RETIREMENT HORIZONS INCORPORATED

City of Houston
HFRRF Pension Reform
Cost Analysis

March 15, 2017

INTERIM REPORT

RETIREMENT HORIZONS INCORPORATED

March 15, 2017

Mr. Kelly Dowe
Chief Business Officer and Finance Director
City of Houston
611 Walker
Houston, TX 77002

Re: HFRRF Pension Reform Cost Analysis

Dear Kelly:

The City of Houston has worked to reform the HFRRF system with the goal of budget neutrality and cost avoidance, reducing the unfunded liability, and creating a mechanism to better manage pension costs and liabilities in the future. Retirement Horizons Inc. (RHI) was engaged by the City of Houston to perform an actuarial analysis of the anticipated savings and projected cost levels associated with the new plan design based on the Pension Reforms (Parity Proposal) being considered. This report replaces all previous reports and analyses provided regarding potential plan changes in relation to Pension Reform, including our report issued December 5, 2016, as those analyses may have used different plan provisions or assumptions and methods. Our report is organized as follows:

- Section 1 – Executive Summary and Results
- Section 2 – City Pension Funding Policy
- Section 3 – Detailed Forecast Results
- Section 4 – Commentary on Results
- Section 5 – Summary of Plan Provisions
- Section 6 – Actuarial Methods and Assumptions
- Section 7 – Data Sources

The results of this study are based on information provided by the City of Houston and HFRRF, including the June 30, 2016 fair market value of assets and the new benefit provisions. This analysis under the new Pension Funding Policy is based on actuarial methods and assumptions summarized in this report based on the presumption that the Pension Reforms are enacted by the Texas State Legislature, and the interest rate assumption will be prescribed by law. Each of the other non-prescribed assumptions was selected by the City of Houston Finance Department and described herein.

RHI has relied upon the census data and other information noted in *Section 7*. As we have previously discussed with the Finance Department, we have some concerns about the use of grouped data from the HFRRF July 1, 2015 actuarial report, in particular related to the DROP account values. Further, it is our understanding that we will receive a full census file in the future. However, we are providing this report in the interim to provide the City of Houston with high level cost results after Pension Reform.

RHI has not received a formal HFRRF actuarial communication related to the plan provisions described in this report, so we have not been able to confirm the actuarial assumptions and methods used by the HFRRF actuary. Any differences in assumptions and methods would create different results. However, even if such information had been received, there will generally be some differences in results produced by different actuaries due to the data limitations mentioned above and the nature of using different valuation systems.

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The actual costs and savings could be materially different 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 other than those specifically noted. 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 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 forecasting future contribution requirements under the City's funding policy, 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 actuaries for this report are members of the Society of Actuaries and other professional actuarial organizations and meet the "Qualification Standards for Actuaries Issuing Statements of Actuarial Opinion." The undersigned are 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	Carly A. Nichols, FSA EA MAAA
Senior Consultant	Actuarial Consultant

Executive Summary and Results

Pension Reform Plan Design Overview

Below is a summary of our understanding of the key plan design features of the HFRRF Retirement system compared to the Pension Reform changes, with more details provided in *Section 5*:

Plan Comparison	***Current HFRRF (Baseline)***	***Pension Reform***
Retirement Eligibility	20 years of service	**Rule of 70 for new members** (age plus service at least 70)
Final Average Pay (FAP)	Highest 78 pay periods, including overtime	**Final** 78 pay periods, **excluding overtime and pay above the member's highest tested rank**
Post-DROP Annuity	Original Annuity as of DROP entry increased 2% per year	**Original Annuity** as of DROP entry **if enter DROP after effective date**
Pension Formula (% of Final Average Pay)	2.5% first 20 years of service 3.0% next 10 years of service Max. 80% of Final Average Pay	**Existing Members:** **2.75% first 20 years of service** **2.00% thereafter** **New Members:** **2.25% first 20 years of service** **2.00% thereafter** Max. 80% of Final Average Pay
Retiree COLA	3.0% per year beginning age 48	**5-year average of the Fund's return, less 5%, with a floor of 0% and a maximum of 4% beginning age 55,** with 3-year freeze for retirees under 70
Employee Contributions	9.0% of gross pay	**10.50%** of pensionable pay
DROP Eligibility	Same as service retirement eligibility	**No eligibility for new members**
DROP • Member Contr. • Monthly Annuity • Interest Credited • Duration	 • 9.0% of gross pay • With COLA as applicable • 5-year average Fund return, minimum 5% per year and maximum 10% per year • Maximum 13 years	 • **No longer credited to account** • **No COLA while in DROP** • **65% of 5-year average of the Fund's return,** minimum 2.5% per year • Same
PROP	Ability to defer portion of monthly annuity	**No future annuity additions to PROP account**

A summary of the Parity Proposal was provided by the City of Houston via email on February 21, 2017.

Executive Summary and Results

City Pension Funding Policy Objectives

Under the administration of Mayor Sylvester Turner, the City of Houston will implement a new, more fiscally responsible Pension Funding Policy designed to reverse the trend of steadily increasing unfunded pension liabilities and begin to "bend the curve down." The three objectives of the new funding policy, as presented to the City Council Budget and Fiscal Affairs Committee Subcommittee on Pensions and Debt Service, are summarized below:

- Achieve budget neutrality and cost avoidance
- Reduce unfunded liability
- Achieve a solution that removes pension issues from the table

Plan Changes – City Contribution Rate

The City is currently paying 33.20% of payroll, but this rate was based on the July 1, 2013 Actuarial Valuation performed by the HFRRF actuary. The July 1, 2015 Actuarial Valuation Report from the HFRRF actuary shows an Actuarially Determined Contribution Rate of 30.80% of payroll using a long-term interest rate assumption of 8.50% and a rolling or open 30-year amortization period. Under the current statutory provisions, HFRRF may reset this rate again by FY 2018.

