CHEIRON

Classic Values, Innovative Advice

# Fire and Police Employees' Retirement System of the City of Baltimore

## Actuarial Valuation Report as of June 30, 2018

**Produced by Cheiron**

**October 2018**

www.cheiron.us 1.877.CHEIRON (243.4766)

## TABLE OF CONTENTS

October 16, 2018

Board of Trustees
Fire and Police Employees' Retirement System
of the City of Baltimore
7 East Redwood Street, 18th Floor
Baltimore, Maryland 21202-3470

Dear Members of the Board:

We are pleased to submit the June 30, 2018 actuarial valuation report of the Fire and Police Employees' Retirement System of the City of Baltimore (System). This report contains information on System assets, liabilities, and contributions and discloses required employer contribution levels. Financial disclosures are provided in a separate Governmental Accounting Standards Board (GASB) Statement Nos. 67/68 report.

In preparing our report, we relied on information (some oral and some written) supplied by the System's staff. This information includes, but is not limited to, plan provisions, member data, and financial information. The actuarial assumptions reflect our understanding of the likely future experience of the System and represent our best estimate, in cooperation with the views of the Board of Trustees (Board), for the future experience of the System. The required contribution developed in this report is only applicable to the employer contributions for Fiscal Year (FY) 2020 and relies on future System experience conforming to the underlying assumptions. To the extent that actual System experience deviates from the underlying assumptions, the results will vary accordingly.

To the best of our knowledge, this report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices that are consistent with the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board, including the use of assumptions and methods for funding purposes that comply with the Actuarial Standards of Practice. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys, and our firm does not provide any legal services or advice.

This report was prepared solely for the Fire and Police Employees' Retirement System of the City of Baltimore for the purposes described herein, except that the System auditor may rely on this report solely for the purpose of completing an audit related to the matters herein. This valuation report is not intended to benefit any third party, and Cheiron assumes no duty or liability to any such party.

Sincerely,
Cheiron

Fiona E. Liston, FSA, EA
Principal Consulting Actuary

Elizabeth Wiley, FSA, EA
Consulting Actuary

Brett Warren, FSA, EA
Associate Actuary

# FOREWORD

Cheiron is pleased to provide the annual actuarial valuation report of the **Fire and Police Employees' Retirement System of the City of Baltimore (System)** as of June 30, 2018. The purpose of this report is to:

1) **measure and disclose**, as of the valuation date, the financial condition of the System,

2) **report** on past and expected financial trends, and

3) **determine** the recommended employer contributions for Fiscal Year (FY) 2020.

An actuarial valuation establishes and analyzes System assets and liabilities on a consistent basis and traces the progress of both from one year to the next. It includes measurement of the System's investment performance as well as an analysis of actuarial liability gains and losses. This valuation report is organized as follows:

**Section I** presents a summary of the valuation and compares this year's results to last year's results.

**Section II** contains exhibits relating to the valuation of assets.

**Section III** shows the various measures of liabilities and presents an analysis of the experience gains and losses over the past year and the source of changes to the unfunded actuarial liability.

**Section IV** develops the City of Baltimore (City) and State of Maryland (State) contribution rates.

The appendices to this report contain a summary of the System's membership at the valuation date, a summary of the major provisions of the System, and the actuarial methods and assumptions used in developing the valuation.

In preparing our report, we relied on information (some oral and some written) supplied by the System's staff. This information includes, but is not limited to, the plan provisions, employee data, and financial information.

The actuarial assumptions reflect our understanding of the likely future experience of the System, and the assumptions as a whole represent our best estimate for the future experience of the System. The results of this report are dependent upon future experience conforming to these assumptions. To the extent that future experience deviates from the actuarial assumptions, the true cost of the System could vary from our results.

**SECTION I - SUMMARY**

## General Comments

This is the seventh actuarial valuation report prepared for the System by Cheiron. The results prior to June 30, 2012 in the historic trend charts are those produced by the System's former actuary.

The Baltimore City Code requires an experience study of the System to be performed at least once every three years and the Board of Trustees to adopt assumptions and methodologies based upon this study. Cheiron performed its second complete experience study for the System this past year. The analysis covered both economic and demographic assumptions. The Board adopted recommended changes, including:

- Recommended demographic assumption changes, including updates to the termination rates, retirement rates, disability rates, DROP/DROP2 exit rates, percent married, children and benefit loads
- Decrease in rate of investment return assumption from 7.50% to 7.25%, and
- Decrease in inflation assumption from 3.00% to 2.75%.

The impact of these changes is reflected in the June 30, 2018 valuation and resulting Fiscal Year (FY) 2020 contributions. The assumptions and methods reflected in the results of this valuation are listed in Appendix C.

The employer annual contributions to this System, for both the City and the State, are determined as the sum of the net normal cost rate, reflecting a provision for expenses, and an amortization of the System's unfunded actuarial liability. The employer contribution rates will change when benefits are modified, assumptions are changed, or the characteristics of the members change. The rate also changes in response to gains and losses on either the assets or the liabilities of the System.

The key results of the June 30, 2018 actuarial valuation are as follows:

- The total recommended employer contribution for FY 2020 is $147.2 million, increased from $141.8 million for FY 2019 as a reflection of the prior years' experience and the assumptions adopted as a result of the 2017 experience study. The City's portion of the total employer contribution for FY 2020 is $146.3 million compared to $140.9 million for FY 2019.

- Investments earned 8.40%, on a market value basis, for the period ending June 30, 2018, resulting in an investment gain on the market value of assets (MVA) of $22.6 million. Due to smoothing of the prior investment gains and losses, the actuarial value of assets (AVA) return was 5.78%, producing a loss of $49.9 million to the System on that basis. Both returns are measured against the prior year's 7.50% expected return.

- The unfunded actuarial liability on a AVA basis [actuarial liability (AL) – AVA] increased from $1,075.7 million on June 30, 2017 to $1,172.4 million on June 30, 2018 due to the actuarial investment loss discussed above partially offset by a liability gain of $20.0 million, and an increase of $86.4 million due to change in assumptions adopted as a result of the experience study. The liability gain is primarily due to salary increases being less than expected for continuing actives. The System's AVA funded ratio, the ratio of the actuarial value of assets over liabilities, decreased from 71.1% as of June 30, 2017 to 69.8% as of June 30, 2018 .

## Summary Tables

The tables below provide details on the development of the City's contribution, together with the corresponding figures from the June 30, 2017 report. Details of this development, along with the State contribution calculations, are provided in Section IV.

**Table I-1**
**Valuation Summary of City Only Costs**

| | 2017 Valuation Applies to FY 2019 Amount | 2017 Valuation % of Pay | 2018 Valuation Applies to FY 2020 Amount | 2018 Valuation % of Pay |
|---|---|---|---|---|
| **1. Contributions** | | | | |
| Total Normal Cost | $ 70,640,805 | 23.86% | $ 69,746,231 | 21.58% |
| Expense Load | 4,441,785 | 1.50% | 4,847,746 | 1.50% |
| Expected Member Conts. for FY | (29,611,900) | (10.00%) | (32,318,305) | (10.00%) |
| Net Normal Cost | $ 45,470,690 | 15.36% | $ 42,275,672 | 13.08% |
| Interest to Val. Date + One Year | $ 1,364,121 | 0.46% | $ 1,162,581 | 0.36% |
| Amortization of Unfunded Actuarial Liability | $ 93,618,333 | 31.62% | $ 102,445,323 | 31.70% |
| Net Plan Cost at Val. Date + One Year | $ 140,453,144 | 47.44% | $ 145,883,576 | 45.14% |
| Adjustment to Payment Date* | $ 424,514 | 0.13% | $ 426,691 | 0.13% |
| Net Plan Cost at Val. Date + One Year (with adjustment) | $ 140,877,658 | 47.57% | $ 146,310,267 | 45.27% |
| **2. Unfunded Liabilities** | | | | |
| Actuarial Liability | | | | |
| Actives | $ 1,207,773,348 | | $ 1,315,645,844 | |
| Retirees and Dependents | 2,477,384,003 | | 2,535,962,168 | |
| Terminated Vesteds | 1,182,483 | | 1,007,010 | |
| Total | $ 3,686,339,834 | | $ 3,852,615,022 | |
| Allocated Actuarial Value of Assets | $ 2,620,497,815 | | $ 2,689,902,888 | |
| Unfunded Actuarial Liability | $ 1,065,842,019 | | $ 1,162,712,134 | |

* FY 2019 and 2020 contribution assumed to be made 49.85% at July 1 and 50.15% at August 1

## SECTION I - SUMMARY

The following tables summarize changes in System membership over the past year.

**Table I-2**
**Active Membership Summary**

| | Active Members (City & State) | | |
|---|---|---|---|
| | **2017** | **2018** | **% Increase** |
| Active Members | 4,012 | 4,049 | 0.92% |
| Total Pensionable Payroll | $ 296,356,741 | $ 305,372,850 | 3.04% |
| Average Pensionable Payroll | $ 73,868 | $ 75,419 | 2.10% |
| Total Projected Current Payroll | $ 310,512,535 | $ 323,350,763 | 4.13% |
| | | | **Absolute Difference** |
| Average Age | 40.95 | 41.11 | 0.16 |
| Average Service | 14.06 | 13.99 | (0.07) |

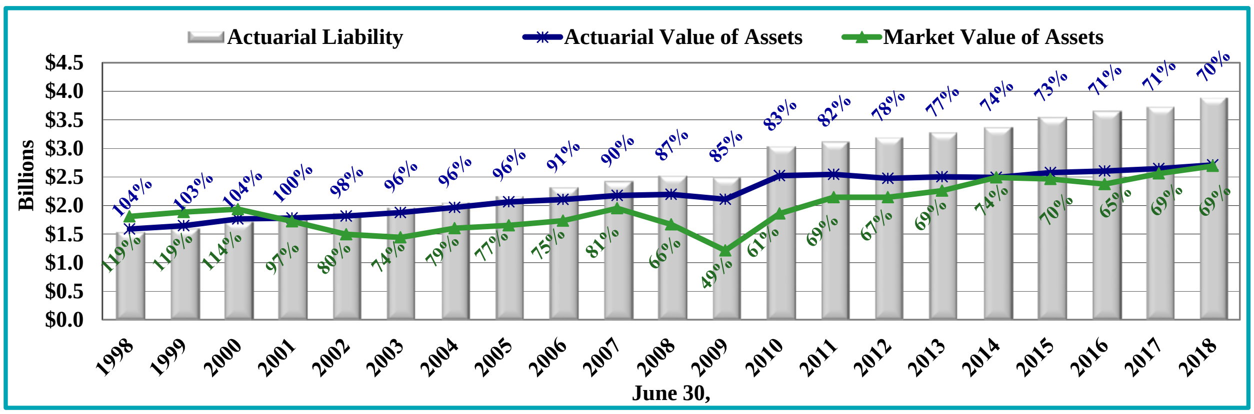
**Table I-3**
**Inactive Membership Summary**

| | Number of Retirees | | | Average Annual Benefit Amount | | |
|---|---|---|---|---|---|---|
| | **2017** | **2018** | **% Increase** | **2017** | **2018** | **% Increase** |
| Normal Service Retirement | 3,808 | 3,784 | (0.6%) | $ 42,738 | $ 43,706 | 2.3% |
| Early Retirement | 14 | 23 | 64.3% | 28,264 | 31,232 | 10.5% |
| Discontinued Service | 13 | 13 | 0.0% | 31,627 | 31,727 | 0.3% |
| Non-Line-of-Duty Disability | 240 | 233 | (2.9%) | 19,870 | 20,213 | 1.7% |
| Line-of-Duty Disability | 727 | 725 | (0.3%) | 37,169 | 37,845 | 1.8% |
| Beneficiaries of Above | 1,334 | 1,341 | 0.5% | 18,469 | 18,947 | 2.6% |
| Non-Line-of-Duty Death | 124 | 119 | (4.0%) | 25,401 | 25,567 | 0.7% |
| Line-of-Duty Death | 59 | 58 | (1.7%) | 47,326 | 48,257 | 2.0% |
| **Total** | **6,319** | **6,296** | **-0.4%** | **$ 35,753** | **$ 36,517** | **2.1%** |

## Historical Trends

It is important to take a step back from these latest results and view them in the context of the System's recent history. Below we present a series of charts displaying key factors in the valuations of the last 21 years.

