



City of Houston
HMEPS Pension Reform
Cost Analysis

March 15, 2017

INTERIM REPORT



March 15, 2017

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

Re: HMEPS Pension Reform Cost Analysis

Dear Kelly:

The City of Houston has worked with the HMEPS Board to reform the pension 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 being considered. This report replaces all previous reports and analyses provided regarding potential plan changes in relation to Pension Reform, including the report issued January 12, 2017, as those analyses may have used different potential plan provisions or assumptions and methods, or data. 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 HMEPS, including the June 30, 2016 fair market value of assets and the new benefit provisions. This analysis 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, 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 input on the potential cost levels after Pension Reform.

Mr. Kelly Dowe
March 15, 2017

RHI has not received a formal HMEPS actuarial communication related to the plan provisions described in this report, but we have confirmed the main actuarial assumptions and methods used by the HMEPS actuary. Any differences in other 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.

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
Senior Consultant



Carly A. Nichols, FSA EA MAAA
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 HMEPS Retirement system compared to the Pension Reform, with more details provided in *Section 5*:

<i>Plan Comparison</i>	<i>Current HMEPS (Baseline)</i>	<i>Pension Reform</i>																														
Service Retirement Eligibility	<p>Groups A and B: Earlier of age 62 with 5 years of service or age 50 with 75 points (70 points if meet certain conditions)</p> <p>Group D: Normal Retirement at age 62 with 5 years of service; early retirement at age 55 with 10 years of service or 75 points with at least 5 years of service</p>	Same																														
Pension Formula (% of Final Average Pay)	<p>FAP x the following percentages based on years of service:</p> <p>Group A</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th><i>Service</i></th> <th><i>Pre-2005</i></th> <th><i>Post-2004</i></th> </tr> </thead> <tbody> <tr> <td>0 - 10</td> <td>3.25%</td> <td>2.50%</td> </tr> <tr> <td>11 - 20</td> <td>3.50%</td> <td>2.50%</td> </tr> <tr> <td>Over 20</td> <td>4.25%</td> <td>3.25%</td> </tr> </tbody> </table> <p>Group B</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th><i>Service</i></th> <th><i>Pre-2005</i></th> <th><i>Post-2004</i></th> </tr> </thead> <tbody> <tr> <td>0 - 10</td> <td>1.75%</td> <td>1.75%</td> </tr> <tr> <td>11 - 20</td> <td>2.00%</td> <td>2.00%</td> </tr> <tr> <td>Over 20</td> <td>2.75%</td> <td>2.50%</td> </tr> </tbody> </table> <p>Group D:</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th><i>Service</i></th> <th><i>Percentage</i></th> </tr> </thead> <tbody> <tr> <td>0 - 25</td> <td>1.80%</td> </tr> <tr> <td>Over 25</td> <td>1.00%</td> </tr> </tbody> </table> <p>Maximum 90% of FAP</p>	<i>Service</i>	<i>Pre-2005</i>	<i>Post-2004</i>	0 - 10	3.25%	2.50%	11 - 20	3.50%	2.50%	Over 20	4.25%	3.25%	<i>Service</i>	<i>Pre-2005</i>	<i>Post-2004</i>	0 - 10	1.75%	1.75%	11 - 20	2.00%	2.00%	Over 20	2.75%	2.50%	<i>Service</i>	<i>Percentage</i>	0 - 25	1.80%	Over 25	1.00%	Same
<i>Service</i>	<i>Pre-2005</i>	<i>Post-2004</i>																														
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<i>Service</i>	<i>Percentage</i>																															
0 - 25	1.80%																															
Over 25	1.00%																															
Final Average Pay	Highest 78 pay periods, including base pay, longevity pay, and shift differential	Same																														

Executive Summary and Results

Plan Comparison	Current HMEPS (Baseline)	Pension Reform
Employee Contributions	Group A: 5.00% of pay Group B: None required Group D: None required	Group A: 8.00% of pay (2%/1% phase-in) Group B: 4.00% of pay (2%/2% phase-in) Group D: 3.00% of pay total, with 1% of pay to cash balance account
DROP Eligibility (Groups A and B only)	Same as service retirement eligibility	Same
DROP (Groups A and B only) <ul style="list-style-type: none"> • Member Contr. • Monthly Annuity • Interest Credited • Number of Years in DROP 	<ul style="list-style-type: none"> • Pre-2005 employee contributions to DROP • With COLA as applicable • 50% of the prior year return on plan assets, with a minimum of 2.5% and a maximum of 7.5% • No limit 	<ul style="list-style-type: none"> • Same • No COLA on benefit while in DROP until 62 • 50% of the five-year return on plan assets net of investment expenses, with a minimum of 2.5% and a maximum of 7.5% • Same
Retiree COLA	Groups A and B only: 3% per year, not compounded, if hired prior to 2005. 2% per year, not compounded, if hired after 2004.	5-year investment return, less adjustment factor, with result multiplied by 50%. Adjustment factor is interest rate less 2.0%. COLA will be no less than 0% and no more than 2% for all members including Group D
Survivor Benefit	100% of participant's monthly benefit	80% of participant's monthly benefit for future survivors

The Pension Reform plan provisions were provided by the City of Houston via email on November 7, 2016.