Before Pension Reform, the City Contribution Rate for FY 2018 is expected to be 64.59% of pre-reform pensionable payroll (including overtime) using a long-term interest rate assumption of 7.00% and a rolling or open 30-year amortization period. Pension Reform includes a new Funding Policy designed to fully amortize the Unfunded Actuarial Liability over a 30-year closed period. The City Contribution Rate for FY 2018 under Pension Reform using a long-term interest rate assumption of 7.00% and a closed 30-year amortization period is expected to decrease by 38.77% of post-reform pensionable payroll (no overtime), to 25.82% of payroll, further decreasing over time.

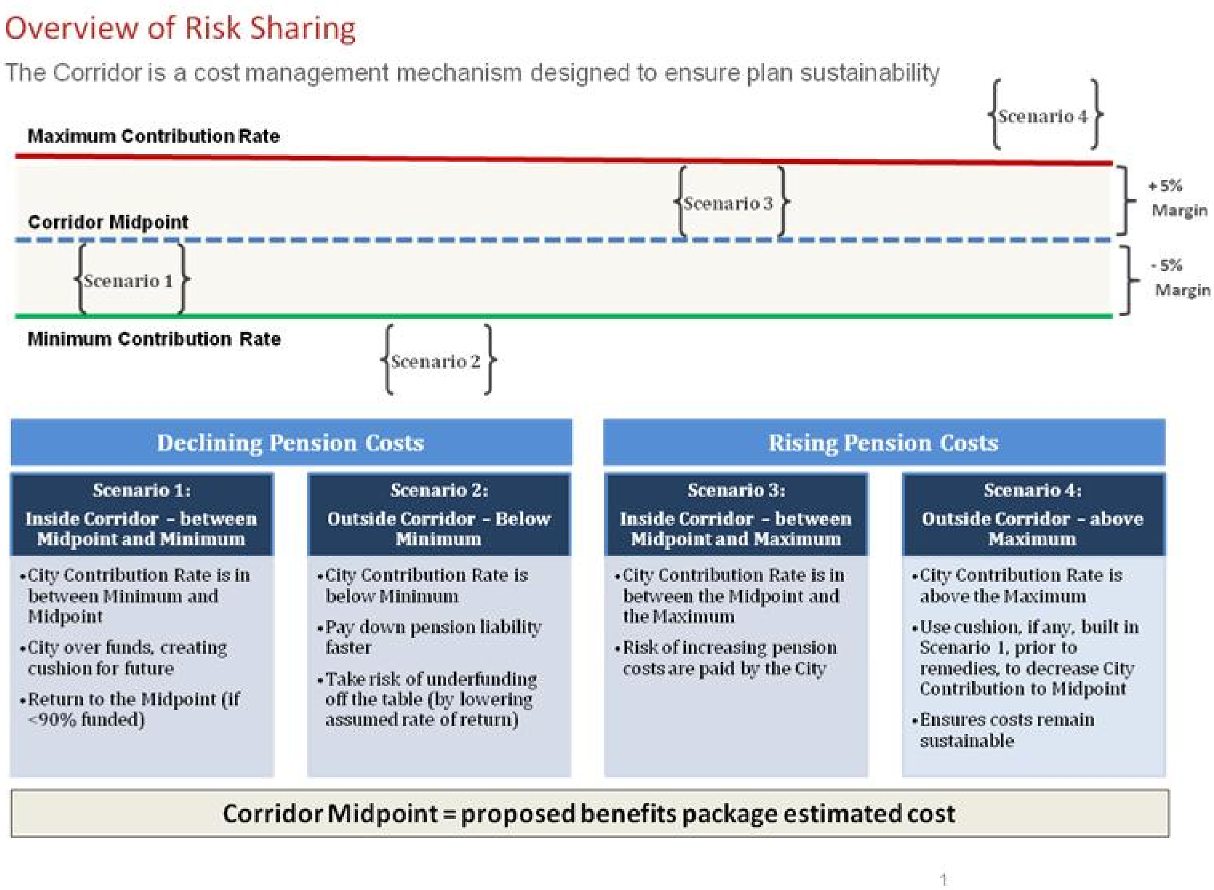
Plan Changes – City Net Pension Liability

The June 30, 2016 GASB Net Pension Liability at a long-term interest rate assumption of 8.50% and using the salary increase rates detailed in this report is estimated to be $0.835 billion. (This differs from the amount of $0.900 reported by the HFRRF actuary due to the use of different salary increase rates.) Using a long-term interest rate assumption of 7.00%, the June 30, 2016 GASB Net Pension Liability is estimated to be $1.588 billion before Pension Reform. The Pension Reforms are anticipated to be effective July 1, 2017, but if they had been adopted by June 30, 2016, the GASB Net Pension Liability would have been expected to decrease by $1.153 billion, to $0.435 billion. This is consistent with the objective to reduce unfunded liability. Please note the GASB results are separate from the City Contribution Rate and do not impact plan funding. Please see *Section 3* for more information about GASB results.

Risk Sharing Corridor

The mechanism to meet Mayor Turner's objective of achieving a solution that removes pension issues from the table is the Risk Sharing Corridor, which sets a minimum and maximum City Contribution Rate. In a falling-cost environment, gains are used to accelerate the payoff of unfunded liabilities or reduce the interest rate. In a rising-cost environment, adjustments are made to the amortization period, employee contributions, or benefits to reduce the City Contribution Rate.

