay was reduced 9% for future years. The 9% was based on input from the City of Houston and the HFRRF actuary.

Load for Nature of Average Salaries

Benefits for active members with at least ten years of service by July 1, 2017 were increased 5% to account for difference between the plan's definition of average monthly salary and the average of the most recent 78 pay periods.

Actuarial Methods and Assumptions

Payment of DROP Balances

Installments over 15 years for active members and 10 years for inactive members. A factor of 0.8654 was applied to active DROP balances and a factor of 0.9105 was applied to inactive DROP balances to account for the difference between the 4.75% DROP interest crediting rate and the 7.00% interest rate assumption.

Funding Policy

The City is assumed to contribute the City Contribution Rate from the prior year. The actuarially determined City Contribution Rate is measured as the normal cost rate, plus the administrative expenses rate, plus 30-year amortization rate of the Unfunded Actuarial Accrued Liability (UAAL) from the initial RSVS, plus the amortization rates of all subsequently-determined Liability Layers, less the member contribution rate, adjusted with interest to mid-year. The closed amortization rates for the Liability Layers are calculated as a level percent of pay. The initial amortization period for a Liability Loss Layer is 30 years. The initial amortization period for a Liability Gain Layer is equal to the remaining amortization period for the largest Liability Loss Layer.

Benefits Not Valued

Due to limitations of the data received, no adjustment has been made for the difference between pay based on the appointed position and pay based on the highest tested rank. Additionally, no marital status was provided for child beneficiaries, so the provision against married children in college receiving a survivor benefit was not valued. All child beneficiaries were assumed to receive benefits until age 23.

Summary of Valuation Data

| | July 1, 2016 | July 1, 2017 |
|--------------------------------------|---------------|---------------|
| A. Active Members Not in DROP | | |
| 1. Number | 3,321 | 3,277 |
| 2. Valuation payroll | \$201,194,698 | \$198,088,640 |
| 3. Average pay | \$60,583 | \$60,448 |
| 4. Average age | 37.1 | 36.9 |
| 5. Average service | 9.7 | 9.4 |
| B. Active Members in DROP | | |
| 1. Number | 773 | 817 |
| 2. Valuation payroll | \$60,887,278 | \$64,592,349 |
| 3. Average pay | \$78,768 | \$79,060 |
| 4. Average age | 53.4 | 52.4 |
| 5. Average service | 28.3 | 26.6 |
| C. Terminated Vested | | |
| 1. Number | 14 | 13 |
| 2. Total benefits | \$100,362 | \$93,582 |
| 3. Average Annual benefits | \$7,169 | \$7,199 |
| D. Disabled | | |
| 1. Number | 315 | 307 |
| 2. Total benefits | \$15,376,486 | \$15,464,455 |
| 3. Average Annual benefits | \$48,814 | \$50,373 |
| E. Retired | | |
| 1. Number | 2,232 | 2,352 |
| 2. Total benefits | \$111,347,825 | \$122,666,940 |
| 3. Average Annual benefits | \$49,887 | \$52,154 |
| F. Beneficiaries | | |
| 1. Number | 591 | 591 |
| 2. Total benefits | \$23,280,755 | \$24,540,000 |
| 3. Average Annual benefits | \$39,392 | \$41,523 |

Notes:

1. DROP Balance values not shown.
2. Terminated Vested count does not include 29 members due refunds totaling \$561,000 for July 1, 2016 and 40 members due refunds totaling \$946,560 for July 1, 2017.
3. Payroll and Pay values exclude overtime.
4. Date fields provided to RHI by HFRRF only included the year (no month or day).

Data Sources

Data and inputs used in this report were provided from the following sources:

- Census data for all members was provided on October 31, 2017. We understand this data is substantially the same as that used by the HFRRF actuary for their Risk Sharing Valuation Study. As the data provided to RHI does not contain the month for any dates, we have assumed all dates are July 1st of the respective year.
- The fair value of assets of \$4,025,089,667 as of June 30, 2017 was provided in the audited HFRRF financials. These were provided to RHI by HFRRF on October 19, 2017.
- The Fiscal Year 2018 payroll used was \$262,680,989, which was based on the census data as of July 1, 2017, reduced by 9.00% to account for the removal of overtime and increased with one year of salary scale.
- The provisions of the Article are contained in the enrolled text of Senate Bill 2190, which was signed by the Governor on May 31, 2017.