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 expected to pay 29.36% of payroll for FY 2017, based on the July 1, 2015 Actuarial Valuation dated March 24, 2016 performed by the HMEPS actuary and applying the Meet & Confer agreement. The July 1, 2015 Actuarial Valuation Report from the HMEPS actuary shows an Actuarially Determined Contribution Rate of 31.81% of payroll for FY 2017 using a long-term interest rate assumption of 8.00% and a rolling or open 30-year amortization period.

Before Pension Reform, the City Contribution Rate for FY 2018 is expected to be 39.40% at a long-term interest rate assumption of 7.00%. Pension Reform includes a new Pension 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 at a long-term interest rate assumption of 7.00% and a closed 30-year amortization period is expected to decrease by 10.67%, to 28.73%, before inclusion of Pension Obligation Bonds (POBs). With POBs, it is expected to decrease by an additional 2.20%, to 26.53%.

Plan Changes – City Net Pension Liability

The June 30, 2016 GASB Net Pension Liability at a long-term interest rate assumption of 8.00% and using the assumptions detailed in this report is estimated to be \$2.611 billion. (This differs from the amount of \$2.634 billion reported by the HMEPS actuary due to the use of different inflation and salary increase assumptions.) Using a long-term interest rate assumption of 7.00%, the June 30, 2016 GASB Net Pension Liability is estimated to be \$3.182 billion before Pension Reform. Under Pension Reform, the June 30, 2016 GASB Net Pension Liability is expected to decrease by \$0.768 billion, to \$2.414 billion, before inclusion of POBs. With POBs, it expected to decrease by an additional \$0.226 billion, to \$2.188 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.

Executive Summary and Results

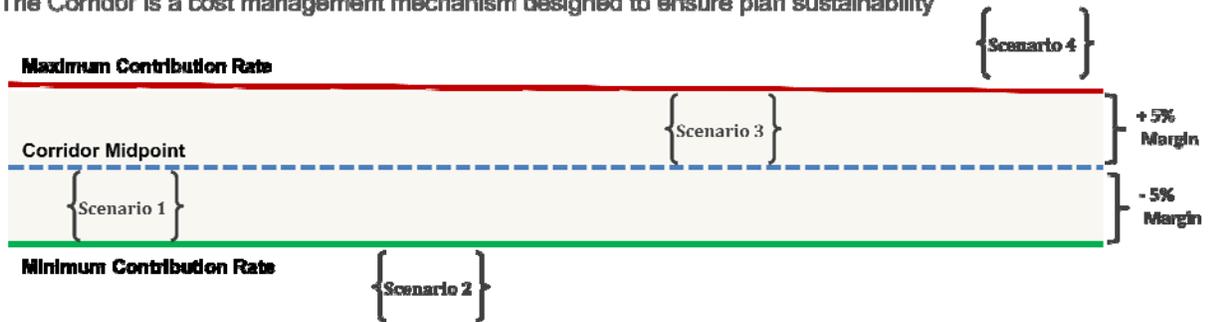
Risk Sharing Corridor

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.

Overview of Risk Sharing

The Corridor is a cost management mechanism designed to ensure plan sustainability



Declining Pension Costs		Rising Pension Costs	
Scenario 1: Inside Corridor – between Midpoint and Minimum	Scenario 2: Outside Corridor – Below Minimum	Scenario 3: Inside Corridor – between Midpoint and Maximum	Scenario 4: Outside Corridor – above Maximum
<ul style="list-style-type: none"> •City Contribution Rate is in between Minimum and Midpoint •City over funds, creating cushion for future •Return to the Midpoint (if <90% funded) 	<ul style="list-style-type: none"> •City Contribution Rate is below Minimum •Pay down pension liability faster •Take risk of underfunding off the table (by lowering assumed rate of return) 	<ul style="list-style-type: none"> •City Contribution Rate is in between the Midpoint and the Maximum •Risk of increasing pension costs are paid by the City 	<ul style="list-style-type: none"> •City Contribution Rate is above the Maximum •Use cushion, if any, built in Scenario 1, prior to remedies, to decrease City Contribution to Midpoint •Ensures costs remain sustainable
Corridor Midpoint = proposed benefits package estimated cost			

City Pension Funding Policy

Historical Funding Policy

In general, the actuarially determined contribution rate (ADR) has been set by the HMEPS Board based on the most 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. Additionally, the City's contribution is further adjusted under the applicable Meet & Confer agreement. It is important to recognize that the Board can select different actuarial methods and assumptions to perform these calculations.