Below is an illustration created by FirstSouthwest for the City of Houston summarizing the Risk Sharing Corridor.



City Pension Funding Policy

Historical Funding Policy

In general, the actuarially determined contribution rate (ADR) has been set by the HFRRF Board based on a recent valuation by the Fund's actuary, equal to normal cost plus amortization of the unfunded actuarial accrued liability, calculated under the level percentage of payroll method with 30-year open period. It is important to recognize that the Board can select different actuarial methods and assumptions to perform these calculations. The Statute allows the HFRRF Board to re-set the ADR based on actuarial valuations performed within the last 3 years, but the City contribution rate can only be increased once within the period unless the City consents.

The HFRRF ADR in effect for FY 2016 and 2017 is 33.20%, which was set by the Board based on an actuarial valuation as of July 1, 2013. The measurement was based on the traditional entry age normal actuarial cost method (with attribution period ending at assumed DROP exit), standard 5-year smoothing method for the actuarial value of assets, a rolling or open 30-year amortization period, and a long-term interest rate assumption of 8.5%. The HFRRF Board has since published an actuarial valuation as of July 1, 2015, which produced an ADR of 30.80%.

Interest Rate Assumptions

HFRRF has been using a discount rate assumption of 8.5%, which is consistent with the long-term investment return assumption historically used for funding valuation purposes. However, the calculations in the forecast section of this report are based on a long-term interest rate assumption of 7.0% selected by the City of Houston using the data, assumptions, methods, and plan provisions described in this report.

Below is a summary of liabilities and costs under the two discount rate assumptions, before Pension Reform was considered. All other actuarial assumptions were consistent with the valuation basis described in *Sections 5 and 6*. The Actuarial Accrued Liability shown below is the value as of the beginning of FY 2017. Due to the budgeting process, any change in the City Contribution Rate from the plan changes would not occur until FY 2018. The Net Pension Liability results reflect the salary increase rates shown in this report.

Unfunded Actuarial Liability Results

Values Before Pension Reform as of July 1, 2016 ($000s)	*8.5%*	*7.0%*
Actuarial Accrued Liability	$4,562,487	$5,223,159
Market Value of Assets (MVA)	$3,729,670	$3,729,670
Unfunded Actuarial Liability	$832,817	$1,493,489

GASB Net Pension Liability Results

Values Before Pension Reform as of July 1, 2016 ($000s)	*8.5%*	*7.0%*
Total Pension Liability	$4,564,571	$5,317,821
Fiduciary Net Position	$3,729,670	$3,729,670
Net Pension Liability	$834,901	$1,588,151

City Pension Funding Policy

New Standardized Funding Policy

Upon passage of the legislation supporting the pension reforms, the City of Houston will use a long-term interest rate assumption of 7.00% (subject to adjustment as discussed below) and will implement a new standardized funding policy, including the following key elements:

- Ultimate entry age normal actuarial cost method
- Amortization of the Unfunded Actuarial Liability over a 30-year or shorter closed period for each base
- An asset method which smoothes gains and losses over no more than five years, with the value as of June 30, 2016 set to fair market value
- Explicit recognition of administrative costs as a component of the contribution

Please note the projected cost assumes that future actuarial experience, including DROP duration, is consistent with the underlying measurement basis. For example, the potential cost could be lower if HFRRF has favorable experience generating actuarial gains. Conversely, the potential cost could be higher if unfavorable experience generates actuarial losses.

Ultimate Entry Age Normal

Each of the City of Houston retirement systems uses different actuarial methods and assumptions for their determination of the actuarially determined contribution rates. HFRRF currently uses the standard Entry Age Normal method, with attribution to assumed DROP exit. This method is intended to produce a stable Normal Cost Rate as a percentage of payroll to the extent members have the same benefit structure. The Ultimate Entry Age Normal method is also intended to produce a stable contribution rate as a percentage of payroll. However, the Normal Cost is calculated for all members based on provisions in effect for new hires, with Actuarial Accrued Liability equal to the difference between the Present Value of Future Benefits, calculated based on the provisions for each individual member, and the Present Value of Future Normal Cost based on the provisions for new hires.

Closed Period Amortization

The new Pension Funding Policy uses 30-year closed period amortization method, rather than a rolling or open 30-year period as permitted in the actuarially determined contribution rate for each retirement system. The initial base will be amortized over a 30-year closed period as a level percentage of payroll, with a separate closed period amortization base established for subsequent changes in the Unfunded Actuarial Liability due to actuarial gain/loss, assumption changes or plan changes. Additional mechanics of the amortization method are discussed below under *Risk Sharing Corridor*.

Asset Method

The Pension Funding Policy will measure the Unfunded Actuarial Liability based on the fair market value of assets upon initial adoption, rather than applying asset smoothing as used in the calculation of the actuarially determined contribution rate (ADR). In future years, standard five-year asset smoothing will be used. This should result in less year-to-year volatility of contributions.

City Pension Funding Policy

Risk Sharing Corridor

The mechanism to meet Mayor Turner's objective of achieving a solution that removes pension issues from the table is the Risk Sharing Corridor.

The Corridor sets a minimum and maximum City Contribution Rate. The Corridor Midpoint is set for each year based on an initial 31-year projection of City Contribution Rates, assuming no deferred actuarial gains or losses and the plan provisions are as in effect after Pension Reform. The Corridor Minimum and Maximum for each year are set by reference to this Midpoint.

