GRS

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September 25, 2017

Mr. John Lawson
Houston Police Officers' Pension System
602 Sawyer
Suite 300
Houston, TX 77007

Re: Final Risk Sharing Valuation Study as of June 30, 2016

Dear John:

This analysis provides the results of the Risk Sharing Valuation Study as of June 30, 2016. The results have been duplicated with 2% of payroll by Retirement Horizons and thus the contribution requirements for Fiscal Year 2018 and the projected corridor midpoint from this report will be used without modification. The accompanying Exhibit 1 shows the development of both the Net Pension Liability and City Contribution Rate. Projected City Contribution Rates from FY2018-FY2047 are included in a projection of the alternative assumptions, methods, and provisions in Exhibit 2.

Data

Member data is the same as the data supplied for use in the July 1, 2016 actuarial valuation. GRS is not responsible for the accuracy or completeness of the information provided to us.

Baseline Assumptions, Methods, and Provisions

In the baseline scenario, the assumptions, methods, and plan provisions are described in Appendices A and B of the July 1, 2016 Valuation Report, dated October 12, 2016, with the following modifications:

- The discount rate was lowered to 7.00%.
- The ultimate salary scale and payroll growth rate assumptions were changed to 2.75%.
- The cost method was changed to Entry Age Normal.
- The Actuarial Value of Assets was marked to Market Value, plus an expected $750 million in Pension Obligation Bonds (POBs), discounted from January 1, 2018 at 7.00%.

Alternative Assumptions, Methods, and Provisions

In the scenario reflecting SB 2190, the following changes were made in addition to those described in the previous section:

- Prospective Cost of Living Adjustments (COLAs) were calculated as 100% of the average five-year investment return less five percentage points, with a minimum of 0% and a maximum of 4%. The assumed COLA is 2.00% per year.
- The DROP Interest Credit formula is 65% of the five-year investment return, with a minimum of 2.50%. The assumed DROP Interest Credit is 5.10%. This also applies to PROP.
- There will be a 3-year moratorium on all COLAs for members under the age of 70. Afterwards, COLAs will be delayed until age 55. Line-of-Duty Survivors and any participants or survivors of participants receiving benefits before June 8, 1995 will begin receiving COLAs following the moratorium and are not subject to the age 55 requirement.
- Participants will no longer receive COLAs while actively employed in the DROP.
- Normal retirement eligibility for members sworn after 10/9/2004 also includes a 'rule of 70' provision, where participants are eligible to retire when the sum of age and years of service equals or exceeds 70. Participants affected by this new eligibility were assumed to be more likely to retire in their first year of retirement eligibility. At the age of first retirement eligibility, 3% per year that the member's retirement age exceeds 45 was added to the original probability of retirement, with up to a maximum of 30% being added at age 55. For example, a member with first retirement eligibility age 53 would be 24% more likely to retire at age 53.
- For current and future participants in the DROP, future employee contributions will no longer be credited to DROP accounts. Due to this change, the retirement rates for participants currently in DROP were multiplied by 110%.
- The prospective employee contribution rate will be 10.50% for all participants.
- Current and future participants in the DROP may not participate in the DROP more than 20 years.
- The cost method was changed to Ultimate Entry Age Normal.
- For setting the generational mortality assumption in the ultimate entry age pass, each member's birth year was set to the valuation date minus the age at entry.
- To perform an open group projection, a new entrant profile was created based on recent new hires into the System. Each annual cohort of new entrants had their beginning salaries increased by the 2.75% wage inflation assumption over the previous cohort. For the application of generational mortality, the birth year was set to the valuation date minus the age at entry.

General Comments

Our calculations are based upon assumptions regarding future events, which may or may not materialize. Please bear in mind that actual results could deviate significantly from our projections, depending on actual plan experience.

Nothing in this letter should be construed as providing legal or tax advice. Please feel free to call if you have any questions about this information.

The undersigned are members of the American Academy of Actuaries and meet all of the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

Sincerely,

Mark R. Randall

Mark R. Randall, FCA, MAAA, EA
Chief Executive Officer

Joseph P. Newton, FSA, EA, MAAA
Pension Market Leader and Actuary

Houston Police Officers' Pension System

Impact on Contribution Requirement
Due to Proposed Plan Changes
Based on July 1, 2016 Actuarial Valuation

($ amounts in 000s)

Scenario	2016 Valuation, 7% Discount Rate	Assumption and Benefit Changes, Ultimate EAN
Interest Rate	7.00%	
Future COLAs	2.70%	2.00%
DROP Crediting Rate	100%	65%
Ultimate Salary Scale	2.75%	
Payroll Growth Rate	2.75%	
COLA delayed until specified age[2]	No	55
Active DROP COLA Allowed	Yes	No
Hired pre-2004 accrual rate, <20 years service	2.75%	
Post-2004 Hires Retirement Eligibility	55&10	55&10, Rule of 70
Future employee contributions excluded from DROP balance	No	Yes[1]
Contribution Rate (Pre/Post)	9.00%/10.25%	10.50%/10.50%
Period for DROP Accrual*	Unlimited	20 Years
DROP elections recalculated using Police service	No	
Pay to calculate contributions in DROP reflects future increases	Yes	
Recalculate DROP Benefit	No	
COLA holiday for age <70	No	3 Years
Cost Method	EAN	Ultimate EAN

Where assumptions are not shown, the assumptions used in the previous scenario were applied.

	2016 Valuation, 7% Discount Rate	Assumption and Benefit Changes, Ultimate EAN
AAL		
Actives	$ 3,173,440	$ 2,700,020
Inactives	8,189	7,640
Retirees/Beneficiaries	3,712,645	3,373,731
Total	6,894,274	6,081,391
AVA[3]	4,758,079	4,758,079
UAAL	2,136,195	1,323,312
Funded Ratio	69.0%	78.2%
30 Years Beginning July 1, 2017		
Amortization Charge	29.82%	17.91%
Employer Normal Cost	22.14%	12.86%
Administrative Expense	1.00%	1.00%
Contribution Requirement for Fiscal Year 2018	52.96%	31.77%

[1] *Retirement rates for members currently in DROP are assumed to increase by 10%.*

[2] *Line-of-Duty Survivors are assumed to receive COLAs after the 3 year COLA moratorium, if applicable, and are not subject to the age 55 COLA delay.*

[3] *The assets for these scenarios were the market assets available July 1, 2016 plus $750 million in pension obligation bonds discounted from January 1, 2018.*

[4] *The amortization charge in the second column above was determined using an estimated $424.3M FY2017 payroll.*

Houston Police Officers' Pension System

Impact on Accounting Information
Due to Proposed Plan Changes
Based on July 1, 2016 Actuarial Valuation

($ amounts in 000s)

Scenario	2016 Valuation, 7% Discount Rate	Assumption and Benefit Changes
Interest Rate	7.00%	
Future COLAs	2.70%	2.00%
DROP Crediting Rate (% of 5 Year Rate)	100%	65%
Ultimate Salary Scale	2.75%	
Payroll Growth Rate	2.75%	
COLA delayed until specified age[2]	No	55
Active DROP COLA Allowed	Yes	No
Hired pre-2004 accrual rate, <20 years service	2.75%	
Post-2004 Hires Retirement Eligibility	55&10	55&10, Rule of 70
Future employee contributions excluded from DROP balance	No	Yes[1]
Contribution Rate (Pre/Post)	9.00%/10.25%	10.50%/10.50%
Period for DROP Accrual*	Unlimited	Limited, (E)
DROP elections recalculated using Police service	No	
Pay to calculate contributions in DROP reflects future increases	Yes	
Recalculate DROP Benefit	No	
COLA Holiday for age <70	No	3 Years

Where assumptions are not shown, the assumptions used in the previous scenario were applied.