The City's contribution to HMEPS in effect for FY 2016 was expected to be \$161.6 million and for FY 2017 was expected to be \$178.6 million, as estimated by the HMEPS actuary based on the Meet & Confer agreement. The measurement was based on the ultimate entry age normal actuarial cost method, asset smoothing over no more than five years for the actuarial value of assets, a rolling or open 30-year amortization period, and a long-term interest rate assumption of 8.0%.

Interest Rate Assumptions

HMEPS used a long-term investment return assumption of 8.0% 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 assumptions shown in this report.

Funding Policy Results

Values Before Pension Reform as of July 1, 2016 (\$000s)	8.0%	7.0%
Actuarial Accrued Liability	\$4,974,958	\$5,573,637
Market Value of Assets	\$2,400,023	\$2,400,023
Unfunded Actuarial Liability	\$2,574,935	\$3,173,614

GASB Net Pension Liability Results

Values Before Pension Reform as of July 1, 2016 (\$000s)	8.0%	7.0%
Total Pension Liability	\$5,010,635	\$5,582,192
Fiduciary Net Position	\$2,400,023	\$2,400,023
Net Pension Liability	\$2,610,612	\$3,182,169

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 HMEPS 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. HMEPS currently uses the Ultimate Entry Age Normal method. This method is intended to produce a stable contribution rate as a percentage of payroll. The Normal Cost is calculated for all members based on provisions in effect for new hires, with the 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 30-year open period as permitted in the actuarially determined contribution rate for each retirement system. The initial base (Legacy Liability) will be amortized over a 30-year closed period as a level percentage of payroll based on the initial payroll growth assumption, with a separate closed period amortization base established for each subsequent change 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, asset smoothing over no more than five years 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 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. For HMEPS, the City Contribution Rate and Corridor Midpoint do not include the initial Legacy Liability. Instead, the dollar amount of the Legacy Liability to be amortized each year is added to the City Contribution Rate multiplied by the year's payroll, for a Total City Contribution Amount.

Amortization Period and Payoff Year

Initially, actuarial losses, including the unfunded actuarial liability at the outset of the agreement (Legacy Liability), 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 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.

City Pension Funding Policy

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 that credit past service, 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, HMEPS results use the Ultimate Entry Age Normal actuarial 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 - Before Pension Obligation Bonds

FY	Baseline Forecast				With Pension Reform				Cost Avoidance
	City Normal Cost Rate	Admin. Expenses	Amort. of UAL	City Cont. Rate	City Normal Cost Rate	Admin. Expenses	Amort. of UAL	City Cont. Rate	
2017				29.36%				29.36%	0.00%
2018	8.56%	1.19%	29.65%	39.40%	7.22%	1.19%	20.32%	28.73%	10.67%
2019	8.59%	1.19%	29.00%	38.78%	7.25%	1.19%	20.32%	28.76%	10.02%
2020	8.62%	1.19%	28.37%	38.18%	7.28%	1.19%	20.32%	28.79%	9.39%
2021	8.65%	1.19%	27.77%	37.61%	7.31%	1.19%	20.32%	28.82%	8.79%
2022	8.68%	1.19%	27.19%	37.06%	7.34%	1.19%	20.32%	28.85%	8.21%
2023	8.71%	1.19%	26.62%	36.52%	7.37%	1.19%	20.32%	28.88%	7.64%
2024	8.74%	1.19%	26.07%	36.00%	7.40%	1.19%	20.32%	28.91%	7.09%
2025	8.77%	1.19%	25.55%	35.51%	7.43%	1.19%	20.32%	28.94%	6.57%
2026	8.80%	1.19%	25.03%	35.02%	7.46%	1.19%	20.32%	28.97%	6.05%
2027	8.83%	1.19%	24.54%	34.56%	7.49%	1.19%	20.32%	29.00%	5.56%
2028	8.86%	1.19%	24.06%	34.11%	7.52%	1.19%	20.32%	29.03%	5.08%
2029	8.88%	1.19%	23.59%	33.66%	7.54%	1.19%	20.32%	29.05%	4.61%
2030	8.90%	1.19%	23.14%	33.23%	7.56%	1.19%	20.32%	29.07%	4.16%
2031	8.92%	1.19%	22.70%	32.81%	7.58%	1.19%	20.32%	29.09%	3.72%
2032	8.94%	1.19%	22.28%	32.41%	7.60%	1.19%	20.32%	29.11%	3.30%
2033	8.96%	1.19%	21.86%	32.01%	7.62%	1.19%	20.32%	29.13%	2.88%
2034	8.98%	1.19%	21.46%	31.63%	7.64%	1.19%	20.32%	29.15%	2.48%
2035	9.00%	1.19%	21.06%	31.25%	7.66%	1.19%	20.32%	29.17%	2.08%
2036	9.02%	1.19%	20.68%	30.89%	7.68%	1.19%	20.32%	29.19%	1.70%
2037	9.04%	1.19%	20.31%	30.54%	7.70%	1.19%	20.32%	29.21%	1.33%
2038	9.06%	1.19%	19.94%	30.19%	7.72%	1.19%	20.32%	29.23%	0.96%
2039	9.07%	1.19%	19.58%	29.84%	7.73%	1.19%	20.32%	29.24%	0.60%
2040	9.08%	1.19%	19.23%	29.50%	7.74%	1.19%	20.32%	29.25%	0.25%
2041	9.09%	1.19%	18.89%	29.17%	7.75%	1.19%	20.32%	29.26%	-0.09%
2042	9.10%	1.19%	18.56%	28.85%	7.76%	1.19%	20.32%	29.27%	-0.42%
2043	9.11%	1.19%	18.23%	28.53%	7.77%	1.19%	20.32%	29.28%	-0.75%
2044	9.12%	1.19%	17.91%	28.22%	7.78%	1.19%	20.32%	29.29%	-1.07%
2045	9.13%	1.19%	17.59%	27.91%	7.79%	1.19%	20.32%	29.30%	-1.39%
2046	9.14%	1.19%	17.28%	27.61%	7.80%	1.19%	20.32%	29.31%	-1.70%
2047	9.15%	1.19%	16.98%	27.32%	7.81%	1.19%	20.32%	29.32%	-2.00%
2048	9.16%	1.19%	16.69%	27.04%	7.82%	1.19%	0.00%	9.01%	18.03%