If a Risk Sharing Valuation Study determines the City Contribution Rate differs from the Midpoint, in most cases, steps are taken to bring the Rate back toward the Midpoint. In a falling-cost environment, gains are used to accelerate the payoff of unfunded liabilities or reduce the interest rate. In a rising-cost environment, adjustments are made to the amortization period, employee contributions, or benefits to reduce the City Contribution Rate.

Amortization Period and Payoff Year

Initially, actuarial losses, including the unfunded actuarial liability at the outset of the agreement, have an Amortization Period of thirty years, with a corresponding Payoff Year. Actuarial gains have an Amortization Period and corresponding Payoff Year equal to that of the largest loss base.

If the City Contribution Rate decreases more than expected in a given year, Payoff Years of existing bases may be moved up in time, though to no earlier than twenty years from the original amortization date. If the Rate subsequently increases, Payoff Years may be moved back in time, although to no later than the original Payoff Year, since the amortization periods are closed.

Interest Rate

Initially the interest rate will be 7.00%. However, if the City Contribution Rate decreases more than expected in a given year, and Payoff Years have already been accelerated, the interest rate may decrease.

Valuation Terminology

Under generally accepted accounting principles, the cost of pension benefits are viewed as a component of compensation paid to an employee for services rendered over their period of active employment, so the cost is effectively borne by the generation of owners/taxpayers that benefit from the employee services rendered.

In the actuarial valuation process, a mathematical model is developed to project the future stream of plan benefits and expenses. The model incorporates current plan provisions and member census data, using the actuarial assumptions to predict future events. Periodic updates of the actuarial valuation are necessary to ensure the model is financially sound, comparing emerging plan asset and liability experience to valuation projections to measure actuarial gains and losses. Minor fluctuations from year-to-year are common, but a pattern of significant differences indicate the long-term actuarial assumptions may need adjustment.

Discounting the stream of expected future plan payouts for the time value of money produces the *actuarial present value of projected benefits (PVB).* The *PVB* represents the hypothetical amount of plan assets that would be necessary to fully fund all future plan costs for current plan participants, assuming future plan experience follows the actuarial assumptions over time. This measure of pension liability includes benefits that have not yet been earned for current employees, including the effect of expected future pay increases as well as projected service.

An actuarial cost method is basically a mathematical formula used to allocate the *PVB* over periods of employee service in a systematic fashion. The portion assigned as of the measurement date for the current year is referred to as the *normal cost (NC)*, and the cumulative portion allocated for employee service credit prior to the measurement date is referred to as the *actuarial accrued liability (AAL).*

The *unfunded actuarial accrued liability (UAL),* equals the excess, if any, of the *AAL* over the value of plan assets. At the time a plan is first established, a *UAL* will exist if prior service credit is recognized for benefit accrual purposes, sometimes referred to as a past service liability. Over the life cycle of a mature retirement system, a *UAL* may also emerge due to plan improvements, or actuarial losses from unfavorable plan experience compared to the long-term actuarial assumptions.

The Funding Policy amount produced by the actuarial cost method is basically equal to the normal cost plus amortization of the *UAL* over a reasonable period of time. There are several alternative actuarial cost methods that can be used under generally accepted actuarial standards of practice, each of which, when properly applied, will determine annual contributions that will accumulate with interest to meet plan obligations for benefit payments and expenses as they come due.

As previously noted, HFRRF results use the Ultimate Entry Age Normal cost method. Under this method, the NC is determined based on provisions in effect for new hires, and the AAL is the difference between the PVB and the present value of future normal costs.

Detailed Forecast Results

Forecast of Corridor Midpoint - 7% Interest Rate - Percent of Total Payroll (Including Overtime)