Total Pension Liability		
Actives	3,679,000	3,012,000
Inactives	8,000	8,000
Retirees/Beneficiaries	3,713,000	3,374,000
Total	7,400,000	6,394,000
Plan Fiduciary Net Position	4,080,000	4,080,000
Net Pension Liability	3,320,000	2,314,000

[1] *Retirement rates for members currently in DROP are assumed to increase by 10%.*

[2] *Line-of-Duty Survivors are assumed to receive COLAs after the 3 year COLA moratorium, if applicable, and are not subject to the age 55 COLA delay.*

Exhibit II

Houston Police Officers Pension System
Projection Results Based on July 1, 2016 Actuarial Valuation and Adopting Cost-Saving Provisions

Assumption and Benefit changes, as described in Letter
Market Earnings: 7% each year
Contribution Rate: Laddered Amortization Bases with 30 year periods created annually

Valuation as of July 1,	Market Return for FY Beginning on Valuation Date	Employer Contribution Rate for Fiscal Year Following Valuation Date	Compensation (in Millions)	Employer Contributions (in Millions)	Actuarial Accrued Liability (AAL, in Millions)	Actuarial Value of Assets (AVA, in Millions)	Unfunded Actuarial Accrued Liability (UAAL, in Millions)	Funded Ratio	Calculated Employer Contribution Rate, Applicable next FY	Funding Period	Total Normal Cost	Employer Normal Cost
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
2016	7.00%	31.35%	$ 424.3	$ 133.0	$ 6,081	$ 4,758	$ 1,323	78.2%	31.77%	30	24.36%	13.86%
2017	7.00%	31.77%	436.0	138.5	6,255	4,914	1,341	78.6%	31.85%	30	24.39%	13.89%
2018	7.00%	31.85%	448.0	142.7	6,412	5,058	1,354	78.9%	31.82%	30	24.36%	13.86%
2019	7.00%	31.82%	460.3	146.5	6,553	5,187	1,366	79.2%	31.84%	30	24.38%	13.88%
2020	7.00%	31.84%	472.9	150.6	6,679	5,302	1,376	79.4%	31.92%	30	24.45%	13.95%
2021	7.00%	31.92%	485.9	155.1	6,786	5,400	1,386	79.6%	31.98%	30	24.50%	14.00%
2022	7.00%	31.98%	499.3	159.7	6,873	5,480	1,393	79.7%	32.03%	30	24.54%	14.04%
2023	7.00%	32.03%	513.0	164.3	6,939	5,541	1,399	79.8%	32.07%	30	24.57%	14.07%
2024	7.00%	32.07%	527.1	169.1	6,983	5,581	1,402	79.9%	32.10%	30	24.59%	14.09%
2025	7.00%	32.10%	541.6	173.9	7,003	5,601	1,403	80.0%	32.12%	30	24.60%	14.10%
2026	7.00%	32.12%	556.5	178.8	6,999	5,600	1,400	80.0%	32.13%	30	24.61%	14.11%
2027	7.00%	32.13%	571.8	183.7	7,118	5,724	1,394	80.4%	32.13%	30	24.61%	14.11%
2028	7.00%	32.13%	587.6	188.8	7,243	5,858	1,385	80.9%	32.13%	30	24.61%	14.11%
2029	7.00%	32.13%	603.7	194.0	7,375	6,003	1,373	81.4%	32.14%	30	24.62%	14.12%
2030	7.00%	32.14%	620.3	199.4	7,515	6,159	1,356	82.0%	32.14%	30	24.62%	14.12%
2031	7.00%	32.14%	637.4	204.8	7,663	6,328	1,335	82.6%	32.14%	30	24.62%	14.12%
2032	7.00%	32.14%	654.9	210.5	7,821	6,512	1,310	83.3%	32.15%	30	24.63%	14.13%
2033	7.00%	32.15%	672.9	216.3	7,991	6,712	1,279	84.0%	32.14%	30	24.63%	14.13%
2034	7.00%	32.14%	691.4	222.2	8,173	6,930	1,242	84.8%	32.14%	30	24.63%	14.13%
2035	7.00%	32.14%	710.4	228.3	8,369	7,169	1,200	85.7%	32.14%	30	24.64%	14.14%
2036	7.00%	32.14%	730.0	234.6	8,581	7,430	1,151	86.6%	32.14%	30	24.64%	14.14%
2037	7.00%	32.14%	750.1	241.1	8,808	7,713	1,095	87.6%	32.13%	30	24.64%	14.14%
2038	7.00%	32.13%	770.7	247.6	9,049	8,018	1,031	88.6%	32.14%	30	24.65%	14.15%
2039	7.00%	32.14%	791.9	254.5	9,306	8,347	959	89.7%	32.13%	30	24.65%	14.15%
2040	7.00%	32.13%	813.6	261.5	9,580	8,701	879	90.8%	32.13%	30	24.65%	14.15%
2041	7.00%	32.13%	836.0	268.6	9,870	9,082	788	92.0%	32.13%	30	24.66%	14.16%
2042	7.00%	32.13%	859.0	276.0	10,178	9,491	687	93.2%	32.13%	30	24.66%	14.16%
2043	7.00%	32.13%	882.6	283.6	10,504	9,929	575	94.5%	32.13%	30	24.66%	14.16%
2044	7.00%	32.13%	906.9	291.4	10,848	10,397	451	95.8%	32.13%	30	24.67%	14.17%
2045	7.00%	32.13%	931.9	299.4	11,209	10,896	313	97.2%	32.13%	30	24.67%	14.17%
2046	7.00%	32.13%	957.5	307.7	11,588	11,426	162	98.6%	14.17%	30	24.67%	14.17%
2047	7.00%	14.17%	983.8	139.4	11,983	11,987	(5)	100.0%	14.18%	30	24.68%	14.18%

APPENDIX A

SUMMARY OF ACTUARIAL ASSUMPTIONS AND METHODS

Summary of Actuarial Assumptions and Methods

The following methods and assumptions were used in preparing the July 1, 2016 actuarial valuation report.

1. Valuation Date

   The valuation date is as of July 1st, the first day of each plan year. This is the date as of which the actuarial present value of future benefits and the actuarial value of assets are determined.