Please note: Employee contributions above those assumed for Group D (3% of pay after Pension Reform) are used to offset the UAL, reducing the amortization rate. The increase in the City Normal Cost rate shown above is due to the mortality improvement assumption and was estimated based on grouped data.

Detailed Forecast Results

Forecast of Corridor Midpoint - 7% Interest Rate - With Pension Obligation Bonds

FY	Baseline Forecast				With Pension Reform				Cost Avoidance
	City Normal Cost Rate	Admin. Expenses	Amort. of UAL	City Cont. Rate	City Normal Cost Rate	Admin. Expenses	Amort. of UAL	City Cont. Rate	
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2018	8.56%	1.19%	29.65%	39.40%	7.22%	1.19%	18.12%	26.53%	12.87%
2019	8.59%	1.19%	29.00%	38.78%	7.25%	1.19%	18.12%	26.56%	12.22%
2020	8.62%	1.19%	28.37%	38.18%	7.28%	1.19%	18.12%	26.59%	11.59%
2021	8.65%	1.19%	27.77%	37.61%	7.31%	1.19%	18.12%	26.62%	10.99%
2022	8.68%	1.19%	27.19%	37.06%	7.34%	1.19%	18.12%	26.65%	10.41%
2023	8.71%	1.19%	26.62%	36.52%	7.37%	1.19%	18.12%	26.68%	9.84%
2024	8.74%	1.19%	26.07%	36.00%	7.40%	1.19%	18.12%	26.71%	9.29%
2025	8.77%	1.19%	25.55%	35.51%	7.43%	1.19%	18.12%	26.74%	8.77%
2026	8.80%	1.19%	25.03%	35.02%	7.46%	1.19%	18.12%	26.77%	8.25%
2027	8.83%	1.19%	24.54%	34.56%	7.49%	1.19%	18.12%	26.80%	7.76%
2028	8.86%	1.19%	24.06%	34.11%	7.52%	1.19%	18.12%	26.83%	7.28%
2029	8.88%	1.19%	23.59%	33.66%	7.54%	1.19%	18.12%	26.85%	6.81%
2030	8.90%	1.19%	23.14%	33.23%	7.56%	1.19%	18.12%	26.87%	6.36%
2031	8.92%	1.19%	22.70%	32.81%	7.58%	1.19%	18.12%	26.89%	5.92%
2032	8.94%	1.19%	22.28%	32.41%	7.60%	1.19%	18.12%	26.91%	5.50%
2033	8.96%	1.19%	21.86%	32.01%	7.62%	1.19%	18.12%	26.93%	5.08%
2034	8.98%	1.19%	21.46%	31.63%	7.64%	1.19%	18.12%	26.95%	4.68%
2035	9.00%	1.19%	21.06%	31.25%	7.66%	1.19%	18.12%	26.97%	4.28%
2036	9.02%	1.19%	20.68%	30.89%	7.68%	1.19%	18.12%	26.99%	3.90%
2037	9.04%	1.19%	20.31%	30.54%	7.70%	1.19%	18.12%	27.01%	3.53%
2038	9.06%	1.19%	19.94%	30.19%	7.72%	1.19%	18.12%	27.03%	3.16%
2039	9.07%	1.19%	19.58%	29.84%	7.73%	1.19%	18.12%	27.04%	2.80%
2040	9.08%	1.19%	19.23%	29.50%	7.74%	1.19%	18.12%	27.05%	2.45%
2041	9.09%	1.19%	18.89%	29.17%	7.75%	1.19%	18.12%	27.06%	2.11%
2042	9.10%	1.19%	18.56%	28.85%	7.76%	1.19%	18.12%	27.07%	1.78%
2043	9.11%	1.19%	18.23%	28.53%	7.77%	1.19%	18.12%	27.08%	1.45%
2044	9.12%	1.19%	17.91%	28.22%	7.78%	1.19%	18.12%	27.09%	1.13%
2045	9.13%	1.19%	17.59%	27.91%	7.79%	1.19%	18.12%	27.10%	0.81%
2046	9.14%	1.19%	17.28%	27.61%	7.80%	1.19%	18.12%	27.11%	0.50%
2047	9.15%	1.19%	16.98%	27.32%	7.81%	1.19%	18.12%	27.12%	0.20%
2048	9.16%	1.19%	16.69%	27.04%	7.82%	1.19%	0.00%	9.01%	18.03%