	Baseline Forecast				*With Pension Reform*				
FY	**City Normal Cost Rate**	**Admin. Expenses**	**Amort. of UAL**	**City Cont. Rate**	**City Normal Cost Rate**	**Admin. Expenses**	**Amort. of UAL**	**City Cont. Rate**	**Cost Avoidance**
2017				33.20%				33.20%	0.00%
2018	31.57%	1.82%	31.20%	64.59%	11.96%	1.82%	9.72%	23.50%	41.09%
2019	31.57%	1.82%	30.65%	64.04%	11.96%	1.82%	9.72%	23.50%	40.54%
2020	31.57%	1.82%	30.12%	63.51%	11.96%	1.82%	9.72%	23.50%	40.01%
2021	31.57%	1.82%	29.59%	62.98%	11.96%	1.82%	9.72%	23.50%	39.48%
2022	31.57%	1.82%	29.08%	62.47%	11.96%	1.82%	9.72%	23.50%	38.97%
2023	31.57%	1.82%	28.57%	61.96%	11.96%	1.82%	9.72%	23.50%	38.46%
2024	31.57%	1.82%	28.07%	61.46%	11.96%	1.82%	9.72%	23.50%	37.96%
2025	31.57%	1.82%	27.58%	60.97%	11.96%	1.82%	9.72%	23.50%	37.47%
2026	31.57%	1.82%	27.10%	60.49%	11.96%	1.82%	9.72%	23.50%	36.99%
2027	31.57%	1.82%	26.63%	60.02%	11.96%	1.82%	9.72%	23.50%	36.52%
2028	31.57%	1.82%	26.17%	59.56%	11.96%	1.82%	9.72%	23.50%	36.06%
2029	31.57%	1.82%	25.71%	59.10%	11.96%	1.82%	9.72%	23.50%	35.60%
2030	31.57%	1.82%	25.26%	58.65%	11.96%	1.82%	9.72%	23.50%	35.15%
2031	31.57%	1.82%	24.82%	58.21%	11.96%	1.82%	9.72%	23.50%	34.71%
2032	31.57%	1.82%	24.39%	57.78%	11.96%	1.82%	9.72%	23.50%	34.28%
2033	31.57%	1.82%	23.96%	57.35%	11.96%	1.82%	9.72%	23.50%	33.85%
2034	31.57%	1.82%	23.55%	56.94%	11.96%	1.82%	9.72%	23.50%	33.44%
2035	31.57%	1.82%	23.14%	56.53%	11.96%	1.82%	9.72%	23.50%	33.03%
2036	31.57%	1.82%	22.73%	56.12%	11.96%	1.82%	9.72%	23.50%	32.62%
2037	31.57%	1.82%	22.34%	55.73%	11.96%	1.82%	9.72%	23.50%	32.23%
2038	31.57%	1.82%	21.95%	55.34%	11.96%	1.82%	9.72%	23.50%	31.84%
2039	31.57%	1.82%	21.56%	54.95%	11.96%	1.82%	9.72%	23.50%	31.45%
2040	31.57%	1.82%	21.19%	54.58%	11.96%	1.82%	9.72%	23.50%	31.08%
2041	31.57%	1.82%	20.82%	54.21%	11.96%	1.82%	9.72%	23.50%	30.71%
2042	31.57%	1.82%	20.46%	53.85%	11.96%	1.82%	9.72%	23.50%	30.35%
2043	31.57%	1.82%	20.10%	53.49%	11.96%	1.82%	9.72%	23.50%	29.99%
2044	31.57%	1.82%	19.75%	53.14%	11.96%	1.82%	9.72%	23.50%	29.64%
2045	31.57%	1.82%	19.40%	52.79%	11.96%	1.82%	9.72%	23.50%	29.29%
2046	31.57%	1.82%	19.07%	52.46%	11.96%	1.82%	9.72%	23.50%	28.96%
2047	31.57%	1.82%	18.73%	52.12%	11.96%	1.82%	9.72%	23.50%	28.62%
2048	31.57%	1.82%	18.41%	51.80%	11.96%	1.82%	0.00%	13.78%	38.02%

Detailed Forecast Results

Forecast of Corridor Midpoint - 7% Interest Rate - Percent of Pensionable Payroll after Reform (Excluding Overtime)

	Baseline Forecast				*With Pension Reform*				
FY	**City Normal Cost Rate**	**Admin. Expenses**	**Amort. of UAL**	**City Cont. Rate**	**City Normal Cost Rate**	**Admin. Expenses**	**Amort. of UAL**	**City Cont. Rate**	**Cost Avoidance**
2017				36.48%				36.48%	0.00%
2018	34.69%	2.00%	34.28%	70.97%	13.14%	2.00%	10.68%	25.82%	45.15%
2019	34.69%	2.00%	33.68%	70.37%	13.14%	2.00%	10.68%	25.82%	44.55%
2020	34.69%	2.00%	33.10%	69.79%	13.14%	2.00%	10.68%	25.82%	43.97%
2021	34.69%	2.00%	32.52%	69.21%	13.14%	2.00%	10.68%	25.82%	43.39%
2022	34.69%	2.00%	31.95%	68.64%	13.14%	2.00%	10.68%	25.82%	42.82%
2023	34.69%	2.00%	31.40%	68.09%	13.14%	2.00%	10.68%	25.82%	42.27%
2024	34.69%	2.00%	30.85%	67.54%	13.14%	2.00%	10.68%	25.82%	41.72%
2025	34.69%	2.00%	30.31%	67.00%	13.14%	2.00%	10.68%	25.82%	41.18%
2026	34.69%	2.00%	29.78%	66.47%	13.14%	2.00%	10.68%	25.82%	40.65%
2027	34.69%	2.00%	29.26%	65.95%	13.14%	2.00%	10.68%	25.82%	40.13%
2028	34.69%	2.00%	28.75%	65.44%	13.14%	2.00%	10.68%	25.82%	39.62%
2029	34.69%	2.00%	28.25%	64.94%	13.14%	2.00%	10.68%	25.82%	39.12%
2030	34.69%	2.00%	27.76%	64.45%	13.14%	2.00%	10.68%	25.82%	38.63%
2031	34.69%	2.00%	27.28%	63.97%	13.14%	2.00%	10.68%	25.82%	38.15%
2032	34.69%	2.00%	26.80%	63.49%	13.14%	2.00%	10.68%	25.82%	37.67%
2033	34.69%	2.00%	26.33%	63.02%	13.14%	2.00%	10.68%	25.82%	37.20%
2034	34.69%	2.00%	25.87%	62.56%	13.14%	2.00%	10.68%	25.82%	36.74%
2035	34.69%	2.00%	25.42%	62.11%	13.14%	2.00%	10.68%	25.82%	36.29%
2036	34.69%	2.00%	24.98%	61.67%	13.14%	2.00%	10.68%	25.82%	35.85%
2037	34.69%	2.00%	24.55%	61.24%	13.14%	2.00%	10.68%	25.82%	35.42%
2038	34.69%	2.00%	24.12%	60.81%	13.14%	2.00%	10.68%	25.82%	34.99%
2039	34.69%	2.00%	23.70%	60.39%	13.14%	2.00%	10.68%	25.82%	34.57%
2040	34.69%	2.00%	23.28%	59.97%	13.14%	2.00%	10.68%	25.82%	34.15%
2041	34.69%	2.00%	22.88%	59.57%	13.14%	2.00%	10.68%	25.82%	33.75%
2042	34.69%	2.00%	22.48%	59.17%	13.14%	2.00%	10.68%	25.82%	33.35%
2043	34.69%	2.00%	22.09%	58.78%	13.14%	2.00%	10.68%	25.82%	32.96%
2044	34.69%	2.00%	21.70%	58.39%	13.14%	2.00%	10.68%	25.82%	32.57%
2045	34.69%	2.00%	21.32%	58.01%	13.14%	2.00%	10.68%	25.82%	32.19%
2046	34.69%	2.00%	20.95%	57.64%	13.14%	2.00%	10.68%	25.82%	31.82%
2047	34.69%	2.00%	20.59%	57.28%	13.14%	2.00%	10.68%	25.82%	31.46%
2048	34.69%	2.00%	20.23%	56.92%	13.14%	2.00%	0.00%	15.14%	41.78%