2. Actuarial Cost Method

   The Ultimate Entry Age Normal (UEAN) actuarial cost method allocates the System's actuarial present value of future benefits to various periods based upon service. The portion of the present value of future benefits allocated to years of service prior to the valuation date is the actuarial accrued liability, and the portion allocated to years following the valuation date is the present value of future normal costs. The normal cost is determined for each active member as the level percent of payroll necessary to fully fund the expected benefits to be earned over the career of each individual active member. Under UEAN, the normal cost calculation is done assuming all members earn benefits that would be applicable to a newly hired member so that the normal cost should remain fairly stable as the relative distribution of active employees in different benefit groups changes. The normal cost is partially funded with active member contributions with the remainder funded by employer contributions.

   An unfunded accrued liability exists in the amount equal to the excess of accrued liability over valuation assets. The amortization period of the System is the number of years required to fully amortize the unfunded accrued liability, on an actuarial value of asset basis, with the expected amount of employer contributions in excess of the employers' portion of the normal cost.

   The contribution rate determined by this valuation will not be effective until one year later, but the determination of the rate does not reflect this deferral. It is assumed that there will be no change in the employer normal cost rate due to the deferral, and it is assumed that payments are made uniformly throughout the year.

3. <u>Actuarial Value of Assets</u>

The actuarial value of assets is equal to the market value of assets less a five-year phase in of the excess (shortfall) between expected investment return and actual income. The actual calculation is based on the difference between actual market value and the expected actuarial value of assets each year, and recognizes the cumulative excess return (or shortfall) over at a minimum rate of 20% per year. Each year a base is set up to reflect this difference. If the current year's base is of opposite sign to the deferred bases then it is offset dollar for dollar against the deferred bases. Any remaining bases are then recognized over the remaining period for the base (5 less the number of years between the bases year and the valuation year). This is intended to ensure the smoothed value of assets will converge towards the market value in a reasonable amount of time. Expected earnings are determined using the assumed investment return rate and the beginning of year actuarial value of assets (adjusted for receipts and disbursements during the year). The returns are computed net of investment expenses.

The actuarial value of assets was set equal to the market value of assets as of July 1, 2016.

4. Economic Assumptions

a. Investment return: 7.00% per year, compounded annually, composed of an assumed 2.75% inflation rate and a 4.25% net real rate of return. This rate represents the assumed return, net of all investment expenses.

b. Cost of Living Adjustment (COLA): Monthly benefits for participants receiving payments are increased each April 1 by 100% of the five-year average investment return minus 5.00%, with a minimum of 0.00% and a maximum of 4.00%. For this valuation, the annual COLA is assumed to be 2.00%.

c. Salary increase rate: A service-related component, plus a 2.75% inflation and productivity component, as follows:

Years of Service	Service-related Component	Total Annual Rate of Increase Including 2.75% Inflation & Productivity Component
(1)	(2)	(3)
1	12.00%	14.75%
2	9.00%	11.75%
3	7.25%	10.00%
4	6.00%	8.75%
5	5.50%	8.25%
6	5.00%	7.75%
7	4.25%	7.00%
8	4.00%	6.75%
9	3.50%	6.25%
10	3.25%	6.00%
11	3.00%	5.75%
12	2.75%	5.50%
13	2.50%	5.25%
14	2.25%	5.00%
15	2.00%	4.75%
16	1.75%	4.50%
17	1.50%	4.25%
18 and Over	0.00%	2.75%

d. Payroll growth rate: In the amortization of the unfunded actuarial accrued liability, payroll is assumed to increase 2.75% per year. This increase rate is solely due to the effect of inflation on salaries, with no allowance for future membership growth.

5. Demographic Assumptions

a. Retirement Rates

	Service		
Age	<25	25 - 29	30+
40-49	4.0%	6.0%	10.0%
50-54	4.0%	6.0%	10.0%
55-59	6.8%	10.2%	17.0%
60-64	9.6%	14.4%	24.0%
65 +	100.0%	100.0%	100.0%

For members hired after October 9, 2004, 3% per year the member's first retirement eligibility exceeds 45 is added to the retirement rate at first eligibility up to a maximum increase of 30% at age 55. For members in DROP as of July 1, 2016, retirement rates are multiplied by 110% to reflect that future employee contributions are no longer credited to the DROP balance.

b. DROP Participation

100% of eligible active participants are assumed to elect the DROP.

c. DROP Entry Date

Active members (not already in DROP) are assumed to take advantage of the DROP and enter when first eligible. Participants are assumed to elect the maximum duration for the back DROP, up to 20 years.

d. DROP Interest Credit

Interest in the amount of 65% of the five-year average investment return, with a minimum of 2.50%, will be credited to existing DROP accounts on a monthly basis. For this actuarial valuation, the drop interest credit is assumed to be 5.10%.

e. Withdrawal of DROP and PROP Balances

Members are assumed to withdraw balances in equal annual installments over 10 years.

f. Mortality rates (for active and retired members)

- Healthy retirees - The Gender-distinct RP-2000 Combined Healthy Mortality Tables with Blue Collar Adjustment are used with male rates multiplied by 109% and female rates multiplied by 103%. The rates are projected on a fully generational basis by scale BB to account for future mortality improvements.

- Disabled males and females – The gender-distinct RP-2000 Disabled Retiree Mortality Tables are used without adjustment. The rates are projected on a fully generational basis by scale BB to account for future mortality improvements.

- Active members - The Gender-distinct RP-2000 Combined Healthy Mortality Tables with Blue Collar Adjustment are used with male rates multiplied by 54% and female rates multiplied by 51%. The rates are projected on a fully generational basis by scale BB to account for future mortality improvements. An additive factor of .0003 is applied to all active mortality rates. All active deaths are assumed to be duty-related.

Sample rates are shown below for 2016:

Age	Healthy Retired Males	Healthy Retired Females	Disabled Males	Disabled Females	Healthy Active Males	Healthy Active Females
(1)	(2)	(3)	(4)	(5)	(6)	(7)
25	0.04%	0.02%	2.15%	0.71%	0.05%	0.04%
30	0.08%	0.03%	2.15%	0.71%	0.07%	0.04%
35	0.11%	0.05%	2.15%	0.71%	0.09%	0.06%
40	0.14%	0.09%	2.15%	0.71%	0.10%	0.07%
45	0.19%	0.14%	2.15%	0.71%	0.12%	0.10%
50	0.25%	0.19%	2.76%	1.10%	0.15%	0.13%
55	0.44%	0.27%	3.38%	1.53%	0.25%	0.16%
60	0.81%	0.43%	3.76%	1.86%	0.43%	0.24%
65	1.40%	0.88%	4.14%	2.31%	0.72%	0.47%
70	2.29%	1.58%	4.91%	3.10%	1.16%	0.81%
75	3.69%	2.62%	6.44%	4.31%	1.86%	1.33%
80	6.04%	4.16%	8.59%	5.96%	3.02%	2.09%

g. Termination Rates and Disability Rates

Termination rates (for causes other than death, disability or retirement) are a function of the member's service and are not applied after a member becomes eligible for a retirement benefit. Disability rates are age-based and not applied for members in the DROP or those members eligible to back DROP. All disabilities are assumed to be duty-related. Rates at selected ages and service levels are shown below.