Please note: Pension Obligation Bonds were assumed to be issued December 31, 2017 and discounted with interest to June 30, 2016. Employee contributions above those assumed for Group D (3% of pay after Pension Reform) are used to offset the UAL, reducing the amortization rate. The increase in the City Normal Cost rate shown above is due to the mortality improvement assumption and was estimated based on grouped data.

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 HMEPS, 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 HMEPS, using the 7.0% long-term interest rate assumption:

Before Pension Obligation Bonds

FY (Results in \$000s)	June 30, 2016 NPL Before Pension Reform	June 30, 2016 NPL After Pension Reform	Reduction in NPL
2017	\$3,182,169	\$2,414,059	\$768,110

With Pension Obligation Bonds

FY (Results in \$000s)	June 30, 2016 NPL Before Pension Reform	June 30, 2016 NPL After Pension Reform	Reduction in NPL
2017	\$3,182,169	\$2,188,186	\$993,983

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. That is, the normal cost rate used in the funding calculation is the same for all members. This normal cost rate remains level each year in the future. While the gross normal cost has increased under Pension Reform due to additional benefits granted to Group D (COLA, cash balance benefit), the additional employee contributions more than offset this increase, so the net employer normal cost is lower under Pension Reform. The estimated change in gross and net employer normal costs is shown below as a percentage of payroll. Please note these amounts do not include any allowance for administrative expenses:

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
8.56%	8.56%	10.22%	7.22%	1.66%	-1.34%

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. Additionally, the Normal Cost Rate will change slightly to incorporate generational mortality improvement.

Several 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:

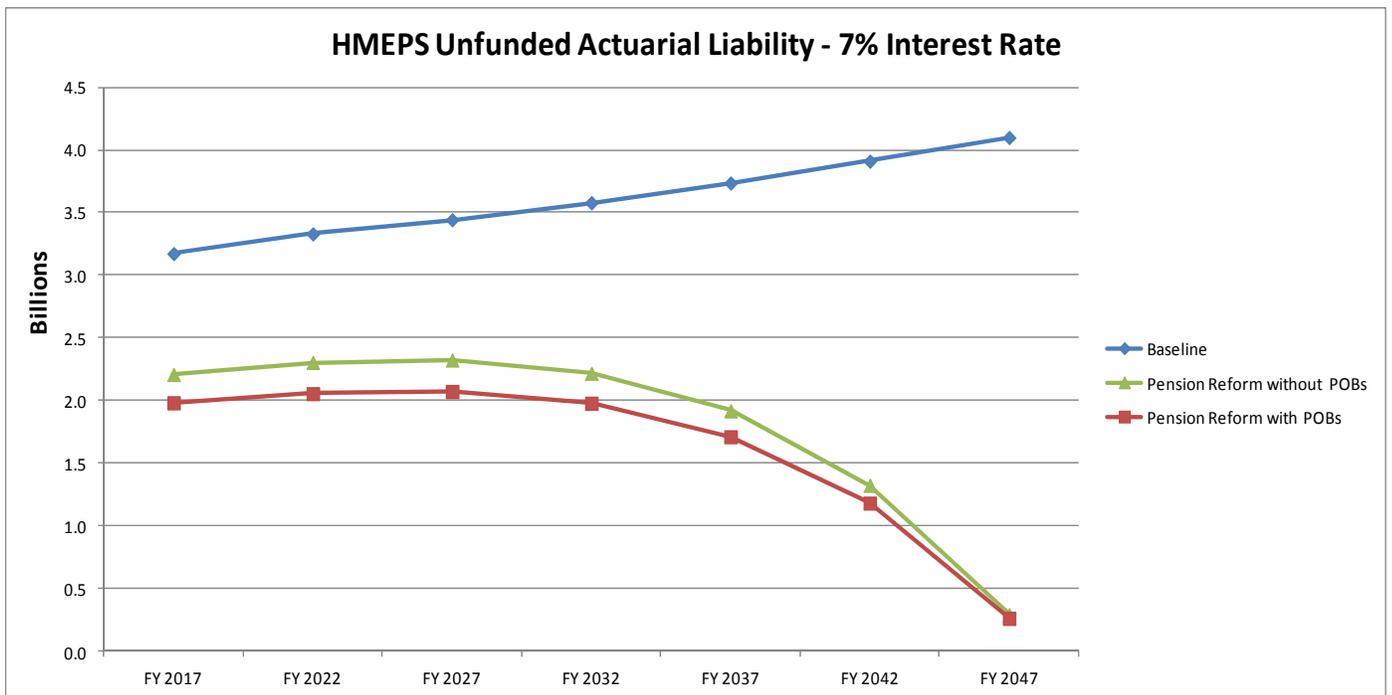
7.00% Interest Rate (\$000s)	Baseline AAL	Pension Reform AAL	Difference
Active Members	\$2,469,373	\$1,951,545	(\$517,828)
Inactive Members	\$3,104,264	\$2,752,604	(\$351,660)
Total	\$5,573,637	\$4,704,149	(\$869,488)