### <u>Assets and Liabilities</u>




The bars represent the actuarial liability (AL) as measured for funding purposes in the valuations. We compared this liability measure to the actuarial value of assets (AVA) in each report to develop the AVA funded ratios for each year; these are the blue percentages shown in the graph along the top of each bar. We also compare these liability measures to the market value of assets (MVA) in each report to develop the MVA funded ratios for each year; these are the green percentages shown in the graph in the middle of each bar.

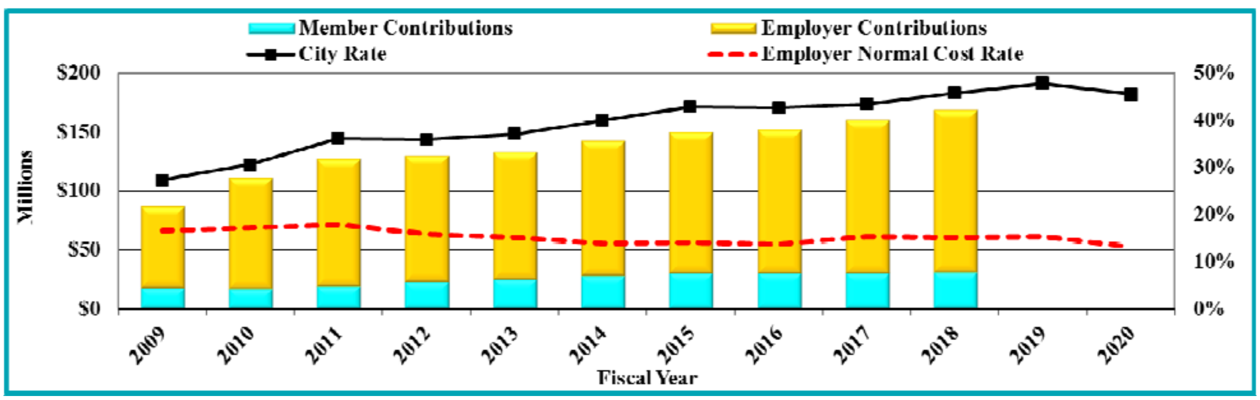
As shown, the System had its highest funded ratios in the late 1990s, when the ratios, based on both MVA and AVA, were over 100%. The two market declines in 2000 – 2002 and in 2007 – 2009 caused declines in the funded ratio. Both the liability and assets shown in 2010 and later include the former BIF, ERF, and MSF funds, as well as their liabilities, but the actuarial assets reflect a gradual recognition of these balances through 2014, at which point they were fully recognized. This recognition is largely responsible for the decline in the funded ratio based on the AVA leading up to the full recognition of these funds in 2014. The AVA was set equal to the MVA in 2014, with smoothing to develop the AVA begun again in 2015. In 2015-2018, both funded ratios decreased slightly, primarily due to investment losses and changes to the actuarial assumptions (2015 and 2018).

## SECTION I - SUMMARY

### Contribution Rates

The stacked bars in the graph below show the contributions made by the employers and members and are read using the left-hand scale, in millions of dollars. The yellow employer contributions amounts reflect both the City and State contributions. The black line shows the employer contribution rate for the City only as a percentage of payroll and is read using the right-hand scale. There are two more years of contribution rates shown than contribution dollar amounts, since we already know the rates in effect for Fiscal Years 2019 and 2020. We will not know the actual dollar amounts contributed by the City and State until the close of those years.

The red line shows the employer net normal cost, the portion of the total normal cost rate that is paid by the employers rather than by the members. The normal cost measures the value of benefits to be accrued in the coming year taking into consideration future salary increases. The employer net normal cost rate decreases over the period FY 2011 through FY 2014 as member contributions increased. The employer normal cost rate increased in FY 2017 due to the changes in both assumptions and funding method. It then is relatively flat for FY 2018 and FY 2019 and decreases slightly in FY 2020 due to the changes in assumptions.



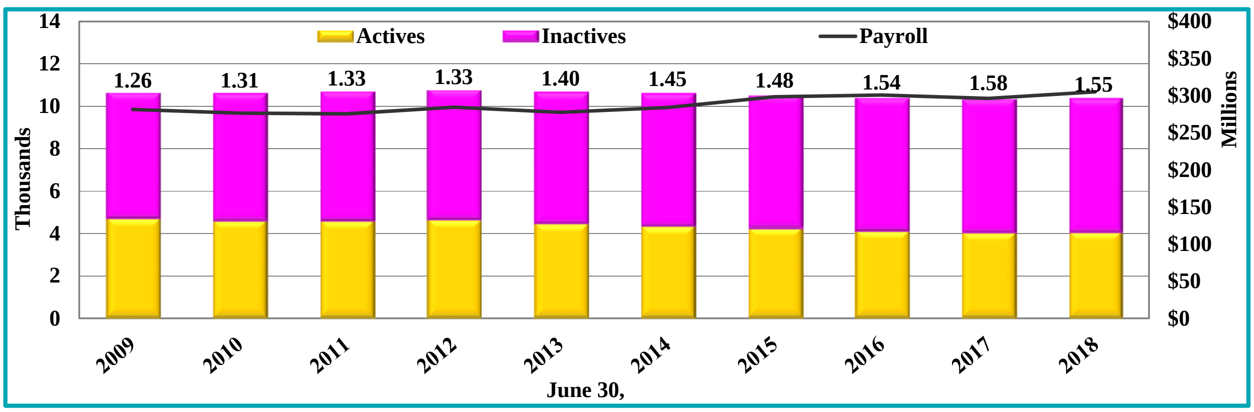
## SECTION I - SUMMARY

**Member Trends**

The chart below shows the membership counts of the System at successive valuations. The numbers that appear above each bar represent the ratio of the number of inactive members to active members at each valuation date.

The number of inactives per each active has been steadily increasing since 2009. An increasing ratio is a sign of plan maturity and should continue to be monitored. As a plan becomes more mature, the assets backing the retiree benefits become large relative to the contribution base, i.e. the active participant payroll. As assets grow relative to the pensionable payroll, any experience gain or loss can have a significant impact, resulting in volatile costs from year-to-year even with the application of smoothing methods.

The black line in the chart that follows shows the total covered payroll over the period and is read using the right-hand scale. Contributions are made as a percent of payroll, so changes in this key statistic have an impact on the System's funding status.



## Projections

The charts in this section show the expected progress of the System's funding status over the next 25 years, measured in terms of the AVA funded ratio, the expected total employer contribution rates, and the total dollar amounts of contributions, assuming that the Plan is ongoing.

The baseline projections include the adopted Board changes including demographic changes, the 7.25% rate of return assumption, and the 2.75% inflation assumption. It is important to note that the experience will not conform exactly to the assumptions every year. As a result, in addition to the baseline projection, we provided additional stress testing based on varying returns in the future as variation in this assumption is typically the most significant driver of variation in results. For each projection set, we assume three different future investment return scenarios: baseline returns of 7.25%, optimistic returns of 9.25%, and pessimistic returns of 5.25%.

For purposes of these projections, it is assumed that gains and losses will be amortized over the remaining period of the current amortization period until that reaches 15 years and after that date each year's gains and losses will be amortized over its own 15-year period in addition to the remaining amortization of the prior gains and losses.

Finally, the projections assume there will be no future gains or losses on the liability. These projections also assume all of the valuation assumptions are exactly met, including the long-term rate of return assumed for each scenario and covered payroll increasing by the inflation assumption, 2.75% per year in all three scenarios.

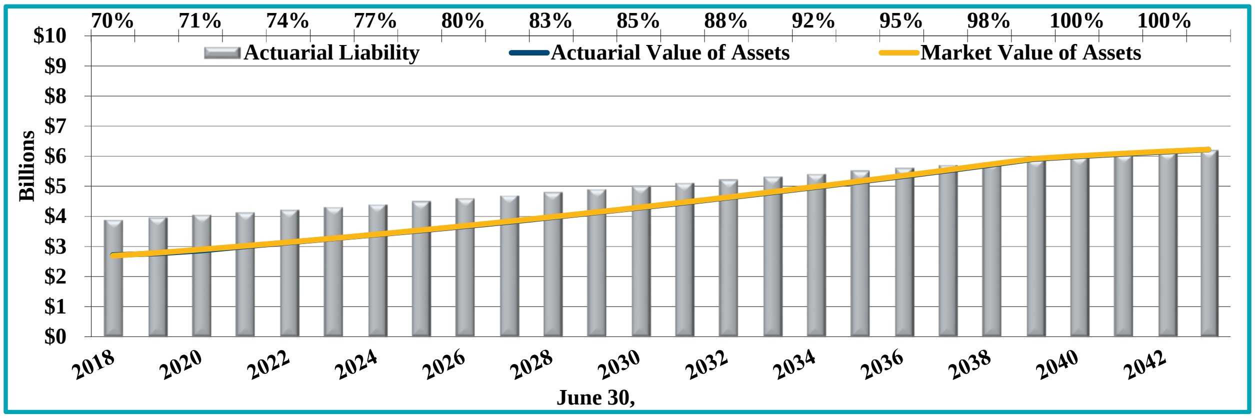
## SECTION I - SUMMARY

### 1. Asset and Liability Projections

This first set of projection charts compares the market value of assets (MVA) (gold line) and the actuarial or smoothed value of assets (AVA) (blue line) to the Plan's actuarial liabilities (AL) (gray bars). In addition, at the top of each chart, we show the Plan's AVA funded ratio (ratio of AVA to AL). The years shown in the chart signify the valuation date as of June 30 of the labeled year.

**Baseline Returns of 7.25%**

The first chart below shows that if all actuarial assumptions, including the rate of return assumption, are exactly met, the System's AVA funded ratio, shown along the top of the graph, is projected to improve from the current level of 70% to 100% by the 2039 valuation.

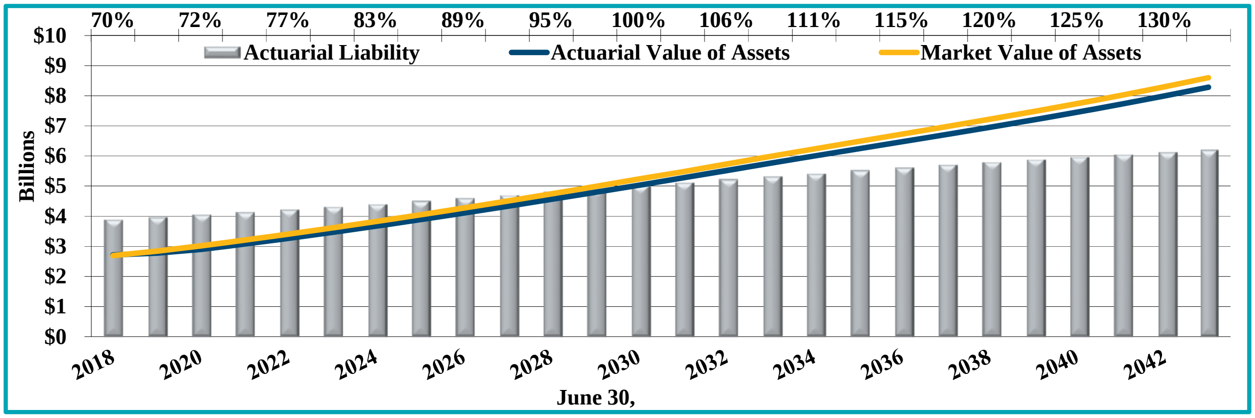



The charts on the next page show the projection if the rate of return assumption is two percent greater and then two percent less than the assumed 7.25% rate of return in each year of the projection.