Service Based Rates of Termination		
Service	Male	Female
1	2.71%	2.71%
3	1.95%	1.95%
5	1.40%	1.40%
7	1.01%	1.01%
9	0.72%	0.72%
11	0.52%	0.52%
13	0.37%	0.37%
15	0.27%	0.27%
17	0.19%	0.19%
19	0.14%	0.14%
20 +	0.10%	0.10%

Age Based Rates of Disability		
Age	Male	Female
20	0.1149%	0.1149%
25	0.1145%	0.1145%
30	0.1197%	0.1197%
35	0.1321%	0.1321%
40	0.1516%	0.1516%
45	0.1785%	0.1785%
50	0.2126%	0.2126%
55	0.2538%	0.2538%
60	0.3023%	0.3023%

6. Other Assumptions

a. Percent married: 90% of employees are assumed to be married. (No beneficiaries other than the spouse assumed.)

b. Age difference: Male members are assumed to be three years older than their spouses, and female members are assumed to be three years younger than their spouses.

c. Percent electing annuity on death (when eligible): All of the spouses of vested, married participants are assumed to elect an annuity.

d. Percent electing deferred termination benefit: 50% of vested terminating members are assumed to elect a refund rather than take a deferred benefit at age 60.

e. There will be no recoveries once disabled.

f. No surviving spouse will remarry.

g. Assumed age for commencement of deferred benefits: Members electing to receive a deferred benefit are assumed to commence receipt at the first age at which unreduced benefits are available.

h. Administrative expenses: Administrative expenses are accounted for as an explicit component on the normal cost rate.

i. Pay increase timing**:** Beginning of (fiscal) year. This is equivalent to assuming that reported pays represent amounts paid to members during the year ended on the valuation date.

j. Decrement timing: Decrements of all types are assumed to occur mid-year.

k. Eligibility testing: Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.

l. Decrement relativity: Decrement rates are converted to probabilities in order to account for multiple decrements.

m. Incidence of Contributions**:** Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in our Report, and the actual payroll payable at the time contributions are made.

n. Benefit Service: All members are assumed to accrue one year of service each year. Exact fractional service is used to determine the amount of benefit payable.

7. Participant Data

Participant data was supplied in electronic files. There were separate files for (i) active members, (ii) inactive members, and (iii) members and beneficiaries receiving benefits.

The data for active members included birth date, gender, most recent hire date, salary paid during last fiscal year, hours worked by the employee, and employee contribution amounts. For retired members and beneficiaries, the data included date of birth, gender, amount of monthly benefit, and date of retirement. Also included was the member's Group and for members participating in DROP, their account balances and monthly DROP income.

All healthy and disabled retirees are assumed to have 100% joint and survivor annuities, prorated by the 90% marriage assumption and reflecting the three year spousal age differential described above. All beneficiaries are assumed to have life annuity only benefits.

Salary supplied for the current year was based on the earnings for the year preceding the valuation date. This salary was adjusted by the salary increase rate for one year.

In fiscal years when a 27th pay period occurs the individual pays for employees who were employed throughout the year will be adjusted by multiplying their reported pay by the ratio of 26/27. In years that have only 26 pay periods no adjustment would be needed.

Assumptions were made to correct for missing, bad, or inconsistent data. These had no material impact on the results presented.

APPENDIX B

SUMMARY OF PLAN PROVISIONS

Summary of Plan Provisions

Covered Members

All police officers sworn before September 1, 1975 are covered under Plan 1, except those who elected by December 31, 1981 to participate in Plan 3.

All police officers sworn on or after September 1, 1975, but before September 1, 1981 are covered under Plan 2, except those who elected by December 31, 1981 to participate in Plan 3 and those Plan 1.

All other police officers are covered by Plan 3, except those from Police Cadet Classes 70 and 71 who elected to pay additional contributions and transfer to Plan 1.

Final Compensation

Prior to November 28, 1998

Monthly base salary paid to the participant in his/her last month of service. For any participant from a position held for less than 3 years, final compensation is the average monthly base salary for the 3 years prior to retirement.

After November 28, 1998 but prior to July 1, 2001

Monthly total direct pay less overtime paid to the participant in his/her last month of service. For any participant from a position held for less than 3 years, final compensation is the average monthly base pay for the 3 years prior to retirement plus the other current components of total direct pay.

After July 1, 2001 but prior to October 9, 2004

Highest biweekly pay period (excluding overtime) during the last 26 pay periods annualized. Amounts not paid on a biweekly basis are deducted from period paid. Annual amounts are divided by 26 and added to the highest pay period, including motorcycle allowances.

After October 9, 2004

Average of the last three years of compensation (excluding exempt time, overtime and strategic officer staffing pay). This average will be phased in beginning with the pay period ending after October 9, 2004 until the new definition is fully phased in after 78 pay periods.

Service Retirement

Eligibility

- Sworn prior to October 9, 2004

20 years of service.

- Sworn on or after October 9, 2004

Age 55 with 10 years of service or the sum of age and years of service is at least 70 (Rule of 70).

Benefit

‣ Prior to November 1, 1955	$75 per month plus $2 per month for each year of service in excess of 25 years.
‣ After November 1, 1955 but prior to January 13, 1968	30% of final compensation plus 1 % of final compensation for each year of service in excess of 20 years.
‣ After January 13, 1968 but prior to July 1, 1986	Plans 1 and 2: 30% of final compensation plus 2% of final compensation for each year of service in excess of 20 years. Plan 3: 2% of final compensation for each year of service up to 40 years, reduced 0.42% for each month benefit commencement precedes age 55.
‣ After July 1, 1986 but prior to July 1, 1988	2% of final compensation for each year of service up to 40 years.
‣ After July 1, 1988 but prior to September 1, 1997	45% of final compensation plus 2% of final compensation for each year of service in excess of 20 years; maximum 80% of final compensation. Benefit based on prior formula is payable until July 1, 1991 and recomputed benefit is payable thereafter.
‣ After September 1, 1997 but prior to July 1, 2001	50% of final compensation plus 2% of final compensation for each year of service in excess of 20 years; maximum 80% of final compensation.
‣ After July 1, 2001 but prior to October 9, 2004	55% of final compensation plus 2% of final compensation for service in excess of 20 years. The Pension System recomputed the benefit of each person who retired before July 1, 2001. The retiree's benefit was increased by the result of multiplying the difference between 55% and the percentage used at the time of retirement in computing the retiree's benefit for the first 20 years of service by the base salary of the retiree at the time of retirement. Retroactive cost-of-living increases were not applied to the increased benefit. This recomputed benefit is effective for all payments on or after July 1, 2001.

- After October 9, 2004

Participants sworn prior to October 9, 2004 will receive the highest of the following alternatives using Final Average Compensation effective after October 9, 2004, from October 9, 2004 through October 7, 2007:

1) 2.75% of Final Average Compensation for each of the first 20 years of service plus 2% of Final Average Compensation for each year of service in excess of 20 years, with a maximum of 80% of Final Average Compensation.
2) Benefit participant would have received had participant retired or entered the DROP immediately before October 9, 2004
3) Benefit calculated using a sliding average of the pay received for the pay periods elapsed since October 9, 2004.