Commentary on Results

Payoff of Unfunded Actuarial Liability

The graph below shows the projected Unfunded Actuarial Liability both before and after Pension Reform, assuming the Pension Reform changes become law prior to the June 30, 2017 measurement date. The results reflect the new Pension Funding Policy and a 7.00% interest rate.

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.



Please note: 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

Group A: Hired after September 1, 1981 and prior to September 1, 1999 and opted into Group A, or hired after September 1, 1999 and prior to January 1, 2008. Group C participants receive the same benefits as Group A participants for service after December 31, 2004.

Group B: Hired after September 1, 1981 and prior to September 1, 1999 and did not opt into Group A.

Group D: Hired after January 1, 2008.

Final Average Pay (FAP)

The average of the highest 78 bi-weekly payroll periods of salary, including base pay, longevity pay, and shift differential.

Credited Service

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

Retirement Benefit

Eligibility

➤ Groups A and B

The earliest of:

1. Age 62 with 5 years of Credited Service
2. 5 years of Credited Service and age plus Credited Service of 70 or more, with at least 5 years of Credited Service and age plus Credited Service of 68 or more as of January 1, 2005
3. 5 years of Credited Service and age plus Credited Service of 75 or more and age at least age 50

➤ Group D

Age 62 with 5 years of Credited Service. Early retirement benefits are available at age 55 with at least 10 years of Credited Service or at 75 Points with at least 5 years of Credited Service.

Summary of Plan Provisions

Amount

➤ Group A

FAP multiplied by the following service-based percentages:

Service	Pre-2005	Post-2004
0 - 10	3.25%	2.5%
11 - 20	3.5%	2.5%
Over 20	4.25%	3.25%

➤ Group B

FAP multiplied by the following service-based percentages:

Service	Pre-2005	Post-2004
0 - 10	1.75%	1.75%
11 - 20	2.0%	2.0%
Over 20	2.75%	2.5%

➤ Group D

FAP multiplied by the following service-based percentages. The benefit is reduced by 0.25% for each month retirement precedes age 62:

Service	Percentage
0 - 25	1.8%
Over 25	1.0%

Maximum benefit is 90% of FAP for all groups.

Summary of Plan Provisions

Termination Benefit

Eligibility	5 years of Credited Service.
Amount	Accrued normal retirement benefit payable at the normal retirement eligibility date. Group A members have the option of receive a refund of contributions without interest. Non-vested members may receive a refund of contributions without interest.
	<u>Pension Reform</u> will add employee contributions for Groups B and D, meaning they will also be eligible for contribution refunds.

On-Duty Disability

Eligibility	No age or service requirements.
Amount	
➤ Group A	Accrued benefit, not less than 20% of final monthly salary, plus 1% per year of final monthly salary per year of Credited Service, up to a maximum of 40% of final monthly salary.
➤ Groups B and D	Accrued benefit, not less than 20% of final monthly salary.

Off-Duty Disability

Eligibility	5 years of Credited Service.
Benefit	Accrued benefit payable immediately.

On-Duty Death

Eligibility	No age or service requirements.
Benefit	100% of FAP. <u>Pension Reform</u> 80% of FAP

Off-Duty Death

Eligibility	5 years of Credited Service.
Benefit	100% of the accrued benefit. <u>Pension Reform</u> 80% of the accrued benefit

Summary of Plan Provisions

Retired Member Death

Eligibility

Retired and receiving monthly pension.