## SECTION I - SUMMARY

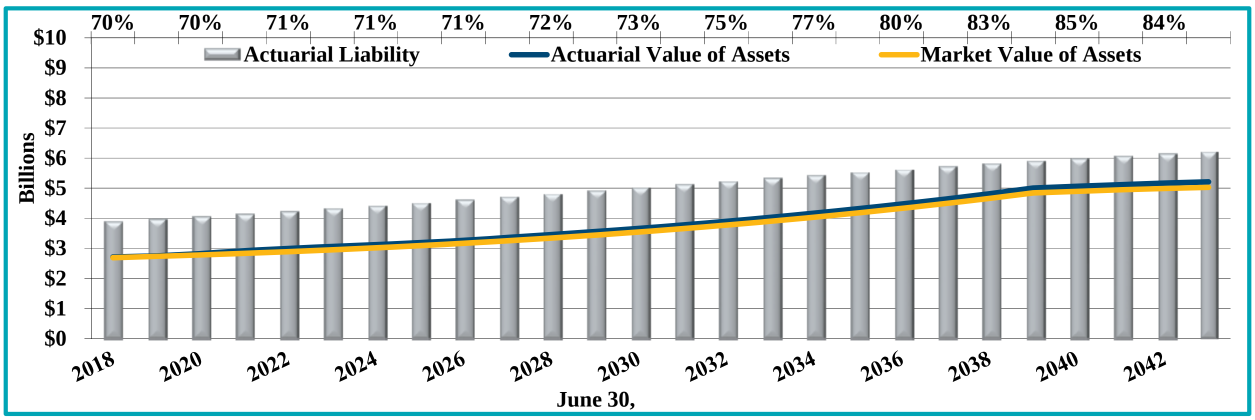
### Optimistic Returns of 9.25%

If the System earns 2.00% greater than the assumed rate of return in each year of the projection, with all other assumptions being exactly met, the AVA funded ratio is projected to increase to 100% by the 2030 valuation, nine years earlier than in the baseline projection.




### Pessimistic Returns of 5.25%

If the System earns 2.00% less than the assumed rate of return in each year of the projection, with all other assumptions being exactly met, the AVA funded ratio is projected to increase to only 85% by 2039, when 100% is reached in the baseline projection.



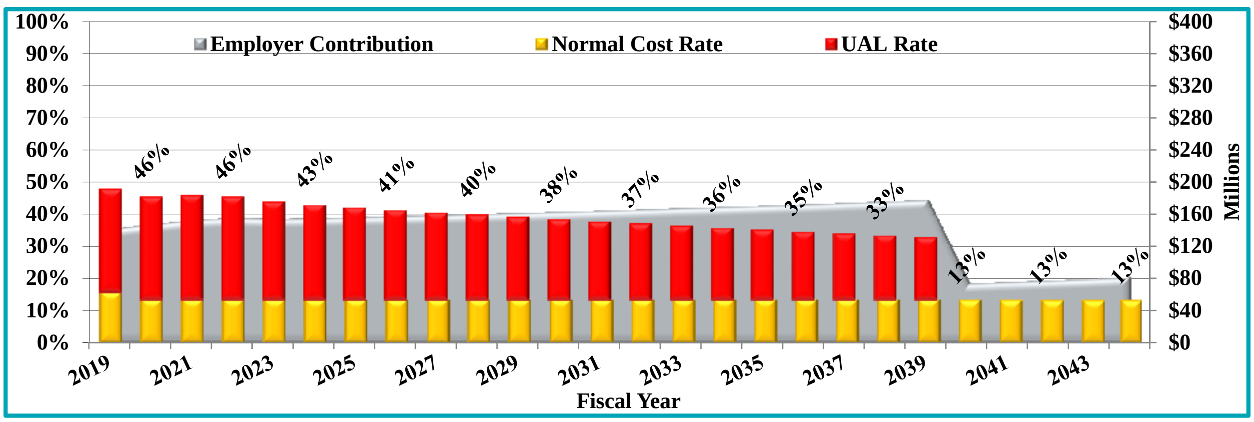
## SECTION I - SUMMARY

### 2. Contribution Rate Projections

The next set of charts shows projection of the System's projected total employer contribution rates (red/gold bars) and the projected dollar amount of total employer contributions (the gray shaded area) over the 25-year period shown, based on three different rate of return levels with all other valuation assumptions being exactly met. The contribution rates are read using the left-hand axis, and the dollars are read using the right-hand axis. The yellow bars for the normal cost rate also reflect the provision for anticipated administrative expenses.

**Baseline Returns of 7.25%**

The first chart below shows that the total employer contribution rate is projected to decrease as the unfunded actuarial liability (UAL) is paid down under the baseline scenario where the rate of return assumption is exactly met. The expected decrease in the UAL rate is due to the level dollar amortization being expressed as a percent of an increasing payroll. In this projection, the initial closed layer UAL is fully paid off with the FY 2039 payment.

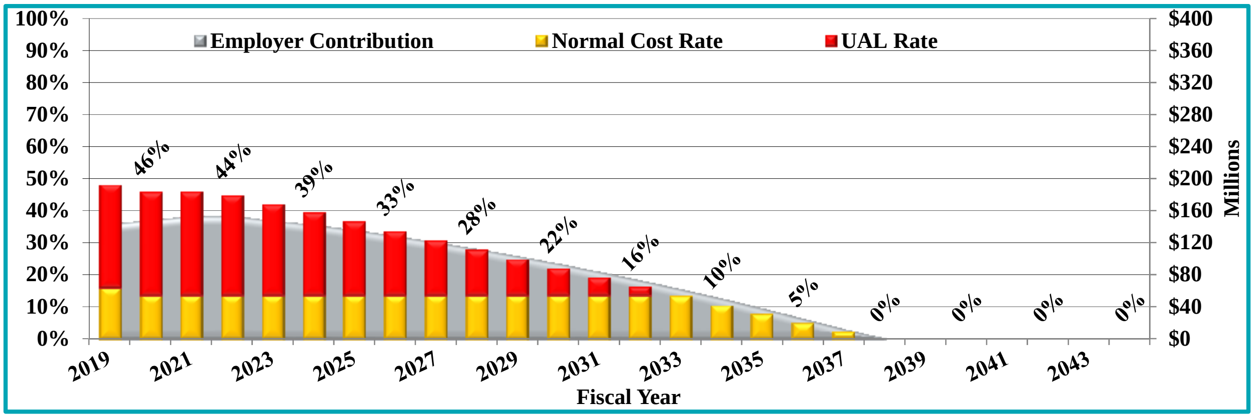



The charts on the next page show the projection if the rate of return assumption is two percent greater and then two percent less than the assumed 7.25% rate of return in each year of the projection.

## SECTION I - SUMMARY

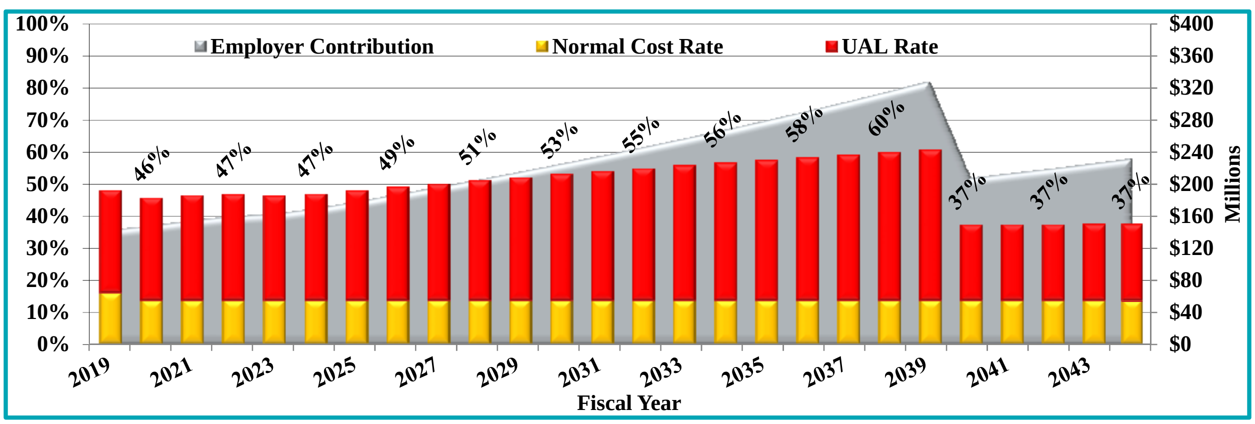
**Optimistic Returns of 9.25%**

If the System earns 2.00% greater than the assumed rate in each year of the projection, the employer contribution rate will begin to rapidly decrease and eventually reach 0.0% in FY 2038. In FY 2038, and all future years, the investment gains would cover all the employer normal costs (including administrative expenses).




**Pessimistic Returns of 5.25%**

If the System earns 2.00% less than the assumed rate in each year of the projection, the employer contribution rate will steadily increase to about 60.5% by FY 2039 in the final year of the initial 25-year closed period. In FY 2040, the initial closed layer UAL is fully paid off, and the entirety of the UAL rate shown is due to the funding of asset losses from the 15-year layered approach during the projection period.



# SECTION II - ASSETS

Assets play a key role in the financial operation of the System and in the decisions that the Board of Trustees may make with respect to future deployment of those assets. The level of assets, the allocation of assets among asset classes, and the methodology used to measure assets will likely impact upon benefit levels, employer contributions, and the ultimate security of members' benefits.

In this section, we present detailed information on System assets including:

- Disclosure of System assets as of June 30, 2018,
- Statement of the changes in market values during the year,
- Development of the actuarial value of assets, and
- A comparison of the year's investment performance to the return assumption.

## Disclosure

The market values of assets represent "snap-shot" or "cash-out" values, which provide the principal basis for measuring financial performance from one year to the next. However, market values can fluctuate widely with corresponding swings in the marketplace. As a result, market values are usually not suitable for budgeting annual contributions.

The actuarial values of assets are market values that have been smoothed; they are used for evaluating the System's ongoing ability to meet its obligations. Current methods employed by this System set the actuarial value equal to the market value, adjusted for a five-year phase-in of experience gains and losses. This method was implemented beginning in 2015 following the actuarial value of assets being set equal to the market value of assets for the June 30, 2014 valuation.

## SECTION II - ASSETS

The assets below are based upon unaudited financial data furnished by the System's staff. The change in the market value of assets for the six funds during the valuation year ending June 30, 2018 is summarized below.

**Table II-1**
**System Market Value of Assets as of June 30, 2018**

| | Annuity Savings Fund | Annuity Reserve Fund | Pension Accumulation Fund | Pension Reserve Fund | Paid Up Benefit Fund | Contingency Reserve Fund | Total |
|---|---|---|---|---|---|---|---|
| Fund Balance on 6/30/2017 | $ 325,140,922 | $ 355,476,186 | $ (1,821,400) | $ 1,912,644,711 | $ (28,875,757) | $ 0 | $ 2,562,564,662 |
| Ordinance Transfers | $ 0 | $ 0 | $ 0 | $ (28,875,757) | $ 28,875,757 | $ 0 | $ 0 |
| Actuarial Transfers | $ 0 | $ 25,035,030 | $ (269,604,695) | $ 244,569,665 | $ 0 | $ 0 | $ 0 |
| Adjusted Fund Balance on 6/30/2017 | $ 325,140,922 | $ 380,511,216 | $ (271,426,095) | $ 2,128,338,619 | $ 0 | $ 0 | $ 2,562,564,662 |
| Contributions | | | | | | | |
| Member | $ 31,285,880 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 31,285,880 |
| Employer (City/State) | $ 0 | $ 0 | $ 137,738,323 | $ 0 | $ 0 | $ 0 | $ 137,738,323 |
| Net Investment Income | | | | | | | |
| Interest, Dividends, and Realized Capital Gains | $ 10,413,379 | $ 0 | $ 151,544,220 | $ 0 | $ 0 | $ 0 | $ 161,957,599 |
| Unrealized Gains (Losses) | $ 0 | $ 0 | $ 65,129,141 | $ 0 | $ 0 | $ 0 | $ 65,129,141 |
| Expenses | $ 0 | $ 0 | $ (15,418,796) | $ 0 | $ 0 | $ 0 | $ (15,418,796) |
| **Total Investment Income** | $ 10,413,379 | $ 0 | $ 201,254,565 | $ 0 | $ 0 | $ 0 | $ 211,667,944 |
| Net ERS Fund Transfers | $ (19,379,609) | $ 19,381,438 | $ (1,829) | $ 0 | $ 0 | $ 0 | $ 0 |
| Payments of Benefit & Refunds | $ (5,668,771) | $ (33,772,998) | $ (12,465,623) | $ (167,657,276) | $ (27,405,897) | $ 0 | $ (246,970,565) |
| Administrative Expenses | $ 0 | $ 0 | $ (4,984,228) | $ 0 | $ 0 | $ 0 | $ (4,984,228) |
| Fund Balance on 6/30/2018 | $ 341,791,801 | $ 366,119,656 | $ 50,115,113 | $ 1,960,681,343 | $ (27,405,897) | $ 0 | $ 2,691,302,016 |
| Ordinance Transfers | $ 0 | $ 0 | $ 0 | $ (27,405,897) | $ 27,405,897 | $ 0 | $ 0 |
| Actuarial Transfers | $ 0 | $ 34,616,409 | $ (266,740,447) | $ 232,124,038 | $ 0 | $ 0 | $ 0 |
| Adjusted Fund Balance on 6/30/2018 | $ 341,791,801 | $ 400,736,065 | $ (216,625,334) | $ 2,165,399,484 | $ 0 | $ 0 | $ 2,691,302,016 |

## SECTION II - ASSETS

The chart below shows the calculation of the investment gain/loss. On a market value basis, the System earned an 8.40% return, a total investment income of $211.7 million during FY 2018, resulting in a net System asset gain, on a market value of assets basis, of $22.6 million. On an actuarial value of assets basis, the System had a much lower return for the year, 5.78%, producing a loss of $49.9 million to the System.