New participants after October 9, 2004:

2.25% of Final Average Compensation for each of the first 20 years of service plus 2% of Final Average Compensation for each year of service in excess of 20 years, with a maximum of 80% of Final Average Compensation.

Additional Benefits

An extra monthly benefit of $150.00 is payable for life. Effective November 28, 1998, a $5,000 lump sum is payable upon retirement for members sworn prior to October 9, 2004.

Terminated Vested Pension Benefit

Eligibility

Sworn in before October 9, 2004 and more than 10 but less than 20 years of service. Termination on or after November 28, 1998.

Benefit

2.75% of final average compensation times years of service. This benefit commences at age 60 or at termination of service if later.

Deferred Retirement Option Plan (DROP)

Eligibility

20 years of service and sworn in prior to October 9, 2004.

Benefit

- After September 1, 1995 but prior to September 1, 1997

Eligible participants may elect to participate in the DROP until they leave active service. The member’s retirement pension will be calculated based on service and earnings at the time the DROP is elected

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

- The member's monthly retirement pension, including applicable cost-of-living adjustments,
- The member's contribution to the Pension System, limited to 8.75% of pay, and
- Investment earnings/losses at the rate of the Pension System's earnings/losses averaged over a five-year period. Effective July 1, 2001, this rate is subject to a minimum of 0%.

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

If a DROP participant suffers an on-duty disability resulting in the inability to perform his/her usual and customary duties as a police officer or dies in the line of duty, he (or his survivors) are allowed to revoke the DROP election and to receive the more generous on-duty disability or death benefits.

- After September 1, 1997 but prior to December 1, 1998: The Pension System recomputed the benefit of each person who entered the DROP before September 1, 1997. The benefit was increased in the same manner as the retiree's benefit.
- After December 1, 1998 but prior to July 1, 2001: The Pension System recomputed the benefit of each person who entered the DROP before December 1, 1998. The benefit was recalculated based on Total Direct Pay less overtime upon entry to the DROP. This recomputed benefit is effective for all payments on or after December 1, 1998.
- After July 1, 2001 but prior to October 9, 2004: The Pension System recomputed the benefit of each person who entered the DROP before July 1, 2001. The member's benefit was increased by the result of multiplying the difference between 55% and the percentage used at the time of DROP entry in computing the member's benefit for the first 20 years of service by the base salary of the member at the time of DROP entry. Retroactive cost-of-living increases were applied to the increased benefit. The account balance for each participant was recomputed as if this new benefit had been effective since DROP entry.
- After October 9, 2004 but prior to July 1, 2016: A minimum of 3.00% interest will be credited to existing DROP accounts with a maximum of 7.00%. If the actuary certifies that past service costs are fully funded, the credit may be as high as 10.00%.
- After July 1, 2016: Participants may participate in the DROP for a maximum of 20 years. Cost of living adjustments will not be granted while still active, and the member's contributions to the Pension System will no longer be credited to the DROP account. DROP accounts will be credited with interest equal 65% of the five-year average investment return, with a minimum of 2.50%.

Benefit Recalculation	Effective July 1, 2001, monthly benefit at retirement will be recalculated to be the greater of (i) current monthly benefit, or (ii) monthly benefit based on service at DROP entry and Final Compensation at retirement date.
Back DROP Option	Effective on July 1, 2001, a back DROP option is available for all eligible participants. The DROP account is recalculated under the option based on what the account balance would have been had the participant elected the DROP earlier than he/she actually did. The initial DROP entry date cannot be backdated prior to September 1, 1995 or prior to 20 years of credited service, and must be on the first of the month selected.

**Postretirement
Option Plan (PROP)**

Eligibility	Retired from DROP and sworn in prior to October 9, 2004.
Benefit	
‣ After November 28, 1998 but prior to July 1, 2001	A retired member is allowed to leave all or a portion of their DROP account in the System. These accounts are credited every calendar year with the 30-year Treasury bond rate as of June of the preceding year.
‣ After July 1, 2001	The interest rate earned on PROP accounts will be the same as the interest rate credited to DROP accounts, including a minimum credited rate of 0%.

**Partial Lump Sum
Optional Payment (PLOP)**

Eligibility	Participant on or after October 9, 2004.
Benefit	
‣ After October 9, 2004	Up to 20% of the actuarial value of the accrued pension at retirement.

Disability Retirement

Eligibility	Effective July 1, 2001, a disabled participant is eligible for Disability Retirement as defined below: – Disability is defined as “unable to perform his/her usual and customary duties as a police officer”.

Benefit	
▸ Duty-connected	The service retirement benefit accrued to date of disability. For participants before October 9, 2004, the disability benefit is 2.75% of final average pay times years of service with a minimum of 55% of final average pay. For participants after October 9, 2004, the disability benefit is 2.25% of final average pay times years of service with a minimum of 45% of final average pay.
Additional Benefits	For participants before October 9, 2004, an education allowance equal to 100% of final compensation less disability benefit is payable for up to four years for off-duty or duty-related disability. Proportionate members injured while on-duty as a municipal worker will receive immediate off-duty benefit upon Board approval.

Survivor Benefits

Eligibility	Surviving spouses and dependent children and parents of participants, including surviving spouses of retired or disabled participants who were not married at the time of retirement or disability, provided the spouse was married to the participant for at least 5 years at the time of death.
Benefit	
▸ Prior to September 1, 1997	If duty-connected: monthly lifetime benefit equal to 100% of final compensation at date of death. If not duty-connected: monthly lifetime benefit equal to 100% of the service retirement benefit the participant had accrued at the time of death. Spouse's benefit upon death after retirement: monthly lifetime benefit equal to actual benefit payable at time of death. Dependent children's benefit if no surviving spouse: the benefit that would have been payable to the spouse is divided equally among the dependent children. If there is a surviving spouse, the dependent children of Plan 1 and Plan 2 participants receive $25 per month. Dependent children include unmarried children who are under age 18, and for Plan 3, full-time students under age 22, or permanently disabled children.

Dependent parent's income if no surviving spouse or children, but there is a dependent parent: the benefit that would have been payable to the spouse will be paid to the dependent parent.

- After September 1, 1997 but prior to July 1, 2001

The Pension System recomputed the benefit of each survivor whose original benefit was computed prior to September 1, 1997. The benefit was increased in the same manner as the retiree's benefit.

- After July 1, 2001

The Pension System recomputed the benefit of each survivor whose original benefit was computed prior to July 1, 2001. The benefit was increased in the same manner as the retiree's benefit.

Additional Benefits

Effective December 1, 1998, a $5,000 lump sum is paid upon the death of an active member who was sworn in prior to October 9, 2004.

Effective July 1, 2001, an extra monthly benefit of $150.00 is payable for life. Children receiving equivalent of the spouse's benefit do not receive this additional benefit.