Amount

Participants other than Option-Eligible Participants: 100% of monthly pension the retired member was receiving.

Pension Reform will change this to 80% of the monthly pension for new survivors.

Option-Eligible Participants: Based on member election at retirement.

Allocation to Beneficiaries

The benefit amount above is payable to a surviving spouse, with 10% payable to each qualifying dependent other than the surviving spouse, with a maximum of 20% and the surviving spouse's benefit offset by this amount. If there is no surviving spouse, 50% is payable to each qualifying dependent, up to a maximum of 100% of the surviving spouse's benefit (does not apply to Option-Eligible Participants after retirement).

Cost of Living Adjustment

3% per year, not compounded, for those hired prior to January 1, 2005. 2% per year, not compounded, for those Group A and B members hired on or after January 1, 2005. Under **Pension Reform**, the COLA will equal the five-year investment return, less an adjustment factor, with the result multiplied by 50%. The adjustment factor is the interest rate less 2.0%. The COLA will be no less than 0% and no more than 2%. Group D members will be eligible for a COLA.

DROP

Upon reaching retirement eligibility, Group A and B 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 Group A member contributions prior to 2005. Interest is credited on the account using the 50% of the Fund's rate of return for the prior year, with a minimum of 2.5% and a maximum of 7.5%. Upon exiting the DROP for retirement, the member's monthly benefit is the current monthly annuity, including COLA increases.

Under **Pension Reform**, COLA adjustments will not be provided on the monthly benefit while in DROP until the member has reached age 62, and the DROP interest crediting rate will be equal to 50% of the five-year investment return net of investment expenses, with a minimum of 2.5% and a maximum of 7.5%.

Summary of Plan Provisions

Contribution Rates

Members

- Group A 5% of total pay.

- Groups B and D No employee contributions required.

Pension Reform will increase this rate to 8.0% for Group A members (phased in at 7.0% the first year and 8.0% per year thereafter), 4.0% for Group B members (phased in at 2.0% the first year and 4.0% per year thereafter), and 3% for Group D members. One third of the contributions from Group D members will be used to provide a cash balance benefit payable upon termination of service, with interest credited at the same rate as is credited on DROP accounts.

City

Based on Meet & Confer agreements.

Pension Reform will be based on the results of the risk sharing valuation. The City will contribute administrative expenses of no more than 1.25% of payroll.

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 Contribution Rate effective July 1, 2017 (Fiscal Year 2018).
Actuarial Value of Assets	Fair market value of assets as of June 30, 2016, with smoothing of future gains and losses over a period of no more than five years. Gains may be used to offset outstanding losses, and vice versa, to accelerate the amortization.
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	7.00% (net of investment expenses), except as noted in the report.
General Inflation	2.25%, except where noted in the report.
Wage Inflation	3.00%, except where noted in the report.
Payroll Growth	2.75%, except where noted in the report.

Actuarial Methods and Assumptions

Individual Pay Increase Rate

A service-related assumption used except where noted in the report. These assumptions reflect the 35 basis point reduction in the general inflation assumption used in the 2015 valuation and were provided by the HMEPS actuary:

Years of Credited Service	Rate
1	5.25%
2	5.25%
3	5.75%
4	5.25%
5	4.75%
6	4.50%
7	4.25%
8	4.00%
9	3.75%
10-24	3.50%
25+	3.00%

DROP Participation

65% of members are assumed to enter DROP. Members are assumed to enter at the earliest eligible date.

DROP Interest Crediting Rate

Baseline: 4.50% with a 7.00% interest rate assumption and 4.65% with an 8.00% interest rate assumption.

Pension Reform: 4.00% with a 7.00% interest rate assumption.

COLA

Baseline: 3.00% per year, not compounded, if hired prior to January 1, 2005. 2.00% per year, not compounded, if hired January 1, 2005 or later and in Group A or B. Note: Due to the use of grouped census data, all inactive participants are assumed to receive a 3.00% COLA.

Pension Reform: 1.00% per year, not compounded, for all participants including Group D.

Actuarial Methods and Assumptions

Demographic Assumptions

Mortality Rates

- Active members The RP-2000 Combined Healthy Mortality, scaled by 90% for males and 80% for females.

90% of active member deaths are assumed to be Non-Service-Connected.

- Retired members and beneficiaries RP-2000 Combined Healthy Mortality Tables with Blue Collar Adjustment, scaled by 125% for males and 112% for females, with generational mortality improvement projected based on Scale BB. Rates are set forward five years for Disabled Retirees.