**Table II-2**
**Development of Investment Gain/(Loss)**

| | | |
|---|---|---|
| 1. | Market Value of Assets as of 6/30/2017 | $ 2,562,564,662 |
| 2. | Market Value of Assets as of 6/30/2018 | $ 2,691,302,016 |
| 3. | Earnings During 7/1/2017 to 6/30/2018 (Net of Investment Expenses) | $ 211,667,944 |
| 4. | Mean Assets [(1. + 2. - 3.) ÷ 2] | $ 2,521,099,367 |
| 5. | Investment Return for FY 2018 [3. ÷ 4.] | 8.3959% |
| 6. | Investment Gain/(Loss) for FY 2018 [5. - 7.5%] x 4. | $ 22,586,529 |

## SECTION II - ASSETS

The next table shows how the actuarial value of assets is developed. The actuarial value of assets represents a "smoothed" value developed by the actuary to reduce, or eliminate, erratic results that could develop from short-term fluctuations in the market value of assets.

The actuarial value of assets for the System was set equal to the market value of assets as of June 30, 2014. Beginning with the plan year ending June 30, 2015, the actuarial value of assets is the current market value of assets, adjusted by a five-year smoothing of gains and losses on a market value basis. However, if the actuarial value of assets is less than 80% or more than 120% of the market value, an adjustment is made to the actuarial value to bring the value within this corridor. Additional details regarding this actuarial methodology are included in Appendix C of the report.

### Table II-3
### Development of Actuarial Value of Assets

| | | | |
|---|---|---|---|
| 1. Market Value of Assets at of 6/30/2018 | | | $ 2,691,302,016 |
| **Plan Year End** | **Gain/(Loss)** | **Percent Not Recognized** | **Amount Not Recognized** |
| 6/30/2015 | $ (136,173,779) | 20% | $ (27,234,756) |
| 6/30/2016 | (178,557,046) | 40% | (71,422,818) |
| 6/30/2017 | 99,405,786 | 60% | 59,643,472 |
| 6/30/2018 | 22,586,529 | 80% | 18,069,223 |
| 2. Total Delayed Recognition | | | $ (20,944,879) |
| 3. Preliminary Actuarial Value of Assets [2. - 1.] | | | $ 2,712,246,895 |
| 4. Corridor for Actuarial Assets | | | |
| 80% of Market Value | | | $ 2,153,041,613 |
| 120% of Market Value | | | $ 3,229,562,419 |
| 5. Actuarial Value of Assets as of 6/30/2018 | | | $ 2,712,246,895 |

## SECTION III - LIABILITIES AND EXPERIENCE GAINS/(LOSSES)

The table that follows presents the actuarial liabilities by membership status and employer and then allocates the actuarial and market values of assets in proportion to each employer's liabilities to produce the unfunded actuarial liabilities by employer. In the next section, these unfunded actuarial liabilities are amortized over a 25-year closed period beginning July 1, 2014, and those amounts are then added to the net normal costs (cost to cover the upcoming year's expected benefit accruals less member contributions) and the expense load to produce the recommended employer contributions for Fiscal Year 2020 as determined by this June 30, 2018 actuarial valuation. This table also shows the System's funded ratio using both the market value of assets and the actuarial value of assets, for informational purposes.

The liability amounts are not appropriate for measuring a settlement of the System's liabilities either by purchase of annuities or payment of lump sums.

## SECTION III - LIABILITIES AND EXPERIENCE GAINS/(LOSSES)

**Table III-1**
**Liability by Employer**

| | As of June 30, 2018 | | |
|---|---|---|---|
| | **State** | **City** | **Total** |
| **Number of Members** | | | |
| Actives | 2 | 4,047 | 4,049 |
| Service Retirees | 56 | 3,764 | 3,820 |
| Disableds | 7 | 951 | 958 |
| Beneficiaries | 11 | 1,507 | 1,518 |
| Total Members | 76 | 10,269 | 10,345 |
| Total Projected Current Payroll of Active Membe | $ 167,715 | $ 323,183,048 | $ 323,350,763 |
| Projected Total Payroll for Plan Year 2019 | $ 172,327 | $ 332,070,582 | $ 332,242,909 |
| Average Active Age | 60.00 | 41.10 | 41.11 |
| Average Active Service | 31.41 | 13.98 | 13.99 |
| **Development of Unfunded Actuarial Liability (UAL)** | | | |
| Actuarial Liability (AL) | | | |
| Actives | $ 1,828,836 | $ 1,315,645,844 | $ 1,317,474,680 |
| Service Retirees | 26,702,286 | 1,894,192,892 | 1,920,895,178 |
| Disableds | 1,817,266 | 376,398,021 | 378,215,287 |
| Beneficiaries | 1,653,829 | 265,371,255 | 267,025,084 |
| Terminated Vesteds | 0 | 1,007,010 | 1,007,010 |
| Total Liabilities | $ 32,002,217 | $ 3,852,615,022 | $ 3,884,617,239 |
| Actuarial Value of Assets (AVA)* | $ 22,344,007 | $ 2,689,902,888 | $ 2,712,246,895 |
| AVA Unfunded Actuarial Liability (UAL) | $ 9,658,210 | $ 1,162,712,134 | $ 1,172,370,344 |
| Funded Ratio using AVA | 69.8% | 69.8% | 69.8% |
| Market Value of Assets (MVA) | $ 22,171,459 | $ 2,669,130,557 | $ 2,691,302,016 |
| Funded Ratio using MVA | 69.3% | 69.3% | 69.3% |

* Actuarial value of assets has been allocated in proportion to each employer's actuarial liability.

## SECTION III - LIABILITIES AND EXPERIENCE GAINS/(LOSSES)

The table below presents the changes in actuarial liabilities and assets during the plan year. In general, the unfunded actuarial liability (UAL) of any retirement system is expected to change at each subsequent valuation for a variety of reasons. In each valuation, we report on those elements of the change in the UAL that are of particular significance, potentially affecting the long-term financial outlook of the System. Below we present key changes in the actuarial liabilities and actuarial value of assets since the last valuation.

**Table III-2**
**Development of 2018 Experience Gain/(Loss)**

| | Actuarial Liabilty | Actuarial Value of Assets | Unfunded Actuarial Liability |
|---|---|---|---|
| 1. Value as of 6/30/2017 | $ 3,720,306,742 | $ 2,644,643,773 | $ 1,075,662,969 |
| 2. Additions | | | |
| a. Total Normal Cost with Expense Load | $ 74,689,747 | | $ 74,689,747 |
| b. Expected Employer Contributions | | $ 137,738,323 | $ (137,738,323) |
| c. Expected Member Contributions | | $ 31,285,880 | $ (31,285,880) |
| 3. Decreases | | | |
| a. Actual Benefit Payments | $ (246,970,565) | $ (246,970,565) | $ 0 |
| b. Actual Administrative Expenses | $ (4,984,228) | $ (4,984,228) | $ 0 |
| 4. Expected Interest | | | |
| a. On 1 for one year | $ 279,023,006 | $ 198,348,283 | $ 80,674,723 |
| b. On 2a for one year | $ 5,601,731 | | $ 5,601,731 |
| c. On 2b for one year* | | $ 10,330,374 | $ (10,330,374) |
| d. On 2c for 1/2 year | | $ 1,173,221 | $ (1,173,221) |
| e. On 3a for 1/2 year | $ (9,261,396) | $ (9,261,396) | $ 0 |
| f. On 3b for 1/2 year | $ (186,909) | $ (186,909) | $ 0 |
| 5. Expected Value 6/30/2018 [sum 1. - 4.] | $ 3,818,218,128 | $ 2,762,116,756 | $ 1,056,101,372 |
| 6. Excess Contributions | $ 0 | $ 0 | $ 0 |
| 7. Due to Change in Actuarial Assumptions and Methodologies | $ 86,384,050 | $ 0 | $ 86,384,050 |
| 8. Benefit Changes | $ 0 | $ 0 | $ 0 |
| 9. Expected Value After Changes | $ 3,904,602,178 | $ 2,762,116,756 | $ 1,142,485,422 |
| 10. Actual Value as of 6/30/2018 | $ 3,884,617,239 | $ 2,712,246,895 | $ 1,172,370,344 |
| 11. Actuarial Gain/(Loss) | $ 19,984,939 | $ (49,869,861) | $ (29,884,922) |
| 12. Total Gain/(Loss) | $ (66,399,111) | $ (49,869,861) | $ (116,268,972) |

* Assumes employer contributions made at beginning of year.

## SECTION III - LIABILITIES AND EXPERIENCE GAINS/(LOSSES)

The table below provides the components of the liability gain developed in the previous table.

**Table III-3**
**Elements of Actuarial Liability -- Gain/(Loss)**

| | | | |
|---|---|---|---|
| 1. | Age and Service Retirements - Gain/(Loss) | $ | 2,190,000 |
| 2. | Disability Retirements - Gain/(Loss) | | 2,700,000 |
| 3. | Deaths in Service - Gain/(Loss) | | (350,000) |
| 4. | Withdrawals from Employment - Gain/(Loss) | | 3,640,000 |
| 5. | Pay Increases - Gain/(Loss) | | 12,010,000 |
| 6. | Deaths After Retirement - Gain/(Loss) | | 1,850,000 |
| 7. | New Entrants - Gain/(Loss) | | (1,000,000) |
| 8. | Continuing Inactives - Gain/(Loss) | | (100,000) |
| 9. | Other - Gain/(Loss)* | | (960,000) |
| 10. | Total Actuarial Liability - Gain/(Loss) [sum of (1. to 9.)] | $ | 19,980,000 |

* Includes the addition of terminated vested liability, gain/(loss) on administrative expenses, and data corrections.

## SECTION IV - CONTRIBUTIONS

In the process of evaluating the financial condition of any pension plan, the actuary analyzes the assets and liabilities to determine the level of contributions needed based on the funding policy. Typically, the primary goal in setting contributions is to maintain a pattern of contributions that is both stable and predictable over time.

Under the current funding policy, there are three components to the total contribution: the net normal cost, a provision for anticipated administrative expenses, and an amortization of the unfunded actuarial liability (UAL).

For this System, the funding methodology employed is the entry age normal actuarial funding method. The total normal cost is determined for each active member in accordance with the method described in Appendix C of this report. The total anticipated member contributions for the year are then subtracted from the sum of the total normal costs to arrive at the employer, or net normal cost. Expenses designed to approximate the administrative expenses for the coming year are then added to this number, as well as the calculated amortization of the UAL to develop the total contribution.

The UAL amount is developed in Section III of this report. In this section, we develop the contribution amounts by amortizing the UAL over the remaining portion of the 25-year closed period beginning July 1, 2014, using a level dollar amortization approach. Additional information about this methodology is provided in Appendix C.

**Table IV-1**
**UAL Amortization Over Closed 20-Year Period**

| | State | City | Total |
|---|---|---|---|
| a. 7/1/2018 Unfunded Actuarial Liability (UAL) | $ 9,658,210 | $ 1,162,712,134 | $ 1,172,370,344 |
| b. Expected Employer Contribution at 7/1/2018 | $ 905,962 | $ 140,453,144 | $ 141,359,106 |
| c. Employer Normal Cost Payment | (24,405) | (37,427,926) | (37,452,331) |
| d. Administrative Expense Payment | (2,516) | (4,847,746) | (4,850,262) |
| e. Net Contribution Applied to UAL (b + c + d) | $ 879,041 | $ 98,177,472 | $ 99,056,513 |
| f. Interest to 7/1/2019 | $ 636,490 | $ 77,178,763 | $ 77,815,253 |
| g. 7/1/2019 Expected UAL | $ 9,415,659 | $ 1,141,713,425 | $ 1,151,129,084 |
| h. 7/1/2019 Amortize Over 20 Years | $ 844,862 | $ 102,445,323 | $ 103,290,185 |

Since contributions are payable a year after they are developed, the UAL is amortized over 20 years on July 1, 2019 recognizing that a payment will be made on July 1, 2019 and August 1, 2019.