Benefit Adjustments

Cost-of-Living

- Prior to October 9, 2004

Monthly benefits for participants receiving payments are increased each April 1 by 2/3 of the increase in the Consumer Price Index for All Urban Consumers (CPI-U) for the preceding calendar year. Effective September 1, 1997 this increase is subject to a minimum of 3.0% per year compounded and a maximum increase of 8.0% per year compounded.

- Between October 9, 2004 and July 1, 2016

Monthly benefits for participants receiving payments are increased each April 1 by 80% of the increase in the Consumer Price Index for All Urban Consumers (CPI-U) for the preceding year, with a minimum of 2.4% and a maximum of 8%.

- After July 1, 2016

Monthly benefits for participants receiving payments are increased each April 1 by 100% of the five-year average investment return minus 5.00%, with a minimum of 0.00% and a maximum of 4.00%.
COLAs are suspended from July 1, 2017 through July 1, 2020 for members who are not over the age of 70 or receiving a line of duty -connected survivor benefit. Following this period, members will receive their COLA once they reach age 55.

Service Adjustments	Effective November 28, 1998, participants with previous service with the City in non-classified positions may use that service to satisfy the service requirement of 20 years for retirement purposes only. Effective July 1, 2001, participants who have service credit in more than one City of Houston Pension Plan may use their combined service to qualify for DROP participation. Effective July 1, 2001, participants involuntarily transferred to the System from the Houston Municipal Employees System will receive service under this plan for years worked while serving as a City Marshall, Airport Police or Park Police.

Contributions

Employee Contributions

‣ Prior to December 1, 1998	Each participant contributes 8.75% of base salary.
‣ After December 1, 1998 but before October 9, 2004	Each participant contributes 8.75% of average total direct pay less overtime.
‣ Between October 9, 2004 and July 1, 2016	
– Members sworn in prior to October 9, 2004	Each participant contributes 9.00% of pay. The additional 0.25% will be credited to the Plan's general fund. 8.75% of pay is used for purposes of crediting eligible DROP accounts.
– Others	Each participant contributes 10.25% of pay, which will be credited to the Plan's general fund.
‣ After July 1, 2016	Each participant contributes 10.50% of pay, which will be credited to the Plan's general fund.

Refunds	Contributions are refunded without interest.

Employer Contribution The City of Houston will contribute the City Contribution Rate which will consistent of a normal cost contribution and a fixed layer closed amortization schedule with each new loss layer having a 30 year period. Each layer will be assumed to begin with the fiscal year beginning 12 months after the valuation date.

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RETIREMENT HORIZONS INCORPORATED

City of Houston

HPOPS

Proposed Initial Risk Sharing

Valuation Study

As of July 1, 2016

August 25, 2017

August 25, 2017

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

Re: HPOPS Proposed Initial Risk Sharing Valuation Study

Dear Kelly:

Texas Revised Statutes article 6243g-4 (the Article) sets forth requirements for an initial Risk Sharing Valuation Study (RSVS) of the Houston Police Officers' Pension System (HPOPS). The purpose of this study is to determine the City Contribution Rate for Fiscal Year 2018. The initial Study will also be used to set the Risk Sharing Corridor Midpoint, Minimum Contribution Rate, and Maximum Contribution Rate for the next 31 years. Retirement Horizons Inc. (RHI) was engaged by the City of Houston to perform this proposed initial Risk Sharing Valuation Study as the municipal actuary. This report provides the results of the Study and is organized as follows:

- Section 1 – Forecast of Corridor Midpoint
- Section 2 – Actuarial Exhibits
- Section 3 – Summary of Plan Provisions
- Section 4 – Actuarial Methods and Assumptions
- Section 5 – Summary of Valuation Data
- Section 6 – Data Sources

RHI received Actuarial Data as defined in Section 1-a of the Article and required by Section 9A(a) of the Article. RHI conducted our proposed initial RSVS using the Actuarial Data provided and plan provisions as summarized in this report. The analysis presented in this report is based on the interest rate assumption and actuarial cost and asset methods prescribed by law. All other actuarial methods and assumptions summarized in this report were adopted by the City of Houston Finance Department based on existing assumptions used by HPOPS in its July 1, 2016 actuarial valuation and input from RHI for the assumptions resulting from the changes in the plan provisions and compliance with the Article. Please note, the HPOPS actuary's proposed initial RSVS report dated July 11, 2017 was provided to RHI on August 1, 2017.

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

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

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

The signing 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

Carly A. Nichols

David A. Sawyer, FSA EA MAAA
Senior Consultant

Carly A. Nichols, FSA EA MAAA
Actuarial Consultant

Forecast of Corridor Midpoint

Forecast of Corridor Midpoint - 7% Interest Rate

The table below contains a forecast of the Corridor Midpoint, along with the corresponding Minimum and Maximum Contribution Rates using a 5% Corridor Margin as specified in the Article. Based on RHI's initial RSVS results, the City Contribution Rate for FY 2018 would be 32.18% of pensionable payroll.

FY	City Normal Cost Rate	Admin. Expenses	Amort. of Legacy Liability	Corridor Midpoint	Minimum Contribution Rate	Maximum Contribution Rate
2018	12.24%	1.00%	18.94%	32.18%	27.18%	37.18%
2019	12.27%	1.00%	18.94%	32.21%	27.21%	37.21%
2020	12.29%	1.00%	18.94%	32.23%	27.23%	37.23%
2021	12.32%	1.00%	18.94%	32.26%	27.26%	37.26%
2022	12.34%	1.00%	18.94%	32.28%	27.28%	37.28%
2023	12.36%	1.00%	18.94%	32.30%	27.30%	37.30%
2024	12.38%	1.00%	18.94%	32.32%	27.32%	37.32%
2025	12.41%	1.00%	18.94%	32.35%	27.35%	37.35%
2026	12.43%	1.00%	18.94%	32.37%	27.37%	37.37%
2027	12.45%	1.00%	18.94%	32.39%	27.39%	37.39%
2028	12.46%	1.00%	18.94%	32.40%	27.40%	37.40%
2029	12.48%	1.00%	18.94%	32.42%	27.42%	37.42%
2030	12.49%	1.00%	18.94%	32.43%	27.43%	37.43%
2031	12.50%	1.00%	18.94%	32.44%	27.44%	37.44%
2032	12.52%	1.00%	18.94%	32.46%	27.46%	37.46%
2033	12.53%	1.00%	18.94%	32.47%	27.47%	37.47%
2034	12.54%	1.00%	18.94%	32.48%	27.48%	37.48%
2035	12.55%	1.00%	18.94%	32.49%	27.49%	37.49%
2036	12.56%	1.00%	18.94%	32.50%	27.50%	37.50%
2037	12.56%	1.00%	18.94%	32.50%	27.50%	37.50%
2038	12.57%	1.00%	18.94%	32.51%	27.51%	37.51%
2039	12.57%	1.00%	18.94%	32.51%	27.51%	37.51%
2040	12.57%	1.00%	18.94%	32.51%	27.51%	37.51%
2041	12.57%	1.00%	18.94%	32.51%	27.51%	37.51%
2042	12.57%	1.00%	18.94%	32.51%	27.51%	37.51%
2043	12.57%	1.00%	18.94%	32.51%	27.51%	37.51%
2044	12.57%	1.00%	18.94%	32.51%	27.51%	37.51%
2045	12.57%	1.00%	18.94%	32.51%	27.51%	37.51%
2046	12.57%	1.00%	18.94%	32.51%	27.51%	37.51%
2047	12.56%	1.00%	18.94%	32.50%	27.50%	37.50%
2048	12.56%	1.00%	0.00%	13.56%	8.56%	18.56%