Detailed Forecast Results

GASB Net Pension Liability

The Governmental Accounting Standards Board (GASB) has issued Statements Nos. 67 and 68 related to accounting for pension plans. These Statements put forth specific requirements for some of the actuarial methods to be used in plan accounting, and these can differ from the methods used for plan funding. For HFRRF, these differences are summarized below:

- Use of the Entry Age Normal actuarial cost method, with attribution to assumed DROP entry rather than Ultimate Entry Age Normal
- Use of the market value of assets, with no smoothing allowed

Statements Nos. 67 and 68 refer to the actuarial liability as the Total Pension Liability and the asset value as the Fiduciary Net Position. The difference in the two is termed the Net Pension Liability (NPL). Below is a table showing the estimated NPL before and after Pension Reform for HFRRF:

7.0% Interest Rate

(Results in $000s)	June 30, 2016 NPL Before Pension Reform	June 30, 2016 NPL After Pension Reform	Reduction in NPL
	$1,588,151	$435,282	$1,152,869

Commentary on Results

The detailed forecast assumes no actuarial gains or losses; that is, it assumes experience will match the actuarial assumptions. Any gains or losses that arise may produce different unfunded actuarial liability amounts than anticipated in the forecast, so the Amortization of UAL component of the City Contribution Rate may change over time as well.

As noted previously, the Ultimate Entry Age Normal actuarial cost method produces a normal cost based on the plan provisions in effect for new hires. The estimated FY 2017 change in gross and net employer normal costs for the two groups is shown below as a percentage of total payroll (before removal of overtime):

7.00% Interest

Baseline		With Pension Reform		Difference	
Gross Normal Cost	**Net Employer Normal Cost**	**Gross Normal Cost**	**Net Employer Normal Cost**	**Gross Normal Cost**	**Net Employer Normal Cost**
40.57%	31.57%	21.52%	11.96%	-19.05%	-19.61%

The Gross Normal Cost Rate with Pension Reform using pensionable pay (excluding overtime) is 23.64%. The Net Employer Normal Cost Rate is 13.14%.

Please note: Normal Cost Rates may change over time as actuarial gains and losses occur. These gains and losses may be due to changes in census data, plan provisions, and assumptions and methods.

Most of the changes under Pension Reform impact active plan members rather than retirees. However, changes to the COLA do impact retired members and beneficiaries. Below is the estimated change in Actuarial Accrued Liability for active members and inactive members separately:

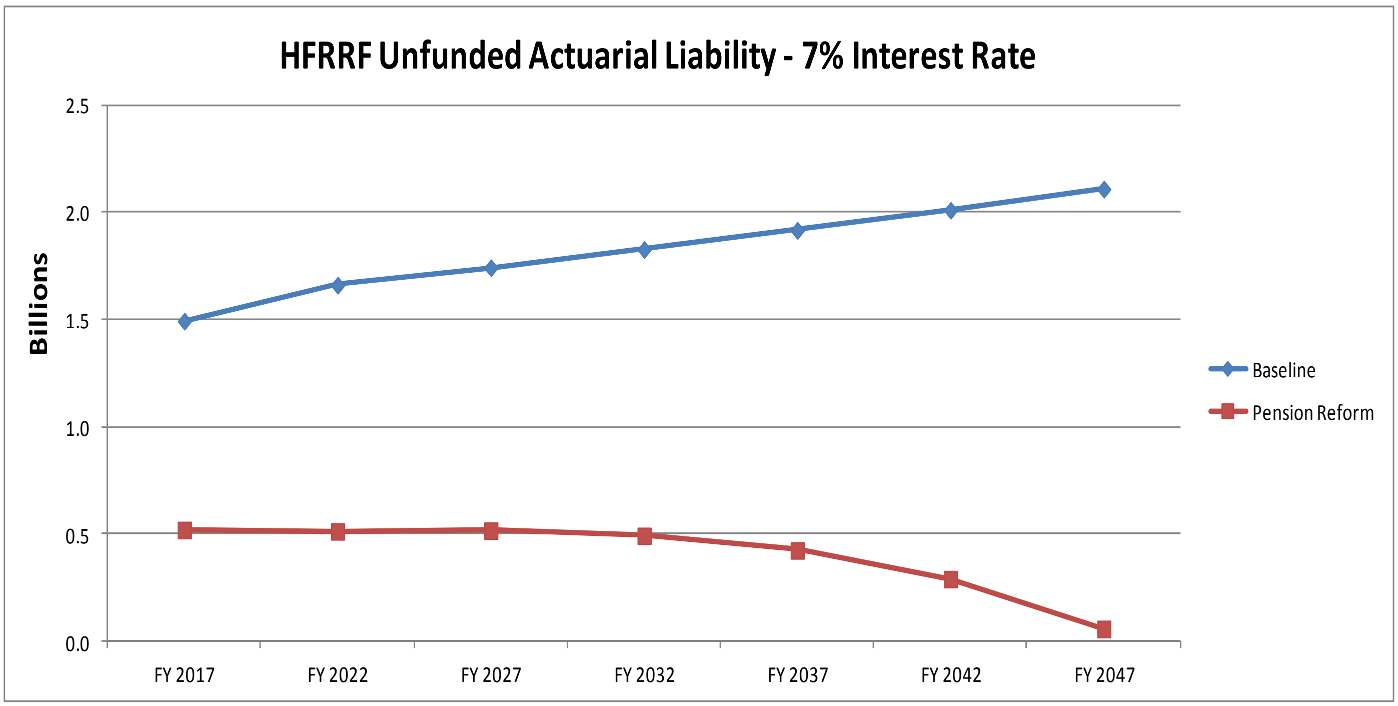
7.00% Interest Rate ($000s)	**Baseline AAL**	**Pension Reform AAL**	**Difference**
Active Members	$2,189,779	$1,581,897	($607,882)
Inactive Members	$3,033,380	$2,667,744	($365,636)
Total	$5,223,159	$4,249,641	($973,518)