## SECTION IV - CONTRIBUTIONS

The table below develops the State and City contributions to be paid in Fiscal Year 2020 based on this June 30, 2018 valuation.

**Table IV-2**
**FY 2020 Contribution Summary**

| | State | City | Total | % of Payroll |
|---|---|---|---|---|
| Total Normal Cost | $ 41,177 | $ 69,746,231 | $ 69,787,408 | 21.58% |
| Expense Load | 2,516 | 4,847,746 | 4,850,262 | 1.50% |
| Expected Member Cont. for FY 2019 | (16,772) | (32,318,305) | (32,335,077) | (10.00%) |
| Net Normal Cost at 7/1/2018 | $ 26,921 | $ 42,275,672 | $ 42,302,593 | 13.08% |
| Interest to 7/1/2019[1] | $ 740 | $ 1,162,581 | $ 1,163,321 | 0.36% |
| 7/1/2019 Amortization of Unfunded Actuarial Liability[2] | 844,862 | 102,445,323 | 103,290,185 | 31.94% |
| Net Plan Cost at 7/1/2019 | $ 872,523 | $ 145,883,576 | $ 146,756,099 | 45.38% |
| Adjustment to Payment Date[3] | 0 | 426,691 | 426,691 | 0.14% |
| Net Plan Cost at 7/1/2019 (w/ adjustment) | $ 872,523 | $ 146,310,267 | $ 147,182,790 | 45.52% |

1 Interest increases the Net Normal Cost by the assumed 2.75% payroll growth.
2 See Table IV-1 for development.
3 City contribution assumed to be 49.85% at July 1 and 50.15% at August 1. Adjustment increases half of the Net Plan Cost (City) to August 1 by the assumed 7.25% interest rate.

## APPENDIX A - SYSTEM MEMBERSHIP

The data for this valuation was provided electronically in Excel formats by the System office. Cheiron did not audit any of the data, but we did perform an informal examination of the obvious characteristics of the data for reasonableness and consistency in accordance with Actuarial Standard of Practice No. 23. The data for active and inactive members is as of June 30, 2018.

The following pages contain a summary of the data provided:

- Reconciliation of active and DROP/DROP2 members as of June 30, 2018
- Reconciliation of retirees, disableds, and beneficiaries as of June 30, 2018
- Age/service and age/salary/service distribution for active members as of June 30, 2018
- Counts and average benefit amount by age for retirees, beneficiaries, and disabled members as of June 30, 2018

# APPENDIX A - SYSTEM MEMBERSHIP

| Reconciliation of Active System Members | | | Active | DROP (Grand) | DROP2 (Grand) | DROP2 (Non-Grand) | Total Total |
|---|---|---|---|---|---|---|---|
| **A.** | **Active Members as of June 30, 2017** | | **3,214** | **266** | **532** | **0** | **4,012** |
| **B.** | **Exits:** | | | | | | |
| | 1. Terminations: | Non-vested | 101 | 0 | 0 | 0 | 101 |
| | 2. Transfers: | Out | 1 | 0 | 0 | 0 | 1 |
| | 3. Leaves: | Other | 0 | 0 | 0 | 0 | 0 |
| | 4. Prior Incorrect Inclusions | | 0 | 0 | 1 | 0 | 1 |
| | 5. Deaths: | Line-of-Duty | 0 | 0 | 1 | 0 | 1 |
| | | Non-Line-of-Duty w/ Survivor | 1 | 0 | 0 | 0 | 1 |
| | | Non-Line-of-Duty w/out Survivor | 1 | 0 | 0 | 0 | 1 |
| | 6. DROP2s: | DROP2 (Grandfathered) | 10 | 0 | 0 | 0 | 10 |
| | | DROP2 (Non-Grandfathered) | 8 | 0 | 0 | 0 | 8 |
| | 7. Retirements: | Service | 24 | 41 | 47 | 0 | 112 |
| | 8. Disablements: | Line-of-Duty | 14 | 0 | 1 | 0 | 15 |
| | | Line-of-Duty - 100% | 0 | 0 | 0 | 0 | 0 |
| | | Non-Line-of-Duty | 3 | 0 | 0 | 0 | 3 |
| | 9. Other Exits: | Hired & Terminated During Year | 0 | 0 | 0 | 0 | 0 |
| | 10. Subtotal (All Exits): | | 163 | 41 | 50 | 0 | 254 |
| | 11. Military Leaves: | | 11 | 0 | 0 | 0 | 11 |
| | 12. Pending Disablement: | | 48 | 0 | 2 | 0 | 50 |
| **C.** | **Remaining Active Members [A. - B.10]** | | **3,051** | **225** | **482** | **0** | **3,758** |
| **D.** | **Entrances:** | | | | | | |
| | 1. New Entrants | | 255 | 0 | 0 | 0 | 255 |
| | 2. New DROP2s | | 0 | 0 | 10 | 8 | 18 |
| | 3. Prior Omissions | | 1 | 0 | 0 | 0 | 1 |
| | 4. Transfers In | | 0 | 0 | 0 | 0 | 0 |
| | 5. Restorations: | Pending | 0 | 0 | 0 | 0 | 0 |
| | | Leave | 0 | 0 | 0 | 0 | 0 |
| | | Retirement | 6 | 0 | 0 | 0 | 6 |
| | | Disability - Non-Line-of-Duty | 0 | 0 | 0 | 0 | 0 |
| | | Disability - Line-of-Duty | 0 | 0 | 0 | 0 | 0 |
| | | Other Termination | 11 | 0 | 0 | 0 | 11 |
| | 6. Subtotal (All Entrances): | | 273 | 0 | 10 | 8 | 291 |
| **E.** | **Active Members as of June 30, 2018** | | **3,324** | **225** | **492** | **8** | **4,049** |

## APPENDIX A - SYSTEM MEMBERSHIP

**Reconciliation of Inactive System Members**

| | | Retirees | | Disableds | | |
|---|---|---|---|---|---|---|
| | | **Primary** | **Beneficiary** | **Primary** | **Beneficiary** | **Total** |
| **A.** | **Inactive Members as of June 30, 2017** | **3,835** | **1,117** | **967** | **400** | **6,319** |
| **B.** | **Exits:** | | | | | |
| | 1. Payments Ceased | 0 | 2 | 0 | 0 | 2 |
| | 2. Returned to Active Membership | 6 | 0 | 0 | 0 | 6 |
| | 3. Prior Incorrect Inclusion | 0 | 0 | 0 | 0 | 0 |
| | 4. Deaths: Primary with no Survivor | 68 | 0 | 13 | 0 | 81 |
| | Beneficiary | 0 | 53 | 0 | 29 | 82 |
| | Primary with Survivor | 55 | 0 | 18 | 0 | 73 |
| | 5. Subtotal (All Exits): | 129 | 55 | 31 | 29 | 244 |
| **C.** | **Remaining Active [A. - B.5]** | 3,706 | 1,062 | 936 | 371 | 6,075 |
| | Adjustments | -1 | 0 | 1 | 0 | 0 |
| | **Adjusted Remaining Members** | 3,705 | 1,062 | 937 | 371 | 6,075 |
| **D.** | **Entrances:** | | | | | |
| | 1. New Retirements: Primary | 112 | 0 | 18 | 0 | 130 |
| | 2. Active Death: Beneficiary | 0 | 2 | 0 | 0 | 2 |
| | 3. Beneficiary Assumes Payments | 0 | 55 | 0 | 18 | 73 |
| | 4. Prior Omissions | 3 | 1 | 3 | 0 | 7 |
| | 5. Ex-Spouse Receiving Payments (QDRO) | 0 | 8 | 0 | 1 | 9 |
| | 6. Subtotal (all exits): | 115 | 66 | 21 | 19 | 221 |
| **E.** | **Inactive Members as of June 30, 2018** | **3,820** | **1,128** | **958** | **390** | **6,296** |

# APPENDIX A - SYSTEM MEMBERSHIP

**Age/Service Distribution of Active Members**

**Active Members as of June 30, 2018**

| | Completed Years of Credited Service | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Age | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40 & Up | Total |
| Under 25 | 108 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 108 |
| 25-29 | 316 | 111 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 430 |
| 30-34 | 203 | 279 | 224 | 0 | 0 | 0 | 0 | 0 | 0 | 706 |
| 35-39 | 98 | 103 | 248 | 121 | 1 | 0 | 0 | 0 | 0 | 571 |
| 40-44 | 45 | 33 | 171 | 286 | 107 | 3 | 0 | 0 | 0 | 645 |
| 45-49 | 19 | 32 | 112 | 185 | 268 | 127 | 3 | 0 | 0 | 746 |
| 50-54 | 9 | 10 | 50 | 79 | 141 | 140 | 53 | 0 | 0 | 482 |
| 55-59 | 2 | 3 | 18 | 28 | 41 | 62 | 52 | 27 | 0 | 233 |
| 60-64 | 2 | 2 | 6 | 9 | 8 | 22 | 20 | 27 | 6 | 102 |
| 65-69 | 0 | 0 | 0 | 1 | 3 | 2 | 3 | 5 | 8 | 22 |
| 70 & Up | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 4 |
| Total | 802 | 573 | 832 | 709 | 569 | 356 | 132 | 59 | 17 | **4,049** |

Average Age = 41.02 Average Service = 13.99

## APPENDIX A - SYSTEM MEMBERSHIP

**Age/Service Distribution of Active Members**

**Active Members as of June 30, 2018**

Average Payroll

| Age | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40 & Up | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Under 25 | $ 48,754 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 48,754 |
| 25-29 | 51,922 | 68,198 | 67,912 | 0 | 0 | 0 | 0 | 0 | 0 | 56,235 |
| 30-34 | 52,390 | 70,052 | 73,093 | 0 | 0 | 0 | 0 | 0 | 0 | 65,938 |
| 35-39 | 49,583 | 69,012 | 75,145 | 81,204 | 99,095 | 0 | 0 | 0 | 0 | 70,977 |
| 40-44 | 54,954 | 69,946 | 74,674 | 82,896 | 89,729 | 94,658 | 0 | 0 | 0 | 79,293 |
| 45-49 | 60,358 | 70,065 | 74,882 | 81,578 | 91,066 | 95,511 | 101,053 | 0 | 0 | 85,397 |
| 50-54 | 70,837 | 71,645 | 74,441 | 78,723 | 89,760 | 91,276 | 97,509 | 0 | 0 | 86,925 |
| 55-59 | 115,281 | 70,634 | 76,775 | 79,457 | 87,161 | 91,789 | 91,234 | 101,851 | 0 | 89,304 |
| 60-64 | 103,295 | 65,009 | 72,027 | 77,867 | 84,895 | 85,812 | 87,129 | 95,715 | 98,202 | 87,771 |
| 65-69 | 0 | 0 | 0 | 83,519 | 83,806 | 80,557 | 89,801 | 97,462 | 98,774 | 92,862 |
| 70 & Up | 0 | 0 | 0 | 0 | 0 | 0 | 79,919 | 0 | 71,520 | 73,620 |
| Total | $ 52,196 | $ 69,514 | $ 74,405 | $ 81,600 | $ 90,099 | $ 92,507 | $ 93,236 | $ 98,671 | $ 93,763 | $ 75,419 |

Total Pensionable Payroll = $ 305,372,850 Average Pensionable Payroll = $ 75,419

# APPENDIX A - SYSTEM MEMBERSHIP

**Schedule of Benefit Recipients by Attained Age and Type of Retirement**
**June 30, 2018 - Primary Members**

| | Type of Retirement | | | | | | |
|---|---|---|---|---|---|---|---|
| Age | NR | ER | DS | NLOD Dis | LOD Dis | LOD 100 | Total |
| Under 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20-24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 25-29 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30-34 | 0 | 0 | 0 | 3 | 18 | 0 | 21 |
| 35-39 | 0 | 0 | 0 | 9 | 27 | 0 | 36 |
| 40-44 | 11 | 5 | 0 | 13 | 67 | 0 | 96 |
| 45-49 | 212 | 8 | 1 | 24 | 108 | 0 | 353 |
| 50-54 | 406 | 6 | 7 | 35 | 114 | 1 | 569 |
| 55-59 | 453 | 1 | 3 | 24 | 87 | 1 | 569 |
| 60-64 | 568 | 3 | 1 | 16 | 49 | 0 | 637 |
| 65-69 | 666 | 0 | 0 | 20 | 57 | 0 | 743 |
| 70-74 | 665 | 0 | 1 | 25 | 66 | 0 | 757 |
| 75-79 | 391 | 0 | 0 | 19 | 51 | 0 | 461 |
| 80-84 | 235 | 0 | 0 | 23 | 33 | 0 | 291 |
| 85-89 | 125 | 0 | 0 | 16 | 34 | 1 | 176 |
| 90 & Up | 52 | 0 | 0 | 6 | 11 | 0 | 69 |
| Total | 3,784 | 23 | 13 | 233 | 722 | 3 | **4,778** |
| Average Annual Benefit | $ 43,706 | $ 31,232 | $ 31,727 | $ 20,213 | $ 37,707 | $ 71,026 | $ 41,579 |