Actuarial Exhibits

3.1. Actuarial Value of Assets

1. Actuarial Value of Assets, beginning of prior year	N/A
2. Net Cash Flow	
a. Contributions	N/A
b. Disbursements	N/A
c. Net Cash Flow [2.a. - 2.b.]	N/A
3. Expected Investment Return [1. x 0.07] + [2.c. x 0.035]	N/A
4. Expected Actuarial Value of Assets at end of year [1. + 2.c. + 3.]	N/A
5. Market Value of Assets at end of year	$ 4,758,079,034
6. Difference [5. - 4.]	N/A

7. Development of Actuarial Value of Assets, end of year

Fiscal Year End	Remaining Deferrals of Excess (Shortfall) of Investment Income	Offsetting of Gains/(Losses)	Net Deferrals Remaining	Years Remaining	Recognized for This Valuation	Remaining after This Valuation
2016	$ -	$ -	$ -	1	$ -	$ -
2017	N/A	N/A	N/A	2	N/A	N/A
2018	N/A	N/A	N/A	3	N/A	N/A
2019	N/A	N/A	N/A	4	N/A	N/A
2020	N/A	N/A	N/A	5	N/A	N/A
Total	$ -	$ -	$ -		$ -	$ -

Actuarial Value of Assets as of July 1, 2016 $ 4,758,079,034

Actuarial Exhibits

3.2. Actuarial Accrued Liability

	July 1, 2016
A. Discount Rate	7.0%
B. Actuarial Accrued Liability	
1. Active	2,785,521,245
2. Terminated Vested	6,440,221
3. Disabled	104,387,919
4. Retired	3,262,975,448
5. Total	$6,159,324,833
C. Change in Actuarial Accrued Liability	
1. Benefits Accumulated	N/A
2. Benefits Paid	N/A
3. Decrease in Discount Period	N/A
4. Plan Experience	N/A
5. Actuarial Assumptions	N/A
6. Actuarial Methods	N/A
7. Plan Amendments	N/A
8. Net Change	N/A
D. Actuarial Value of Assets	$4,758,079,034
E. Unfunded Actuarial Liability	$1,401,245,799
F. Total Normal Cost % of Payroll	22.74%
G. Member Contribution % of Payroll	10.50%
H. City Normal Cost Rate [F - G]	12.24%

Actuarial Exhibits

3.3. Gain/Loss Analysis

		Liability	Assets	Unfunded
A.	Values at Prior Year Beginning	N/A	N/A	N/A
B.	Expected Changes During Year			
	1. Normal Cost	N/A	N/A	N/A
	2. Contributions	N/A	N/A	N/A
	3. Benefits Paid	N/A	N/A	N/A
	4. Interest on			
	a. Item A	N/A	N/A	N/A
	b. Item B.1	N/A	N/A	N/A
	c. Item B.2	N/A	N/A	N/A
	d. Item B.3	N/A	N/A	N/A
	5. Total Expected Changes	$0	$0	$0
C.	Expected Values at Prior Year End	N/A	N/A	N/A
D.	Other Changes			
	1. Plan Experience	N/A	N/A	N/A
	2. Actuarial Assumptions	N/A	N/A	N/A
	3. Actuarial Methods	N/A	N/A	N/A
	4. Plan Amendments	N/A	N/A	N/A
	5. Total Other Changes	$0	$0	$0
E.	Actual Values as of Current Year Beginning	$6,159,324,833	$4,758,079,034	$1,401,245,799

Actuarial Exhibits

3.4. Liability Layers

Fiscal Year	Initial Amount of Liability Layer (BOY)	Liability Layer to be Amortized (EOY)	Amortization Period	Payoff Year	Amortization Amount	Level Percent of Payroll Amortization Rate
2016	$1,401,245,799	$1,420,121,991	30	2047	$82,932,273	18.94%
Total						18.94%

Summary of Plan Provisions

Eligibility and Participation	Any police officer shall automatically become a participant in the plan upon graduation from the police academy.
Final Average Pay (FAP)	The average of the 78 bi-weekly payroll periods of salary prior to termination of employment or DROP date, before reduction for pre-tax employee contributions and salary deferrals but excluding overtime, executive level pay, strategic officer staffing program pay, motorcycle allowance, clothing allowance and mentor pay.
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 Police Department, but excluding any period of DROP participation.

Retirement Benefit

Eligibility

➢ Sworn prior to October 9, 2004	Earlier of 20 years of service or the age at which the member attains both age 60 and at least 10 years of service.
➢ Sworn after October 9, 2004	Rule of 70, when age plus service total at least 70.

Amount

➢ Sworn prior to October 9, 2004	Accrued benefit of 2.75% of FAP times credited service up to 20 years of service, plus 2.0% of FAP for credited service in excess of 20 years. In addition, the member will receive a $5,000 lump sum.
➢ Sworn after October 9, 2004	Accrued benefit of 2.25% of FAP times credited service up to 20 years of service, plus 2.0% of FAP for credited service in excess of 20 years, up to a maximum of 80% of FAP.

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 o Refund of contributions without interest, or o Monthly benefit determined as set forth above payable at normal retirement age

Summary of Plan Provisions

On-Duty Disability

Eligibility	No age or service requirements.
Amount	Officers who are not capable of performing their normal and customary police officer duties receive the greater of their accrued retirement benefit or 45% of FAP (100% of FAP for officers with a Catastrophic Disability). If sworn prior to October 9, 2004, the benefit is the greater of the accrued retirement benefit or 55% of FAP, and the member will receive a $5,000 lump sum.

Off-Duty Disability

Eligibility	No age or service requirements.
Benefit	Officers who are not capable of performing their normal and customary police officer duties receive the greater of their accrued retirement benefit or 22.5% of FAP (27.5% of FAP if sworn prior to October 9, 2004, plus $5,000 lump sum).

Active Member Death

Eligibility	No age or service requirements.
Duty Related Benefit	100% of Final Average Pay (FAP). In addition, if the member was sworn before October 9, 2004, a $5,000 lump sum will be paid, divided equally among eligible survivors.
Non-Duty Related Benefit	Greater of the accrued retirement benefit or Off-Duty Disability benefit. In addition, if the member was sworn before October 9, 2004, a $5,000 lump sum will be paid, divided equally among eligible survivors.
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. The benefit is paid for at least five years following the member's retirement date, even if the beneficiary dies.
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.