Commentary on Results

Payoff of Unfunded Actuarial Liability

The graph below shows the projected Unfunded Actuarial Liability (UAL) both before and after Pension Reform, with the changes that will become effective by June 30, 2017 reflected in the FY 2017 results. The results reflect a 7.00% interest rate. The Baseline results reflect a rolling or open 30-year amortization period, while the Pension Reform results reflect the new Funding Policy of a 30-year closed amortization period.

Prior to the new City funding policy, the use of an open amortization period means the UAL was expected to continue to grow in the future. However, under Pension Reform, the Unfunded Actuarial Liability in FY 2017 is reduced and is projected to be paid off in thirty years.



<u>Please note</u>: The results shown above assume experience will exactly match the actuarial assumptions; that is, they assume there will be no gains or losses. If experience is consistently more favorable than assumptions, the Payoff Year of the Unfunded Actuarial Liability could be as soon as 2037. If unfavorable experience causes recurring losses, the Payoff Year for these new losses may extend beyond 2047. However, the Payoff Year for the initial Unfunded Actuarial Liability will never be later than 2047.

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)	The average of the highest 78 bi-weekly payroll periods of salary, before reduction for pre-tax employee contributions and salary deferrals. **The Parity Proposal** would use the final 78 bi-weekly payroll periods, and pensionable pay would exclude 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. **The Parity Proposal** would require attainment of age plus service of at least seventy (Rule of 70) for eligibility for those hired after the effective date of the Parity Proposal.
Amount	Accrued benefit of 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. **The Parity Proposal** would change future accruals to be 2.75% per year prior to 20 years of service and 2.00% thereafter for those hired prior to the effective date of the Parity Proposal (no maximum). For those hired after that date, accruals would be 2.25% per year up to 20 years of service and 2.00% thereafter, up to a maximum of 80% of FAP. For those hired prior to the effective date, accrued benefits would be retained.

Summary of Plan Provisions

Termination Benefit

Eligibility	Termination of employment prior to satisfying the retirement eligibility requirements.
Amount	Less than 10 years of service: Lump sum refund of member contributions without interest. At least 10 but less than 20 years of service: Choice of • Refund of contributions with 5% interest, not compounded, or • Monthly benefit of 1.7% of final average pay per year of service, payable at age 50 **<u>The Parity Proposal</u>** would provide only a return of contributions without interest for those hired after the effective date of the Parity Proposal. For those hired prior to that date, the choice of deferred annuity or refund of contributions after 10 years of service would remain, but interest would not be credited on contributions made after the effective date of the Parity Proposal.

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. Under **<u>the Parity Proposal</u>**, 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. In addition, the member will receive a $5,000 lump sum. Under **<u>the Parity Proposal</u>**, 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 otherwise paid to any eligible parents.

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 otherwise paid to any eligible parents.
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.
Cost of Living Adjustment	3% per year for any retired member or member in DROP age 48 or greater. **The Parity Proposal** would raise the eligibility age to 55 and limit the COLA to the Fund's 5-year average investment return less 5%, with a floor of 0% and a cap of 4%. For the first three years after the effective date of the agreement, no COLA is provided to members under age 70.

Summary of Plan Provisions

DROP

Upon reaching retirement eligibility, members may enter the Deferred Retirement Option Plan (DROP). The member's monthly annuity (with COLA, as applicable) is added to a notional account, along with member contributions. Interest is credited on the account using the 5-year average of the Fund's rate of return, with a minimum of 5% and a maximum of 10%.

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.

The Parity Proposal includes the following prospective changes:

- DROP availability limited to those hired before the effective date of the Parity Proposal
- No COLA on the benefit paid into DROP accounts, and no COLA applied to post-DROP annuity until after member retires from DROP
- Interest credited at 65% of the 5-year average of the Fund's rate of return, with a minimum of 2.5%
- No recalculation of the monthly annuity on DROP exit (no 2% per year increase) for those not in DROP at the time changes are effective
- Member contributions no longer credited to DROP accounts from the effective date of the changes

Summary of Plan Provisions

PROP	Upon reaching retirement eligibility, members may enter the Post Retirement Option Plan (PROP). The member may elect to have all or a portion of his or her monthly annuity credited to the PROP account, along with interest. Taxes on these benefits are deferred until a distribution is taken. Interest is credited on the account using the 5-year average of the Fund's rate of return, with a minimum of 5% and a maximum of 10% (same as DROP). **The Parity Proposal** changes include limiting the interest credit to 65% of the 5-year average of the Fund's rate of return, with a minimum of 2.5%. Additionally, no new amounts would be eligible for deferral into the PROP.
Unused Leave Pay	Currently not included in DROP account.