NR – Normal Service Retirement
ER – Early Retirement
DS – Discontinued Service
NLOD Dis – Non-Line-of-Duty Disability
LOD Dis – Line-of-Duty Disability
LOD 100 – Line-of-Duty Disability 100% of Compensation

# APPENDIX A - SYSTEM MEMBERSHIP

**Schedule of Benefit Recipients by Attained Age and Type of Retirement**
**June 30, 2018 - Beneficiaries**

| | Type of Retirement | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Age | NR | ER | DS | NLOD Dis | LOD Dis | LOD 100 | NLOD DR | NLOD Dth | LOD Dth | Total |
| Under 20 | 1 | 0 | 0 | 1 | 3 | 0 | 0 | 4 | 3 | 12 |
| 20-24 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 0 | 5 |
| 25-29 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30-34 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 |
| 35-39 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 2 |
| 40-44 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 6 | 2 | 11 |
| 45-49 | 20 | 0 | 0 | 1 | 2 | 0 | 2 | 3 | 6 | 34 |
| 50-54 | 46 | 0 | 0 | 4 | 7 | 0 | 2 | 3 | 2 | 64 |
| 55-59 | 74 | 0 | 0 | 4 | 7 | 0 | 4 | 4 | 3 | 96 |
| 60-64 | 90 | 0 | 0 | 9 | 16 | 0 | 8 | 4 | 4 | 131 |
| 65-69 | 121 | 0 | 0 | 9 | 19 | 0 | 16 | 8 | 9 | 182 |
| 70-74 | 133 | 0 | 0 | 12 | 25 | 0 | 7 | 7 | 9 | 193 |
| 75-79 | 137 | 1 | 0 | 30 | 37 | 1 | 8 | 7 | 5 | 226 |
| 80-84 | 137 | 0 | 0 | 32 | 48 | 0 | 9 | 5 | 5 | 236 |
| 85-89 | 114 | 0 | 0 | 31 | 49 | 0 | 6 | 0 | 3 | 203 |
| 90 & Up | 73 | 0 | 0 | 13 | 26 | 0 | 2 | 1 | 6 | 121 |
| Total | 949 | 2 | 0 | 147 | 242 | 1 | 64 | 55 | 58 | **1,518** |
| Average Annual Benefit | $ 19,766 | $ 20,153 | $ 0 | $ 14,638 | $ 18,254 | $ 40,381 | $ 31,088 | $ 19,142 | $ 48,257 | $ 20,586 |

NR – Normal Service Retirement
ER – Early Retirement
DS – Discontinued Service
NLOD Dis – Non-Line-of-Duty Disability
LOD Dis – Line-of-Duty Disability
LOD 100 – Line-of-Duty Disability 100% of Compensation
NLOD DR – Non-Line-of-Duty Death Member Eligible for Service Retirement
NLOD Dth – Non-Line-of-Duty Death with 25% of Compensation
LOD Dth – Line-of-Duty Death

## APPENDIX B - SUMMARY OF PLAN PROVISIONS

1. **Effective Date:**

   The System was effective July 1, 1962 and has periodically been amended. This valuation incorporates the provisions as last amended by Ordinance 17-068.

2. **Eligibility:**

   Any officer or employee of the Police Department or the Fire Department and certain Department of Aviation employees shall become a member as a condition of employment. Any officer or employee for whom the City makes contributions to Social Security shall be excluded.

3. **Grandfathering:**

   Effective July 1, 2010, members who have either met retirement eligibility (see item 7.A.1.) or have attained 15 years of service prior to July 1, 2010 are considered "Grandfathered" for retirement as well as DROP eligibility. All other members are "Non-Grandfathered." Members have until December 31, 2010 to purchase service to satisfy the 15-year "Grandfathering" requirement.

4. **Member Contributions:**

   Members contribute at the rate of 6% of regular compensation for their entire period of service. Effective July 1, 2010, members contribute at the rate of 7% of regular compensation. This percentage increased to 8% starting July 1, 2011, 9% starting July 1, 2012 and 10% starting July 1, 2013. Contributions are treated as made by the employer and are made to the System pre-tax according to Section 414(h)(2) of the Internal Revenue Code. Members of the ERS who transferred to this system after July 1, 1967, and did not make up the contributions which would have been made from July 1, 1962, are to have their retirement allowance reduced by the actuarial equivalent of the deficient contributions with interest. Effective July 1, 2010, interest is credited on contributions at a rate of 3.0% per annum. Previously, interest was credited at 5.5% per annum. Members' contributions were reduced in several years by a specific ordinance for each year. For purposes of calculating benefits that depend on the amount of member contributions (e.g., DROP accounts), members are deemed to have contributed the full amount.

5. **Compensation:**

   Earnable compensation is all usual including lodging, subsistence, etc. When compensation is not paid in money, the Board of Trustees shall fix the value of that part of compensation. This definition excludes overtime.

   For grandfathered members, Average Final Compensation is the average annual compensation during any 18 consecutive month period of service during which earnable compensation was highest or, if less than 18 months, the average during total service.

## APPENDIX B - SUMMARY OF PLAN PROVISIONS

For non-grandfathered members, Average Final Compensation is the average annual compensation during any 36 consecutive month period of service during which earnable compensation was highest or, if less than 36 months, the average during total service.

6. **Military Service Credit:**

   A. Military Service Prior to Employment: A maximum of three years of service credit is granted provided the member has acquired 10 years of service and attained age 50 or has acquired 20 years of service regardless of age.

   B. Military Service within Employment: Upon retirement or death, any member who, because of military duty, had a break in employment shall receive credit for the period of absence as provided by the Veterans Reemployment Rights Act.

7. **Retirement Allowance Eligibility:**

   A. Service Retirement:
      1) Grandfathered:
         a. Membership commencing prior to July 1, 2003: Age 50 or 20 years of service
         b. Membership commencing on or after July 1, 2003: Age 50 with 10 years of service as a contributing member or 20 years of service with 10 years of service as a contributing member
      2) Non-grandfathered – the earlier of:
         a. Age 55 with 15 years of service or
         b. 25 years of service, regardless of age, with 15 years of service as a contributing member

   B. Early Retirement (only non-grandfathered members):
      1) Membership commencing prior to July 1, 2003: Age 50 or 20 years of service
      2) Membership commencing on or after July 1, 2003: Age 50 with 10 years of service as a contributing member or 20 years of service with 10 years of service as a contributing member
      3) The normal retirement benefit is reduced by 6.5% per year for the first five years, 4.5% per year for the next five years, 3.0% for the next five years, and 2% per year thereafter, from the date the member would have been eligible for normal retirement assuming continued service.

   C. Non-Line-of-Duty Disability Retirement: Five years of service and certified by a member of the Panel of Hearing Examiners to be mentally or physically incapacitated for the performance of duty and that incapacity is likely to be permanent.

   D. Line-of-Duty Disability Retirement: No service or age constraints apply. The benefit is awarded when a member becomes totally and permanently incapacitated for duty as the result of an injury while in performance of duty and certified by a Hearing Examiner as

## APPENDIX B - SUMMARY OF PLAN PROVISIONS

incapacitated for the performance of duty where such incapacity is likely to be permanent. Should such disability further result in extensive brain damage causing total incapacity or in the loss of use of both hands or both arms or both feet or both legs or both eyes or any two thereof, an additional pension will be payable.

8. **Termination of Employment:**

   A. Eligible for a Termination Retirement Allowance payable immediately upon completion of 15 years of service if removed from a position without fault. Presently, this benefit is not reflected in the valuation.

   B. Eligible for a refund of accumulated contributions if not eligible for any other benefits.

9. **Retirement Allowances:**

   A. Service Retirement: The retirement allowance shall be the sum of:

      1) An annuity equal to the actuarial equivalent of a member's accumulated contributions.

      2) A pension, which together with the annuity in 1), equals 2.5% of Average Final Compensation times the first 20 years of service, plus 2.0% of Average Final Compensation times service in excess of 20 years.

   **DROP Benefits**

   Members with more than 20 years of service on or before December 31, 2009 can elect to participate in DROP at any time. A member's DROP participation period can be for one, two, or three years. During that time, the member will accrue no additional service. A member who continues employment at the end of his/her DROP participation period shall begin to earn additional service credit.

   If a member retires during his/her DROP participation period or immediately at the end of this period, he/she shall be entitled to a Basic DROP Retirement Benefit. This shall equal:

   1) The retirement benefit that would have been paid had the member retired at the time he/she began his/her DROP participation, plus

## APPENDIX B - SUMMARY OF PLAN PROVISIONS

2) A lump sum equal to the member's DROP account. This equals the accumulation of the annuity payments the member would have received had he/she retired at the time his/her DROP participation began receiving benefits, plus the member contributions paid during his/her DROP participation period, plus interest at 8.25%.

If a member retires later than the end of the three-year DROP period, but less than 18 months after the conclusion of his/her DROP participation period, he/she is entitled to an Intermediate DROP Retirement Benefit. This shall equal:

1) The retirement benefit that would have been paid had the member retired at the time he/she began his/her DROP participation, plus

2) Benefit accrual of 2% plus an extra 1.5% per year (not to exceed 18 months) for service after the DROP participation period.

3) A lump sum equal to the DROP account. No additions (other than interest) are added after the conclusion of the DROP participation period.

If a member retires more than 18 months after the conclusion of his/her DROP participation period, he/she is entitled to a Full DROP Retirement Benefit. This shall equal:

1) The retirement benefit based on current average final compensation and all service excluding service while a member is in DROP.

2) Benefit accrual includes an extra 1.5% per year (not to exceed four years) for service after the DROP participation period.

3) A lump sum equal to the DROP account. No additions (other than interest) are added after the conclusion of the DROP participation period.

**DROP2 Benefits**

Members with more than 20 years of service on or after January 1, 2010, but not before December 31, 2009, can elect to participate in DROP2. Effective July 1, 2010, the 20-year requirement was moved to 25 years for non-grandfathered members. A member's DROP2 participation period can be for one, two, or three years. The member must remain in DROP2 for at least one year. Those members who retire prior to the end of the first year are not entitled to receive any amounts accumulated in the DROP2 account. No additional service is accrued during DROP2 participation. A member who continues employment at the end of the DROP2 participation period shall begin to earn additional service credit.

## APPENDIX B - SUMMARY OF PLAN PROVISIONS

If a member retires during the DROP2 participation period or immediately at the end of this period, the member is entitled to an Early DROP2 Retirement Benefit. This is equal to:

1) The retirement benefit that would have been paid had the member retired at the time he/she began his/her DROP2 participation, plus

2) A lump sum equal to the member's DROP2 account. This equals the accumulation of the annuity payments the member would have received had he/she retired at the time his/her DROP2 participation began, plus the member contributions paid during his/her DROP2 participation period, plus interest at 5.5% for grandfathered members and 3.0% for non-grandfathered members.

If a member retires later than the end of the three-year DROP2 period but less than 3.5 years for police employees or five years for fire employees after the conclusion of his/her DROP2 participation period, he/she is entitled to a Mid DROP2 Retirement Benefit. This is equal to:

1) The retirement benefit that would have been paid had the member retired at the time he/she began his/her DROP2 participation, plus

2) Benefit accrual of 2% for service after the DROP2 participation period began.

3) An additional benefit accrual of 1.5% per year (not to exceed four years) for service after the DROP2 participation period for fire employees only. Police employees do not receive an additional benefit accrual.

4) A lump sum equal to the DROP2 account. No additions (other than interest) are added after the conclusion of the DROP2 participation period.