Summary of Plan Provisions

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

The five-year investment return less 5%. The COLA will be no less than 0% nor greater than 4%. Only retired members or survivors who are age 55 or older, received benefits prior to June 8, 1995, or survivors of members who died in the line of duty will be eligible for the COLA. Notwithstanding the foregoing, there will be no COLA for retired members or survivors under age 70 for the first three years after July 1, 2017.

DROP

Upon reaching retirement eligibility, members sworn prior to October 9, 2004 may enter the Deferred Retirement Option Plan (DROP). The member's monthly annuity (without COLA) is added to a notional account. Interest is credited on the account using 65% of the 5-year compound average of the Fund's rate of return, with a minimum of 2.5%. Members may remain in DROP for a maximum of 20 years.

PROP

Members sworn prior to October 9, 2004 may have participated in the Post Retirement Option Plan (PROP) at or after service retirement and prior to July 1, 2017. No new amounts are credited to PROP after that date. Account balances are credited with interest at the same rate credited to DROP balances.

PLOP

Members sworn after October 9, 2004 are eligible for the Partial Lump Sum Option Plan (PLOP) at service retirement eligibility. The member receives a reduced monthly benefit plus a lump sum of up to 20% of the value of the unreduced annuity.

Contribution Rates

Members

10.50% of pensionable pay.

City

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

Actuarial Methods and Assumptions

Actuarial Cost Methods

Measurement Date	Census data as of July 1, 2016 for all members. 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 plus receivable contributions, with smoothing of future gains and losses over a period of no more than five years (that is, initial Actuarial Value equal to Fair Market Value with smoothing thereafter). 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> 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 law.
Inflation	2.25%.
Wage Inflation	2.75%.
Payroll Growth	2.75%.

Actuarial Methods and Assumptions

Individual Pay Increase Rate

A service-related assumption:

Service	*Rate*
1	14.75%
2	11.75%
3	10.00%
4	8.75%
5	8.25%
6	7.75%
7	7.00%
8	6.75%
9	6.25%
10	6.00%
11	5.75%
12	5.50%
13	5.25%
14	5.00%
15	4.75%
16	4.50%
17	4.25%
18+	2.75%

DROP Interest Crediting Rate

5.10%. Please note: 5.90% was assumed to be credited prior to the valuation date. This reflects the historical assumption, since actual rates of return on DROP balances were not provided.

COLA

2.00%

Actuarial Methods and Assumptions

Demographic Assumptions

Mortality Rates

- Healthy retirees — The RP2000 Combined Healthy Mortality Tables with Blue Collar Adjustment with male rates multiplied by 109% and female rates multiplied by 103%. The rates are projected on a fully generational basis by scale BB.

- Disabled males and females — The RP2000 Disabled Retiree Mortality Tables without adjustment. The rates are projected on a fully generational basis by scale BB.

- Active members — The RP2000 Combined Healthy Mortality Tables with Blue Collar Adjustment with male rates multiplied by 54% and female rates multiplied by 51%. The rates are projected on a fully generational basis by scale BB. An additive factor of .0003 is applied to all active mortality rates.

Retirement Rates

	Service		
Age	***<25***	***25 - 29***	***30+***
40 - 49	4.0%	6.0%	10.0%
50 - 54	4.0%	6.0%	10.0%
55 - 59	6.8%	10.2%	17.0%
60 - 64	9.6%	14.4%	24.0%
65+	100.0%	100.0%	100.0%

For members sworn after October 9, 2004, rates in the first year of eligibility were increased by 30%, less 3% for each year below age 55. For members currently in DROP, the rates above were multiplied by 1.1.

Eligible members are assumed to enter DROP at first eligibility and remain in DROP until retirement or reaching the maximum 20 years in DROP.

Actuarial Methods and Assumptions

Disability Rates

Age	Males	Females
20	0.1149%	0.1149%
25	0.1145%	0.1145%
30	0.1197%	0.1197%
35	0.1321%	0.1321%
40	0.1516%	0.1516%
45	0.1785%	0.1785%
50	0.2126%	0.2126%
55	0.2538%	0.2538%
60	0.3023%	0.3023%

Percentage of Deaths and Disabilities in the Line of Duty

- Deaths 100%
- Disabilities 100%

Termination Rates

Sample Rates

Service	Termination Rate
1	2.71%
3	1.95%
5	1.40%
7	1.01%
9	0.72%
11	0.52%
13	0.37%
15	0.27%
17	0.19%
19	0.14%
20+	0.10%

For participants with at least 10 years of service but less than 20 years, 50% are assumed to elect a contribution refund, and 50% are assumed to elect a deferred monthly benefit. A commencement age of 60 was used for members hired prior to 2004, and a commencement age of 55 was used for members hired in 2004 and later.

Actuarial Methods and Assumptions

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 maximum of the past five years of pay or $31,000 with the nominal individual pay increase rate. Historical valuation pay for years before data was available was regressed with the nominal individual pay increase rate.
Payment of DROP Balances	Installments over 10 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 (0.9310 at 5.10% DROP interest crediting and 7.0% interest).
Administrative Expenses	1.00% of payroll
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 rate, plus the administrative expenses rate, plus 30-year amortization rate of the Unfunded Actuarial Accrued Liability (UAAL) less the member contribution rate, adjusted with interest to mid-year. The 30-year closed amortization rate of the UAAL is calculated as a level percent of pay.
Benefits Not Valued	Due to limitations of the data received, no adjustment has been made for the difference between pay based on the classified position and executive level pay.

Summary of Valuation Data

	July 1, 2016
A. Active Members Not in DROP	
1. Number	3,204
2. Valuation payroll	$235,020,845
3. Average pay	$73,352
4. Average age	36.5
5. Average service	8.8
B. Active Members in DROP	
1. Number	2,057
2. Valuation payroll	$191,140,953
3. Average pay	$92,922
4. Average age	52.1
5. Average service	26.5
C. Terminated Vested	
1. Number	32
2. Total benefits	$785,327
3. Average Annual benefits	$24,541
D. Disabled	
1. Number	161
2. Total benefits	$7,221,170
3. Average Annual benefits	$44,852
E. Retired	
1. Number	3,002
2. Total benefits	$155,529,581
3. Average Annual benefits	$51,809
F. Beneficiaries	
1. Number	713
2. Total benefits	$30,196,683
3. Average Annual benefits	$42,352

Notes:

1. DROP Balance values not shown.

Data Sources

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

- Individual census data as of July 1, 2016 was originally provided by the HPOPS actuary on October 7, 2016.
- The fair value of assets of $4,080,460,000 as of June 30, 2016 is from the HPOPS July 1, 2016 Actuarial Valuation Report dated October 7, 2016. It is our understanding this amount includes a contribution receivable of $14.284 million based on the plan's funded status being below 80% as of July 1, 2015 as well as the discounted value of the $750 million of Pension Obligation Bonds anticipated to be deposited to the trust December 31, 2017.
- Fiscal Year 2017 payroll of $426,161,798 was based on the highest year in the past five in the individual census data projected forward with one year of assumed salary increase. Adjustments were made to use a minimum pay of $31,000.
- The provisions of the Article are contained in the enrolled text of Senate Bill 2190, which was signed by the Governor on May 31, 2017.