Contribution Rates

Members	9% of total pay. **The Parity Proposal** would increase this rate to 10.50% of pensionable pay.
City	The total actuarially determined contribution rate less the member contribution rate above, applied to total salary. **The Parity Proposal** will be based on the contribution rate determined from the risk sharing valuation applied to the definition of pay in the parity proposal which excludes overtime.

Actuarial Methods and Assumptions

Actuarial Cost Methods

Measurement Date	Census data as of July 1, 2015. Plan changes assumed to take effect July 1, 2016, with changes to City Budget Cost Rate effective July 1, 2017 (Fiscal Year 2018). 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	Fair market value of assets as of June 30, 2016, with five-year smoothing of future gains and losses (that is, initial Actuarial Value equal to Fair Market Value with smoothing thereafter). 20% of each gain or loss will be recognized each year.
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 *normal cost* 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 *actuarial accrued liability*.

Key Economic Assumptions

Interest Rate	7.0%, as prescribed by the City of Houston except where noted within the report.
Inflation	2.25%
Wage Inflation	2.75%
Payroll Growth	2.75%
Cost of Living Adjustment	Baseline: 3.00%
	<u>The Parity Proposal</u>: 2.00%

Actuarial Methods and Assumptions

Individual Pay Increase Rate

	(Nominal = Real + Inflation)	
Age	**Nominal**	**Real**
20	6.75%	4.00%
25	6.00%	3.25%
30	5.25%	2.50%
35	4.75%	2.00%
40	3.75%	1.00%
45	3.45%	0.70%
50	3.15%	0.40%
55	2.75%	0.00%

DROP Interest Crediting Rate

Baseline: 8.50% through June 30, 2015; 7.00% thereafter. This reflects the historical expected rate of return on the trust, since actual DROP balances are not available in the grouped data.

The Parity Proposal: 4.75%.

Demographic Assumptions

Mortality Rates

Active and nondisabled members

RP-2000 Combined Healthy Mortality Tables projected 10 years beyond the valuation date using Scale AA.

Disabled pensioners

	Disabled Mortality Sample Rate per 100	
Age	**Male**	**Female**
20	2.30	0.70
25	2.60	1.30
30	2.90	1.90
35	2.80	2.20
40	3.10	2.30
45	3.50	2.30
50	4.10	2.60
55	5.30	3.00
60	6.50	3.40

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%

Members are assumed to remain in DROP 9 years. This produces approximately the same liabilities as using the DROP duration assumptions used by the Fund's actuary. Under **the Parity Proposal**, these rates were assumed to apply to members hired after October 9, 2004 once they reached Rule of 70 eligibility.

Disability Rates

Disability per 100	
Age	***All***
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 Deaths and Disabilities in the Line of Duty

- Deaths 50%
- Disabilities 50%

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 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. Under **the Parity Proposal**, all members hired after October 9, 2004 receive a refund of contributions.

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.

Development of Valuation Pay

Valuation pay is projected by increasing the prior year's pay with the nominal individual pay increase rate. Historical valuation pay was regressed with the nominal individual pay increase rate. Under **the Parity Proposal**, overtime pay is no longer included in the definition of pensionable pay. Based on input from the City of Houston and the HFRRF actuary, the valuation pay was reduced 9% for future years to account for the removal of overtime.

Load for Nature of Average Salaries

Benefits for active members 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. Under **the Parity Proposal**, this load was removed for members with under 20 years of service.

Actuarial Methods and Assumptions

Payment of DROP Balances	Installments over 15 years for active members and 10 years for inactive members. Under **the Parity Proposal**, 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 4.75% DROP interest crediting rate.
Funding Policy	The City is assumed to contribute the City Contribution Rate from the prior year. This actuarially determined rate is measured as the normal cost plus 30-year amortization of the Unfunded Actuarial Liability (UAL) less the firefighter contributions, adjusted with interest to mid-year. The 30-year amortization of the UAL is calculated as a level percent of pay (rolling or open period before Pension Reform; closed period under the Parity Proposal).

Data Sources

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

- Grouped census data for active members and members in DROP was based on the July 1, 2015 Actuarial Valuation Report dated August 2016.

- Grouped census data for retirees, disabled members, beneficiaries, and members with deferred benefits was based on data as of July 1, 2015 provided by email from the HFRRF actuary on May 23, 2016 (presentation dated May 19, 2016). Aggregate DROP balances for inactive members as of July 1, 2015 of $801,400,591 was provided via email by the HFRRF actuary on February 6, 2017.

- The fair value of assets of $3,729,670,000 as of June 30, 2016 was provided in the HFRRF GASB 67 Accounting Information Report dated September 21, 2016. This report was provided to RHI by the City of Houston Finance Department on November 11, 2016. The GASB Total Pension Liability at 8.5% as of June 30, 2016 and the GASB Net Pension Liability at 8.5% as of June 30, 2016 were also provided in this report.

- The Fiscal Year 2017 payroll used was $265,038,031 which was based on the Fiscal Year 2016 payroll derived from the September 21, 2016 GASB 67 Accounting Information Report by dividing FY 2016 member contributions by 0.09, increased by one year of payroll growth at 2.75%, and reduced by 9.00% to account for the removal of overtime.

- A summary of the Parity proposal was provided by the City of Houston via email on February 21, 2017. If a provision change agreed to in the October 31, 2016 Term Sheet was not explicitly mentioned in the summary of the Parity proposal, it was assumed to continue to apply to this proposal.