If a member retires more than 3.5 years for police employees or five years for fire employees after the conclusion of his/her DROP2 participation period, he/she is entitled to a Complete DROP2 Retirement Benefit. This shall equal:

1) The retirement benefit based on current average final compensation and all service excluding service while a member is in DROP2.

2) Benefit accrual includes an extra 1.5% per year (not to exceed four years) for service after the DROP2 participation period for fire employees only. Police employees do not receive an additional benefit accrual.

3) A lump sum equal to the DROP2 account. No additions (other than interest) are added after the conclusion of the DROP2 participation period.

## APPENDIX B - SUMMARY OF PLAN PROVISIONS

B. Non-Line-of Duty Disability Retirement: A member shall receive an annuity equal to the actuarial equivalent of a member's accumulated contributions plus a pension, which together with the annuity, shall equal 2.5% of his/her Average Final Compensation times service up to 20 years, plus 2.0% of his/her Average Final Compensation times service in excess of 20 years, but in no event less than 25% of Average Final Compensation.

NOTE: This allowance is offset by workers' compensation, if the member entered the system after July 1, 1970.

C. Line-of-Duty Disability Retirement: An annuity equal to the actuarial equivalent of a member's accumulated contributions, plus a pension equal to 66-2/3% of Average Final Compensation. An additional pension is paid for certain disabilities so that the retirement allowance is equal to 100% of compensation at the time of retirement.

NOTE: The same offsets apply as in Non-Line-of-Duty Disability.

D. Termination Retirement Allowance: Determined the same as if the member had retired on a Non-Line-of-Duty Disability Allowance.

**10. Optional Methods of Receiving Benefit Payments:**

These options are available for Service, Non-Line-of-Duty Disability, and Line-of-Duty Disability Retirement. The option and/or beneficiary may be changed within 30 days after retirement. For purposes of determining the amount of an optional retirement benefit, a benefit of equivalent value is determined using 5% per annum compounded annually and the mortality as described in Appendix C with a unisex basis of 85% males/15% female for members and 15% male/85% female for beneficiaries.

A. Joint and 50% to un-remarried spouse or dependent children until the last marries, dies, or attains age 18 (age 22 if a full-time student) (this is known as the maximum service of allowance)

B. Cash refund to designated beneficiary with refund based on present value of allowance at retirement less payments made

C. Joint and 100% to Contingent beneficiary

D. Joint and 50% to Contingent beneficiary

E. Some other periodic benefit subject to the approval of the Board of Trustees

## APPENDIX B - SUMMARY OF PLAN PROVISIONS

**11. Non-Line-of-Duty-Death Benefits:**

Upon the non-duty related death of a member in service, benefits are payable as follows:

A. The member's accumulated contributions shall be payable to the member's designated beneficiary or estate.

B. If a member had one or more years of service, 50% of the greater of his/her current annual compensation or Average Final Compensation will be payable as a lump sum.

C. In lieu of A and B above, if the member had at least two years of continuous service, the benefit is an annual sum equal to 25% of the member's regular gross compensation, plus 1.5% of regular gross compensation times years of service in excess of two years, up to a maximum benefit of 50% of regular gross compensation. The death benefit shall be payable to:

   1) the widow(er), if the beneficiary so elects, during widowhood only, or

   2) if no eligible widow(er), the child or children until the last marries, dies, or attains age 18 (age 22 if a full-time student).

D. If the member was eligible for a service retirement or, if retired on account of service or non-line-of duty disability and dies within 30 days of retirement, and the member's designated beneficiary is the member's spouse with whom the member had been living for at least one year or the member's surviving parent(s), such beneficiary may elect, in lieu of (A) and (B) above, an allowance equal to the amount that would have been paid under the Joint and 100% Contingent Option.

E. If a member dies during or following the DROP participation period, the beneficiary will receive the non-line-of-duty death benefit according to the DROP provisions. The member's DROP account is payable according to the form of the non-line-of-duty death benefit as follows:

   1) Lump sum benefit: The beneficiary of a deceased DROP member will receive the balance of the deceased member's DROP account in a lump sum payment.

   2) 25% plus benefit: The beneficiary can elect to receive the balance of the deceased member's DROP account in a lump sum payment or in periodic payments.

   3) 100% survivorship benefit: The beneficiary can elect to receive the balance of the deceased member's DROP account in a lump sum payment or in periodic payments.

F. If a member dies after a minimum of one year of DROP2 participation or following the DROP2 participation period, the beneficiary will receive the non-line-of-duty death

## APPENDIX B - SUMMARY OF PLAN PROVISIONS

benefit according to the DROP2 provisions. The member's DROP2 account is payable according to the form of the non-line-of-duty death benefit as follows:

1) Lump sum benefit: The beneficiary of a deceased DROP2 member will receive the balance of the deceased member's DROP2 account in a lump sum payment.

2) 25% plus benefit: The beneficiary can elect to receive the balance of the deceased member's DROP2 account in a lump sum payment or periodic payments.

3) 100% survivorship benefit: The beneficiary can elect to receive the balance of the deceased member's DROP2 account in a lump sum payment or in periodic payments.

If a member dies within the first year of the DROP2 participation period, the benefit will be calculated as though the member has never participated in DROP2.

These benefits are offset by workers' compensation, if the member entered the system after July 1, 1970. If no beneficiary and if intestate without heirs, then the benefit shall remain part of the System.

**12. Line-of-Duty Death Benefits:**

If a member's death arose out of and in the performance of duty as certified by a Hearing Examiner, or if the member dies within five years as a result of the last injury which resulted in a Line-of-Duty Disability Retirement, a refund of accumulated contributions shall be paid, plus a pension of 100% of current compensation (not less than $15,000) shall be payable to:

A. the surviving spouse, or

B. if no eligible spouse or if the spouse dies, any children, equally, until age 18 (or age 22 if full-time students), or

C. if no eligible spouse or children, any dependent father or dependent mother for their lifetime.

This benefit is offset by worker's compensation, if the member entered the system after July 1, 1970. If no beneficiary and if intestate without heirs, then the benefit shall remain part of the System.

**13. Minimum Benefits:**

Effective July 1, 2010 for current and future beneficiaries of "pre-DROP" retirees (members who retired prior to August 1, 1996 with 20 or more years of service), the minimum annual benefit is $16,000. Benefits will increase based on the applicable COLA. However, for future beneficiaries of the current pre-DROP retirees, the $16,000 minimum will not be adjusted while the primary annuitant (retiree) is still alive. Once payments to the beneficiaries commence, benefits will increase with the applicable COLA regardless of whether the minimum applies.

Effective January 1, 2012 for current and future beneficiaries of members who retired on account of line-of-duty disability prior to August 1, 1996 with less than 20 years of service, the minimum annual benefit is $16,000. Benefits will increase based on the applicable COLA.

**14. Post-Retirement Benefit Increase:**

Post-retirement benefit increases (Cost-of-Living Adjustments of COLAs) are automatically provided to all current and future retirees and beneficiaries according to the following schedule:

i. Under age 55 – No COLA
ii. Age 55 to age 65 – 1% annual COLA
iii. After age 65 – 2% annual COLA

For current and future members receiving a 100% line-of-duty disability benefit as well as their beneficiaries, the 2% annual COLA will apply regardless of age.

Only retirees and beneficiaries who have been receiving periodic benefit payments for two or more years as of the June 30 determination date are eligible for the increase. For a member who retires during or at the end of the DROP participation period, the member's DROP participation period counts toward the eligibility requirement for post-retirement benefit increases. The 2% COLA is first effective January 1, 2011, and the 1% COLA is first effective January 1, 2012.

Prior to June 30, 2010, investment return based increases were provided to retirees and beneficiaries.

**15. Changes since Last Valuation:**

None

## APPENDIX C - ACTUARIAL ASSUMPTIONS AND METHODS

## A. Actuarial Assumptions

### 1. Rate of Investment Return:

7.25% compounded annually

### 2. Rates of Salary Increase:

Salary increases are split into a static inflation assumption of 2.75% and a merit scale based on department and service, shown below.

| Police | |
|---|---|
| **Service** | **Merit Scale** |
| 0-1 | 0.25% |
| 2 | 1.50% |
| 3 | 18.25% |
| 4 | 6.25% |
| 5 | 5.50% |
| 6 | 1.00% |
| 7 | 4.00% |
| 8 – 14 | 1.00% |
| 15 | 3.75% |
| 16 – 20 | 1.00% |
| 21+ | 0.75% |

| Fire | |
|---|---|
| **Service** | **Merit Scale** |
| 0 | 0.25% |
| 1 | 4.00% |
| 2 – 3 | 15.00% |
| 4 | 2.00% |
| 5 | 3.00% |
| 6 – 13 | 0.75% |
| 14 – 15 | 2.50% |
| 16 – 20 | 0.50% |
| 21+ | 0.50% |

### 3. System Expenses:

All expenses are paid from the fund. Administrative expenses are added to the contribution in the amount of 1.5% of covered payroll.

## APPENDIX C - ACTUARIAL ASSUMPTIONS AND METHODS

### 4. Pre-Retirement Mortality and Disability:

| Age | Non-Line-of-Duty Disability[1] | Line-of-Duty Disability[1] | Non-Line-of-Duty Death[2,3] | | Line-of-Duty Death[2,3] | |
|---|---|---|---|---|---|---|
| | | | Male | Female | Male | Female |
| 20 | 0.0001 | 0.0004 | 0.000534 | 0.000206 | 0.000133 | 0.000051 |
| 25 | 0.0006 | 0.0026 | 0.000637 | 0.000219 | 0.000159 | 0.000055 |
| 30 | 0.0013 | 0.0050 | 0.000595 | 0.000277 | 0.000149 | 0.000069 |
| 35 | 0.0015 | 0.0060 | 0.000688 | 0.000364 | 0.000172 | 0.000091 |
| 40 | 0.0015 | 0.0061 | 0.000825 | 0.000503 | 0.000206 | 0.000126 |
| 45 | 0.0016 | 0.0064 | 0.001280 | 0.000835 | 0.000320 | 0.000209 |
| 50 | 0.0014 | 0.0056 | 0.002216 | 0.001401 | 0.000554 | 0.000350 |
| 55 | 0.0008 | 0.0032 | 0.003665 | 0.002127 | 0.000916 | 0.000532 |
| 60 | 0.0008 | 0.0032 | 0.006163 | 0.003103 | 0.001541 | 0.000776 |
| 64 | 0.0008 | 0.0032 | 0.009698 | 0.004308 | 0.002425 | 0.001077 |

1 Assumes 80%/20% of total rates split between Line of Duty Disability and Non-Line of Duty Disability, respectively.

2 Assumes 20%/80% of total rates split between Line of Duty Death and Non-Line of Duty Death, respectively.

3 114% and 130% of the RP-2014 Blue Collar Mortality Table for males and females, respectively, projected using the RPEC_2014 model, with an ultimate rate of 0.85% for ages 20-95, an ultimate rate of 0.00% for ages 95-120, convergence to the ultimate rate in year 2017, and using the committee selected weighing assumption. Values shown are for 2014.

### 5. Post-Retirement Mortality (values shown for 2014):

Retirees and Beneficiaries: 114% and 130% of the RP-2014 Blue Collar Mortality Table for males and females, respectively, projected using the RPEC_2014 model, with an ultimate rate of 0.85% for ages 20-95, an ultimate rate of 0.00% for ages 95-120, convergence to the ultimate rate in year 2017, and using the committee selected weighting assumption.

Disabled members: RP-2014 Disabled Retiree Mortality blended 50%/50% with the healthy annuitant's table projected using the healthy annuitant's RPEC_2014 model.

| | Retirees and Beneficiaries | | Disabled Members | |
|---|---|---|---|---|
| Age | Male | Female | Male | Female |
| 55 | 0.006839 | 0.005233 | 0.015104 | 0.009856 |
| 60 | 0.009640 | 0.007456 | 0.018122 | 0.012227 |
| 65 | 0.014381 | 0.011343 | 0.023033 | 0.016101 |
| 70 | 0.022443 | 0.018156 | 0.031395 | 0.023179 |
| 75 | 0.035918 | 0.029862 | 0.045102 | 0.035454 |
| 80 | 0.059119 | 0.049613 | 0.067868 | 0.055325 |
| 85 | 0.098987 | 0.084514 | 0.106145 | 0.087467 |
| 90 | 0.166907 | 0.145425 | 0.169956 | 0.139038 |

## APPENDIX C - ACTUARIAL ASSUMPTIONS AND METHODS

### 6. Withdrawal:

Withdrawal rates are based on department and service, shown below.

| Years of Service[1] | Police | Fire |
|---|---|---|
| 0 | 6.0% | 14.0% |
| 1 | 9.0% | 5.0% |
| 2 | 11.0% | 4.0% |
| 3 | 8.0% | 2.5% |
| 4 | 6.0% | 2.5% |
| 5 | 4.5% | 2.5% |
| 6 | 3.5% | 2.0% |
| 7 | 3.0% | 2.0% |
| 8 | 2.5% | 2.0% |
| 9 | 2.0% | 2.0% |
| 10 | 1.7% | 2.0% |
| 11 | 1.4% | 1.2% |
| 12 | 1.1% | 1.2% |
| 13 | 0.8% | 1.2% |
| 14 – 19 | 0.4% | 1.2% |
| 20+ | 0.0% | 0.0% |

[1] Withdrawal decrements are reduced to zero when member is eligible to retire.