Retirement Rates

	Expected Retirements Per 100 Lives			
	<i>Group A & B Members</i>		<i>Group D Members</i>	
	<i>Males</i>	<i>Females</i>	<i>Males</i>	<i>Females</i>
Age				
45 - 49	15	12	0	0
50 - 54	10	11	3	3
55	10	11	4	4
56	10	11	5	5
57	10	11	6	6
58	10	11	7	7
59	10	11	8	8
60	12	11	10	10
61	14	11	13	13
62	16	20	35	35
63	18	18	25	18
64	20	12	18	20
65	20	22	20	20
66 - 69	20	20	20	19
70 - 74	20	25	20	19
75+	100	100	100	100

Actuarial Methods and Assumptions

Disability Rates

Age	Males	Females
20	0.000004	0.000007
25	0.000010	0.000014
30	0.000078	0.000069
35	0.000340	0.000109
40	0.000695	0.000250
45	0.001346	0.000564
50	0.002346	0.001342
55	0.003390	0.002160
60	0.004477	0.002604

Rates of decrement are assumed to be zero once a member reaches retirement eligibility.

Rates of Service-Connected Disability are 93.5% of those shown above. Rates of Non-Service-Connected Disability are 6.5% of those shown above.

Termination Rates

Rate of termination are a function of age and service.

Sample Rates

Males

Age	Years of Service										
	0	1	2	3	4	5	6	7	8	9	10+
20	0.3244	0.2682	0.2300	0.2060	0.1926	0.1824	0.1617	0.1507	0.1400	0.1278	0.0541
30	0.2585	0.2146	0.1808	0.1563	0.1396	0.1275	0.1143	0.1057	0.0985	0.0919	0.0449
40	0.2003	0.1645	0.1351	0.1124	0.0954	0.0832	0.0750	0.0683	0.0634	0.0603	0.0357
50	0.1559	0.1258	0.1013	0.0824	0.0681	0.0577	0.0510	0.0454	0.0411	0.0383	0.0265
60	0.1341	0.1083	0.0887	0.0740	0.0634	0.0557	0.0469	0.0407	0.0344	0.0277	0.0173

Actuarial Methods and Assumptions

Females

Age	Years of Service										
	0	1	2	3	4	5	6	7	8	9	10+
20	0.2811	0.2574	0.2344	0.2123	0.1912	0.1711	0.1506	0.1282	0.1040	0.0784	0.1385
30	0.2155	0.1943	0.1736	0.1539	0.1356	0.1188	0.1032	0.0879	0.0730	0.0585	0.0795
40	0.1688	0.1460	0.1250	0.1063	0.0903	0.0770	0.0664	0.0581	0.0517	0.0472	0.0367
50	0.1510	0.1223	0.0984	0.0791	0.0645	0.0544	0.0481	0.0452	0.0453	0.0481	0.0339
60	0.1794	0.1373	0.1049	0.0812	0.0653	0.0570	0.0540	0.0552	0.0601	0.0682	0.0339

Members with a choice of terminated vested benefit or refund of contributions are assumed to elect the benefit with the larger present value. Those electing the terminated vested benefit are assumed to commence at age 62.

Percentage married

70% 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.

Payment of DROP Balances

Installments over 8 years. The value of the DROP balance is multiplied by a factor which reflects the difference between the assumed DROP interest crediting rate and the interest rate assumption (0.905 at 4.65% DROP interest crediting and 8.0% interest, 0.927 at 4.5% DROP interest crediting and 7.0% interest, and 0.912 at 4.0% DROP interest crediting and 7.0% interest).

Administrative Expenses

1.19% of payroll.

Actuarial Methods and Assumptions

Funding Policy

The City is assumed to contribute the City Contribution Rate from the prior year. This amount is measured as the normal cost plus 30-year amortization of the Unfunded Actuarial Liability (UAL) less the employee contributions, adjusted with interest to mid-year. The 30-year amortization of the UAL is calculated as a level percent of pay (closed period).

Pension Obligation Bonds

\$250,000,000 in Pension Obligation Bonds were assumed to be issued December 31, 2017. This amount was discounted to June 30, 2016 with one and a half years of interest to determine the UAL.

Data Sources

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

- Grouped census data for all members was based on the July 1, 2015 Actuarial Valuation Report dated March 24, 2016. Additional data for inactive members was provided by the HMEPS actuary via email on December 14, 2016.
- Assumptions and methods were based on the July 1, 2015 Actuarial Valuation Report dated March 24, 2016 unless otherwise noted.
- The fair value of assets of \$2,400,023,240 as of June 30, 2016 is from the June 30, 2016 GASB 68 Accounting Report dated November 11, 2016 which was provided by the City of Houston via email on November 11, 2016.
- The fiscal year 2017 payroll was projected to equal \$624.647 million. This is based on FY 2016 amounts projected with one year of payroll growth at 2.75%.
- Pension Reform plan provisions were provided by the City of Houston via email on November 7, 2016.