### 7. Service Retirement:

The valuation uses retirement rates that vary according to member plan (police or firefighter) and whether a member is eligible for DROP, grandfathered DROP2, or non-grandfathered DROP2.

Members with 20 or more years of service on or before December 31, 2009 are eligible for DROP.

Members who had less than 20 years of service on December 31, 2009, but had either 15 or more years of service on June 30, 2010 or were age 50 or older as of June 30, 2010, can elect to participate in grandfathered DROP2 when they have 20 or more years of service.

Members who were not age 50 or older as of June 30, 2010, and also had less than 15 years of service on June 30, 2010, can participate in non-grandfathered DROP2 when they have 25 or more years of service.

Non-grandfathered members, who are not eligible for DROP or grandfathered DROP2, can take early retirement, with a reduced benefit. Prior to reaching normal retirement

## APPENDIX C - ACTUARIAL ASSUMPTIONS AND METHODS

eligibility, these non-grandfathered members are assumed to take early retirement according to the following table.

**Non-grandfathered Early Retirement Rate for Police and Firemen**

| Age | Service <10 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21-24 | 25+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| <45 | | | | | | | | | | | | 5.00% | 5.00% | |
| 45 | | | | | | | | | | | | 5.00% | 5.00% | |
| 46 | Members Not Yet Eligible for Early Retirement | | | | | | | | | | | 5.00% | 5.00% | |
| 47 | | | | | | | | | | | | 5.00% | 5.00% | |
| 48 | | | | | | | | | | | | 5.00% | 5.00% | |
| 49 | | | | | | | | | | | | 5.00% | 5.00% | |
| 50 | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | |
| 51 | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | |
| 52 | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | |
| 53 | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | |
| 54 | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | |
| 55 | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | | | | | | | | |
| 56 | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | | | | | | | | |
| 57 | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | 3.00% | | | | | | | | |
| 58 | 6.00% | 6.00% | 6.00% | 6.00% | 6.00% | 6.00% | | | | | | | | |
| 59 | 12.00% | 12.00% | 12.00% | 12.00% | 12.00% | 12.00% | | | | | | | | |
| 60 | 18.00% | 18.00% | 18.00% | 18.00% | 18.00% | 18.00% | Members Eligible for Unreduced Benefits | | | | | | | |
| 61 | 18.00% | 18.00% | 18.00% | 18.00% | 18.00% | 18.00% | | | | | | | | |
| 62 | 25.00% | 25.00% | 25.00% | 25.00% | 25.00% | 25.00% | | | | | | | | |
| 63 | 25.00% | 25.00% | 25.00% | 25.00% | 25.00% | 25.00% | | | | | | | | |
| 64 | 35.00% | 35.00% | 35.00% | 35.00% | 35.00% | 35.00% | | | | | | | | |
| 65 | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | | | | | | | | |

Once members reach eligibility for normal retirement, they are expected to follow one of two paths: they either enter the DROP/DROP2 program and follow the appropriate post-DROP or post-DROP2 retirement assumptions for their group, or they never enter the DROP/DROP2 program and follow the appropriate non-DROP or non-DROP2 retirement assumptions for their group. Active members, who are beyond their applicable DROP or DROP2 program eligibility as of the valuation date, are assumed to have already made this decision and so are valued only with the applicable DROP/ DROP2 or non-DROP/non-DROP2 retirement assumptions. Those who are not yet normal retirement eligible are valued under both options, and the resulting liabilities are blended according to the following probabilities table.

| | Police and Fire |
|---|---|
| ***DROP Members*** | |
| DROP | 80% |
| Non-DROP | 20% |
| ***Grandfathered DROP2 Members*** | |
| Grandfathered DROP2 | 80% |
| Grandfathered Non-DROP2 | 20% |
| ***Non-Grandfathered DROP2 Members*** | |
| Non-Grandfathered DROP2 | 80% |
| Non-Grandfathered Non-DROP2 | 20% |

## APPENDIX C - ACTUARIAL ASSUMPTIONS AND METHODS

### Non-DROP/Grandfathered Non-DROP2 Retirement Probabilities

Members who do not join DROP or grandfathered DROP2 are assumed to have retirement rates that vary by service until age 50. After age 50, the rates are assumed to vary solely by age.

| Ages Less Than 50 | |
|---|---|
| Years of Service | Probability of Retirement |
| 20 | 40% |
| 21+ | 20% |

| Ages 50 and Higher | |
|---|---|
| Age | Probability of Retirement |
| 50 | 10.00% |
| 51 | 8.00% |
| 52 | 8.00% |
| 53 | 5.00% |
| 54 | 4.00% |
| 55 | 4.00% |
| 56 | 4.00% |
| 57 | 3.00% |
| 58 | 6.00% |
| 59 | 12.00% |
| 60 | 18.00% |
| 61 | 18.00% |
| 62 | 25.00% |
| 63 | 25.00% |
| 64 | 35.00% |
| 65 | 100.00% |

### Non-Grandfathered Non-DROP2 Retirement Probabilities

Assumptions vary between the rate applicable in the first year of eligibility for unreduced retirement and those for subsequent years for those who do not join non-grandfathered DROP2.

| | Police and Fire | |
|---|---|---|
| Age | First Eligible | Subsequent |
| Less than 65 | 50.0% | 30.0% |
| 65 and up | 100.0% | 100.0% |

## APPENDIX C - ACTUARIAL ASSUMPTIONS AND METHODS

**DROP and Grandfathered/Non-Grandfathered DROP2 Retirement Probabilities**

| Years After Electing DROP | DROP and DROP2 Exit Rates | |
|---|---|---|
| | Police | Fire |
| 1 | 12.0% | 3.0% |
| 2 | 12.0% | 6.0% |
| 3 | 15.0% | 6.0% |
| 4 | 10.0% | 6.0% |
| 5 | 10.0% | 6.0% |
| 6 | 25.0% | 6.0% |
| 7 | 20.0% | 12.0% |
| 8 | 20.0% | 20.0% |
| 9 | 15.0% | 10.0% |
| 10 | 15.0% | 10.0% |
| 11 | 15.0% | 10.0% |
| 12 | 15.0% | 15.0% |
| 13 | 15.0% | 15.0% |
| 14 | 15.0% | 15.0% |
| 15+ | 20.0% | 20.0% |

NOTE: In all cases once the member reaches age 65, there is 100% probability of leaving DROP to commence benefit receipt.

**8. Line-of-Duty Disability:**

**Benefit Types:** 1% of line-of-duty disability retirements are assumed to receive a pension equal to 100% of compensation at the time of retirement. The rest are assumed to receive a pension equal to 66 2/3% of Average Final Compensation.

**Form of Payment:** All future withdrawal benefits are assumed to be paid in the form of a lump sum refund of member contributions.

All future retirement benefits are assumed to be paid in the form of a 50% Joint and Survivor Annuity. In addition, members participating in DROP are assumed to receive their DROP account balance in the form of a lump sum upon retirement.

Future non-line-of-duty disability retirement benefits for current active members with fewer than five years of service (i.e., eligible only for the refund of member contributions) are assumed to be paid in the form of a lump sum. All other disability retirement benefits are assumed to be paid in the form of a 50% Joint and

## APPENDIX C - ACTUARIAL ASSUMPTIONS AND METHODS

Survivor Annuity. In addition, members participating in DROP are assumed to receive their DROP account in the form of a lump sum upon disability retirement.

Future death benefits for current active members who have not reached service retirement eligibility are assumed to be paid in the form of a lump sum. Certain line of duty death benefits for refund of member contributions are assumed to be paid in the form of a lump sum. All other death benefits are assumed to be paid in the form of a single life annuity equal to the member's accrued benefit. Beneficiaries of members participating in DROP are assumed to additionally receive the member's DROP account in the form of a lump sum.

**9. Cost-of-Living Adjustment Assumption:**

Assumed to follow System provisions – 0%, 1%, or 2% depending on age and type of retirement

**10. Percent Married:**

Males 85%, Females 85% for actives and current retirees and disableds who elect 50% Joint & Survivor Form

**11. Spouse Age:**

A husband is assumed to be four years older than his wife.

**12. Remarriage Rates:**

None

**13. Children Loads:**

All benefits with Joint & Survivor Forms of Payments for retirees and disableds and all future retirement and disability benefits for actives were increased by 0.3% to account for children's benefits.

**14. Benefit Loads:**

90% of Line-of-Duty death benefits assumed to have future beneficiary (additional 5% above percent married assumption) to allow for contingent beneficiaries.

Benefits payable in the form of a Joint and Survivor 100% Pop-Up or Joint and Survivor 50% Pop-Up were valued, respectively, as 100% Joint and Survivor with a 2.70% load

## APPENDIX C - ACTUARIAL ASSUMPTIONS AND METHODS

and 50% Joint and Survivor with a 1.50% load to account for the additional value of the Pop-Up form of benefit in the absence of data on the amount to which the benefit would increase.

**15. Funding Policy:**

The City's funding policy is to contribute the amount equal to the net normal cost, a provision for anticipated administrative expenses, plus the actuarial liability contribution or less the amortization of the excess assets, as the case may be. However, the aggregate payment by the City must be sufficient, when combined with the amount in the Fund, to provide the pensions and other benefits payable out of the Fund during the then-current year.

**16. Changes Since Last Valuation:**

Demographic assumptions (termination rates, non-grandfathered retirement rates, DROP/DROP2 exit rates, disability rates, percent married, children and benefit loads) and economic assumptions (investment return, inflation) were updated to reflect the most recent experience study.

**17. Rationale for Assumptions:**

The actuarial assumptions were chosen by the Board of Trustees, upon the recommendation of the actuaries, based on an experience study conducted on the System's experience from the 2011-2017 valuations. The results of this study were presented in June 2018 and went into effect starting with the current June 30, 2018 valuation.

## B. Actuarial Methods

### 1. Funding Method:

Liabilities and contributions shown in this report are computed using the entry age normal method of funding. Under this funding method, a normal cost rate is determined as a level percentage of pay for each active member. The normal cost rate times payroll equals the total normal cost for each member. The normal cost plus member contributions will pay for projected benefits at retirement for each active System member.

The actuarial liability is that portion of the present value of future benefits that will not be paid by future employer normal costs or member contributions. The difference between this liability and the funds accumulated as of the same date is referred to as the unfunded actuarial liability (UAL).

The portion of the actuarial liability in excess of System assets, the UAL, is amortized to develop an additional cost or savings that is added to each year's employer normal cost. Under this cost method, actuarial gains and losses are directly reflected in the size of the unfunded actuarial liability. The amortization method is described as item 3 below.

### 2. Asset Valuation Method:

Effective June 30, 2014, the actuarial value of assets was set to equal the market value of assets. The deferral of investment gains and losses only applies after June 30, 2014.

The actuarial value has been calculated by taking the market value of assets less 80% of the investment gain (loss) during the preceding year, less 60% of the investment gain (loss) during the second preceding year, less 40% of the investment gain (loss) during the third preceding year, and less 20% of the investment gain (loss) in the fourth preceding year.

The investment gain (loss) is calculated by taking the difference between the expected value of assets based on an investment return assumption and the actual value of assets. If the actuarial value of assets is less than 80% or more than 120% of the market value, an adjustment is made to the actuarial value to bring the value within this corridor.

### 3. Amortization Method:

The current unfunded actuarial liability is amortized as a level dollar figure over a closed 25-year period beginning on July 1, 2014.

### 4. Changes Since Last Valuation:

None